

EDUCATION'S OWN STATIONS

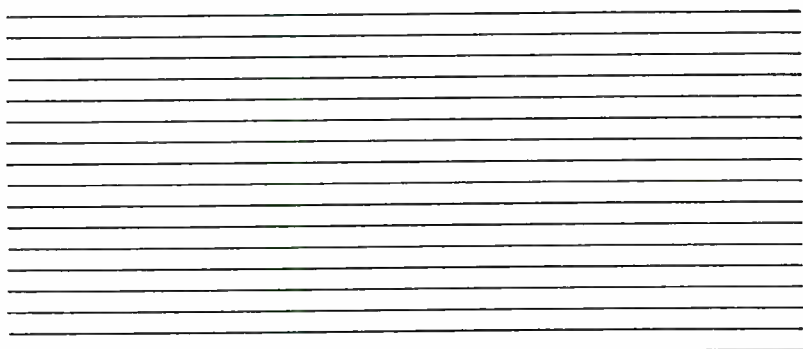
THE HISTORY OF BROADCAST LICENSES ISSUED TO EDUCATIONAL INSTITUTIONS



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PREFACE

SOON after Mr. Franklin D. Roosevelt was inaugurated President in March, 1933, he requested that a specially appointed interdepartmental committee of the government consider the possible advantages or disadvantages that might accrue if the federal government's interest in all communications in the United States should be consolidated in one regulatory authority. This committee initiated an inquiry into the telephone, the telegraph, and the radio, embodying its findings in a report to the President. After the receipt of this report Mr. Roosevelt sent a special message to Congress proposing that legislation be enacted to effect such consolidation. The proposal, which purported to meet suggestions contained in the President's message, was debated in both houses of the Congress and the resulting legislation was the Communications Act of 1934, by which was created the Federal Communications Commission.

When the measure as first presented to both houses of Congress was being debated, various amendments were proposed, some of which suggested that a certain portion or percentage of broadcasting frequencies available for use in the United States be set aside for specific, as opposed to general, purposes. If the merits of all these proposals had been debated thoroughly on the floor of Congress it is reasonable to suppose that the House and Senate would still be arguing over the bill. To settle this legislative jam there was included in the Act as finally passed a mandate upon the Communications Commission that hearings on the merits of the various proposals should be held promptly; and furthermore that the findings of these hearings with recommendations thereon be reported to Congress by a specific date.

The exact wording of this mandate is as follows:

The Commission shall study the proposal that Congress by statute allocate fixed percentages of radio broadcasting facilities to particular types or kinds of non-profit radio programs, or to persons identified with particular types or kinds of non-profit activities, and shall report to Congress, not later than February 1, 1935, its recommendations together with the reasons for the same.

PREFACE

On January 22, 1935, the Communications Commission made its report to Congress and the following sentences of that report are of interest in this connection:

The Federal Communications Commission respectfully recommends that at this time no fixed percentages of radio broadcast facilities be allocated by statute to particular types or kinds of non-profit radio programs or to persons identified with particular types or kinds of non-profit activities.

The Commission proposes to hold a national conference at an early date in Washington, at which time plans for mutual cooperation between broadcasters and non-profit organizations can be made, to the end of combining the educational experience of the educators with the program technique of the broadcasters, thereby better to serve the public interest. The Conference should also consider such specific complaints as might be made by non-profit groups against the actions of commercial broadcasters in order that remedial measures may be taken if necessary.

The Commission intends also actively to encourage the best minds among broadcasters and educators alike in order to develop a satisfactory technique for presenting educational programs in an attractive manner to the radio listener. Cooperation with the United States Commissioner of Education and other governmental agencies already established to assist in building helpful radio programs will be sought to an even greater degree than it now exists.

The Commission feels, in particular, that broadcasting has a much more important part in the educational program of the country than has yet been found for it. We expect actively to assist in the determination of the rightful place of broadcasting in education and to see that it is used in that place.

The conference announced in this report to the Commission was duly held in Washington, beginning May 15, 1935, and itself resulted in a decision on the part of the Communications Commission to form a Federal Radio Education Committee under the chairmanship of United States Commissioner of Education Dr. John W. Studebaker. The purpose of this Committee was to combine forces with the educators on the one hand and the broadcasters on the other, within the present American broadcasting structure, (1) to eliminate controversy and misunderstanding between groups of educators and between the industry and educators, and (2) to promote actual co-operative

arrangements between educators and broadcasters on national, regional, and local bases. As members of this Committee forty individuals active in educational broadcasting and in the industry itself were appointed. Organization of the Committee was announced in January of 1936 and its first meeting was held on February 17 and 18 of that year. Subcommittees have been at work ever since on various phases of problems referred by the Commission to the Committee. In general it has been agreed by the Committee that neither educators nor broadcasters believe any proposal has as yet been presented which will solve the so-called problems of educational broadcasting and that, before any recommendations in respect to educational broadcasting are proposed to the industry, to American education and the Federal Communications Commission, or to Congress, the principle should be established that certain fundamental inquiries must be undertaken and that certain controlled experimentations with programs must be conducted.

In other words it is admitted that even after more than ten years of activity in the educational broadcasting arena certain basic and fundamental facts about the subject have not yet been collected and are not being collected as a matter of routine so that they will constantly be available to the commissioner of education, to the broadcasting industry, to Congress, or to the public generally.

That the information contained in the book, which Mr. Frost has prepared under conditions which he has described in his Introduction, makes an important contribution to the subject no one will attempt to deny. The wisdom of collecting it before it is irretrievably lost will be apparent immediately. Deductions to be made from the data collected in the manner described by Mr. Frost will remain the privilege of the individual who reads the material submitted.¹

The reader should guard himself against either too much optimism or too much pessimism in contemplating these statis-

¹ In *Is American Radio Democratic?* (University of Chicago Press, 1937), chap. viii, Mr. Frost has suggested certain deductions which seem to him to be demanded by this data.

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tics. When we consider an aspect of American radio we must remember that we are dealing with intangible and imponderable matters which cannot always be recorded accurately no matter how elaborate the statistical machinery or the method of inquiry. In this particular study we are concerned also with a large number of individual situations, in no two of which are conditions exactly alike. In one sense, therefore, comparisons or deductions are valueless. In the broad sense we must take into account characteristics of the radio itself, which is a product of the technological development of the early part of the twentieth century. We are concerned with an industry which in some respects admittedly has outrun its own anticipated goals. In American industrial development we have seen the amazing growth of industry's trafficking in material goods; the radio broadcasting industry, by reason of the fact that it derives its support and makes its profit by selling time to advertisers, is trafficking in human intelligence. An authority whereby those who sell goods are made to realize their public responsibility, if perchance they do not see it, admittedly is necessary, and the degree to which that authority is exercised depends upon the willingness of those in control of the industry to see and accept their public responsibility.

In the early days of radio—and as we regard it today broadcasting started in 1920—the acceptance of this responsibility was evident. Those who were most concerned with its development in their public utterances and actions had some inkling of its coming power as an instrument to reach the public and to raise or lower the level of national culture. It appears that not until broadcasting was injected into politics after the debates on the proposed Federal Radio Act of 1927 did a change occur in this basic philosophy. The writer has not discovered an adjective that will describe accurately the regrettable situation which has since developed, for broadcasting has become a political football in Washington.

Throughout all this checkered history the educator, traditionally regarded as impractical and idealistic, has had a difficult time. Suddenly there was placed in his hands a powerful

weapon for the distribution of intelligence. In attempting to use it he found himself immersed in a new species of mud. So far no one has been able to discover a means for extricating him.

One phase of this experience Mr. Frost has recorded. As might be expected it is not altogether a pretty picture and various interpretations of it that logically can be made are not pleasing. At least here are facts which, after all, the government, the broadcasting industry, and American education can use in further consideration of a problem with which all of them are and will continue to be concerned.

Mr. Frost's statistics indicate that there remain several dozen stations owned and operated by educational institutions. These can be regarded either as the fittest that have survived or as the forerunners of a new day. Since the passage of the Federal Radio Act of 1927 and the kaleidoscopic growth of broadcasting as an industry there are many who believe that since broadcasting is an industry, and since it exists to make money, its earlier recognition of its public responsibility has completely disappeared; and that the only hope in the American situation is this group of stations licensed to broadcast for noncommercial purposes. Whether this is true or not is immaterial in this connection. What does matter, and what is undoubtedly true, is that, unless adequate financial support is given to stations of this type as an index of their potential importance in a free and independent broadcasting system, they too will disappear. It is for the authorities both civic and educational in the communities where these stations exist to accept this responsibility. No fulminations against commercial broadcasting or criticisms of industry practices will be of any avail. If the American people in their comparative youth as a nation have not risen to a level where they regard broadcasting as cultural opportunity they cannot expect either an industry or their government so to regard it.

LEVERING TYSON

NEW YORK CITY
AUGUST 1937

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INTRODUCTION

DURING 1930 the Committee on Research of the National Advisory Council on Radio in Education, under the leadership of Dr. W. W. Charters, canvassed the field of education by radio and suggested a number of areas in which research studies might profitably be conducted. History was one of the areas thus suggested.

A detailed analysis of this latter area revealed the urgent need for a compilation of the history of all licenses issued by the federal government to educational institutions for the purpose of broadcasting. It was discovered that, while much material pertinent to such a study was more or less permanently preserved in the files of the various institutions concerned and in the files of the federal government, a great deal that was necessary for complete understanding of such a history had never been committed to writing but remained in the memories of those most closely connected with the radio work of the institutions to be studied. It was realized that time, death, and the shifting of faculty personnel were making any thorough assembling of material from this latter source more and more difficult and in many instances wholly impossible. Consequently it was felt by the Committee and the Council that efforts should be made immediately to gather all possible material dealing with this subject.

Therefore, Mr. C. E. Lakeman, a member of the Council's staff, undertook the study and gathered some material by correspondence with authorities of the institutions involved. When he withdrew from the Council Mr. T. M. C. Johnson carried forward the work and assembled still more information. Upon his transfer to another field of activity the study was temporarily suspended.

In November, 1935, the present author became a member of the Council's staff and was assigned the task of completing the study begun by Mr. Lakeman and Mr. Johnson. Correspondence was immediately established with one or more individuals connected with the 176 institutions involved and in a position to

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give authoritative data regarding the radio work in these institutions. Each individual was asked specifically to state in as great detail as possible all facts pertinent to the history of the license or licenses which his institution had held or was then holding. In every case where a broadcast license was held by the institution but had been lost, the correspondent was urged to recount fully the reasons or causes for this loss.

All material so assembled was taken to the offices of the Federal Communications Commission in Washington and checked carefully against the files of the old Radio Division, United States Department of Commerce, the old Federal Radio Commission, and the present Federal Communications Commission. Through the courtesy of Dr. Irvin Stewart and Judge Eugene O. Sykes, members of the Commission, all files necessary for this work were made available. Further, staffs of the Commission's license, docket, and legal departments were put at the service of the author and co-operated generously throughout the time this phase of the study was under way.

Materials obtained through correspondence with authorities in the institutions studied and from files located in the offices of the Federal Communications Commission, plus additional data gathered from books, articles, mimeographed documents, state records, and numerous personal conferences, were gathered into a first draft of the history of each license. These units were then submitted to the institutions concerned with a request that they be checked carefully for inaccuracies as to data or interpretation. All suggestions received in this manner were again checked with the files of the Federal Communications Commission and whenever necessary incorporated into a final draft which was then resubmitted to the institutions for approval and authority to publish. The individuals mentioned at the close of each unit in the pages which follow are those who furnished data, checked each draft of the histories, and gave authority to publish.

Data in the files of the Latter Day Saints College, Salt Lake City, Utah, successor to the Latter Day Saints University, reveal that this university was granted a broadcast license by the Radio Division, United States Department of Commerce,

sometime in 1921. Since corresponding data is not to be found in the files of this Division, now included in files of the Federal Communications Commission, the contention of the institution that this was the first broadcast license issued to an educational institution by the federal government rests solely upon the evidence of papers contained in its files and upon the memory of certain individuals connected with the university at that time. However, as there is no supportable evidence now available which challenges this contention, this license and date must be accepted, until such evidence is produced, as the point of departure for any historical survey of the broadcast licenses that have been held by educational institutions.

During the sixteen-year period, 1921 through 1936, a total of 202 broadcast licenses were granted by the federal government to educational institutions and held in the names of these institutions. One license was granted to a member of the faculty of the Atwood Township High School, Atwood, Illinois, and held in his name, for broadcasting school events. Further, seven special or temporary permits for broadcasting were issued to five institutions. One institution studied—Ashland College, Ashland, Ohio—was refused a license to broadcast when it was discovered that, because of the low power and limited range of its equipment, it was unwilling to expend money sufficient to operate the station as required by the licensing authority. Another institution—Lincoln Memorial University, Harrogate, Tennessee—had, by January 1, 1937, received a construction permit to erect a transmitter but had not as yet received a broadcast license.

Therefore, the 202 broadcast licenses studied were issued to 168 educational institutions. Of these 24 were granted two broadcast licenses during the sixteen-year period and 5 were granted three such licenses. One hundred and forty institutions received one license.

Analysis of these licenses reveals that, while 202 were granted during the period 1921 through 1936, a total of 164 were either permitted to expire, transferred to other interests, or revoked by the licensing authority; so that on January 1, 1937, only 38 were

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TABLE 1

BROADCAST LICENSES
Issued to Educational Institutions

Year	No.	Year	No.
1921.....	1	1930.....	0
1922.....	73	1931.....	1
1923.....	39	1932.....	0
1924.....	38	1933.....	0
1925.....	25	1934.....	2
1926.....	10	1935.....	1
1927.....	6	1936.....	1
1928.....	4		
1929.....	1	Total.....	202

TABLE 2

BROADCAST LICENSES
Lost by Educational Institutions

Year	No.	Year	No.
1922.....	7	1931.....	2
1923.....	18	1932.....	4
1924.....	24	1933.....	5
1925.....	37	1934.....	1
1926.....	8	1935.....	3
1927.....	8	1936.....	2
1928.....	23		
1929.....	13	Total.....	164
1930.....	9		

TABLE 3

BROADCAST LICENSES
Held by Educational Institutions

Years	No.	Years	No.
Less than 1.....	50	9-10.....	7
1-2.....	35	10-11.....	2
2-3.....	24	11-12.....	6
3-4.....	16	12-13.....	4
4-5.....	13	13-14.....	5
5-6.....	6	14-15.....	20
6-7.....	5		
7-8.....	7	Total.....	202
8-9.....	2		

held by educational institutions. Tables 1 and 2 give this analysis according to years.

It is significant to note that of the 164 broadcast licenses lost by educational institutions, 50, or 30.5 per cent, were held by their respective institutions for a period of less than one year; 85, or 51.8 per cent, less than two years; 109, or 66.46 per cent, less than three years; and only 55, or 33.54 per cent, three years or more. Table 3 gives the life of these licenses by years

The detailed history of these licenses is given in the various sections of the study which follows.

AGRICULTURAL AND MECHANICAL COLLEGE OF TEXAS

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COLLEGE STATION, TEXAS

FOR several years prior to 1922 the students and faculty of the Electrical Engineering Department of the Agricultural and Mechanical College of Texas conducted numerous experiments in wireless telegraphy.

As a result of these early endeavors application was made in the fall of 1922 for a broadcast license. This license was granted on October 7, 1922, designating "unlimited" time on 360 meters (834 kc) and power of 100 watts. Call letters WTAW were assigned to the station. All the equipment for this first station was built by students and staff members of the Electrical Engineering Department of the College. The station went on the air immediately, broadcasting educational material designed to serve the rural population within range of the transmitter.

On January 3 of the following year the power was reduced to 50 watts. On May 29 the station was moved to 1180 kc. April 24, 1924, a power increase to 250 watts was granted. The frequency was again shifted on November 15, 1924, to 1110 kc. On August 10, 1925, the station's power was increased to 500 watts, on which power it has continued to operate.

On June 1, 1927, the station was placed on 970 kc, and on November 1 of the same year was shifted to 620 kc and ordered to share time with Station KFDM. On November 6, 1928, the station was moved to 1120 kc and ordered to share time with Station KUT. This arrangement was continued until April 7, 1930, when Station KTRH was granted the hours shared by Station KUT, the latter being shifted to another frequency. On September 29, 1934, Station KTRH was moved to 1330 kc and Station WTAW was permitted to operate on certain specified hours.

At present the station operates during specified hours on 1120 kc, with a power of 500 watts.

For some time, through the courtesy of the Humble Oil and

Refining Company, which provided free use of its telephone lines, a short program originating on the College campus was broadcast each day except Sunday over a chain of larger stations extending throughout the state.

At present the station is on the air six and one-half hours a week, broadcasting a regular schedule of programs consisting largely of talks and discussions dealing with matters of timely concern to agriculturalists within the area served by the transmitter. These programs are written and broadcast by members of the various divisions of the College. On occasion music and entertainment features by special groups are included in the weekly programs.

Through special arrangement with the Texas Quality Network, the station is enabled to rebroadcast, between 11:30 and 11:50 A.M. daily, programs originating elsewhere of particular interest to its listeners. Occasional athletic contests are supplied by the network.

In addition to the service to its listeners, the station is a means for vitalizing courses in communication engineering in the College and for aiding the Engineering Experiment Station in its investigation of research problems.¹

¹ Data furnished by Dr. C. H. Winkler, dean of the school of vocational teaching, Agricultural and Mechanical College of Texas, and files of the Federal Communications Commission.

ALABAMA POLYTECHNIC INSTITUTE

AUBURN, ALABAMA

WHEN, in 1922, the Alabama Polytechnic Institute was conducting a campaign for funds to erect new buildings, buy new equipment, and expand the institution along all lines, the Hon. Victor Hanson, publisher of the *Birmingham News*, gave the Institute equipment for a small broadcast station. The transmitter was installed and, on October 3, 1922, was licensed by the federal government to operate on 360 meters (834 kc) with "unlimited" time and power of 750 watts. The call letters WMAV were assigned.

Conceiving the station as a publicity organ, those in charge began broadcasting a one-hour program each week, consisting of music and addresses designed to be of practical value to listeners. They were general in nature with emphasis upon rural topics. Advantages of the Alabama Polytechnic Institute were exploited in the background.

It was the custom at WMAV for the operators and talent to assemble in the studio about fifteen minutes before time to go on the air, read the fan mail that had accumulated since the last weekly broadcast, and then present the scheduled program. The best material that the community afforded was used, though no great care was taken in balancing the program or in starting on time. A delay of ten minutes or more was not considered a matter of concern.¹

On December 30, 1922, the power was reduced to 250 watts. The station was shifted, May 10, 1923, to 1,700 kc, and on July 30 of the same year the power was increased to 500 watts. On November 24 the station was again shifted, this time to 1,200 kc.

February 14, 1924, the power was reduced to 250 watts, and on May 28 was increased to 500 watts. These changes in power were caused by mechanical troubles, primarily defective tubes.

¹ P. O. Davis, "A Centralized Unit in Educational Broadcasting," *Education on the Air* (Columbus: Ohio State University, 1930), p. 65.

Gradually the novelty of this first venture wore off and it became increasingly difficult to get program talent for broadcasts. Further, the original equipment was becoming obsolete. To remedy this latter situation the Alabama Power Company was prevailed upon to donate its station WSY, which it was then operating in Birmingham, to the Institute. This was dismantled and moved to Auburn where it was reassembled in combination with Station WMAV, February 22, 1925. This old equipment was found, immediately, to be obsolete.

The donation of WSY in Birmingham to the Alabama Polytechnic Institute and its transfer to Auburn left the largest city in the state without a radio station and combined two at a little town of 2,500 people. Such was radio in its early days.

On November 27, 1924, the license of Station WMAV was allowed to expire and no application for renewal was made. Consequently the station was deleted by the government on July 20, 1925.

Desiring to continue broadcasting and to more adequately serve the state, the Institute purchased a new 1,000-watt Western Electric transmitter, thereby making its equipment equal to anything then being used in the South. These new facilities were licensed by the federal government on September 2, 1925, to operate on 1,210 kc with 500 watts power and with call letters WAPI. The new license permitted "unlimited" time. Broadcasting over this new equipment was begun February 22, 1926.

On August 16, 1926, the station was shifted to 700 kc and permitted to increase its power to 1,000 watts. On September 11 of the same year another shift was made, this time to 650 kc.

Soon thereafter (October, 1926) a brochure was published by the authorities in charge of the station setting forth aims and purposes and announcing the schedule of broadcasts. In this it was stated:

Education is the chief purpose of Station WAPI. Being owned and operated by the Extension Service of the Alabama Polytechnic Institute, it was dedicated to education; but with education must be entertainment and other features to make a first-class broadcasting station. . . . Since Alabama is

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primarily an agricultural state and the Extension Service is engaged in extension work with farm people, special attention is given rural subjects.

With these educational numbers, market reports, weather forecasts, and similar news are broadcast regularly.

Broadcasting athletic events has proved to be a popular feature; and by doing this, station WAPI has made a major contribution to athletics, including football, baseball, and basketball.

Good music, both vocal and instrumental, is the leading entertainment feature. This station has its orchestra and special musicians.²

The station was on the air daily, except Sundays, from 12:00 M. to 1:00 P.M. and from three to five nights a week.

On June 1, 1927, the station was shifted to 610 kc and limited to daytime broadcasting only. Fifteen days later it was shifted to 920 kc and again permitted to use "unlimited" time. September 2 another shift was made to 940 kc, and on November 1 it was again shifted to 920 kc. On November 16 a shift was made to 880 kc and the station ordered to share time with Station WJAX. After approximately a year—on November 11, 1928—the station was shifted to 1,140 kc and ordered to share time with Station KVOO, a 5,000-watt station.

This latter change was the result of the general allocation act of the Federal Radio Commission, and WAPI still remains on this frequency, part time. When the assignment was made WAPI was being installed in Birmingham because it had become evident that if the station was not to become "a little station submerged among larger stations," and if it was to serve the entire state, a change was necessary both in location and in equipment. From Auburn the station was reaching only a very small percentage of the population of the state. It was most difficult to secure sufficient talent to present worth-while and interesting programs. The equipment was obsolete to such an extent that from being equal to any station in the South it was then a little station doing only "a poor job."

At this time the Protective Life Insurance Company was contemplating the erection of a 1,000-watt station at Birmingham. Likewise, the governor of the state wanted a 500-watt station at Montgomery, the state capital. After numerous conferences it

² *Ibid.*, p. 66.

was decided that these interests pool their resources with the Alabama Polytechnic Institute and erect a 5,000-watt station at Birmingham. It was agreed that the Institute instal the station, the city of Birmingham pay half the operating expense, the Institute, assisted by the state of Alabama, the other half, and the Insurance Company furnish studio and office space in its new building.

Thus, on December 31, 1928, broadcasting was begun from Birmingham over the new station in accord with the agreement mentioned above. Programs from the Institute were brought to the station by telephone wire.

Soon the University of Alabama and the Alabama College for Women became interested in radio. The University petitioned the Federal Radio Commission for a permit to instal a 5,000-watt station at Tuscaloosa, Alabama, just sixty miles from Birmingham. Because of the fact that such an arrangement would complicate matters and result in a tremendous expenditure of public money, it was finally decided that the station at Birmingham was sufficient for the state. Consequently an agreement was reached, February 25, 1929, by which the University of Alabama purchased a 39 per cent interest in WAPI, the Alabama College of Women purchased a 22 per cent interest in the station, and the Alabama Polytechnic Institute retained the remaining 39 per cent. Control of the station was placed in the hands of a board composed of the presidents of these three institutions, ownership to rest in the state of Alabama.

The station was so licensed by the Federal Radio Commission to operate on 1140 kc and share time with Station KVOO.

Other educational institutions in the state were invited to present programs from Station WAPI, the only charge being that of getting the programs to the Birmingham studios. A number of such institutions, including the negro schools of the state, took advantage of this offer.

As a result of this agreement between the three educational institutions owning the station, and the co-operation of others, a unit system for broadcasting was established in the state. Station WAPI at Birmingham was the center of this system.

EDUCATION'S OWN STATIONS

Here the main studios were located. Remote control studios were at the Alabama Polytechnic Institute, the state capital in Montgomery, the Alabama College for Women at Montevallo, and the University of Alabama at Tuscaloosa.

The president of Tuskegee Normal and Industrial Institute was invited to instal a studio at the Institute and connect with the circuit, but did not accept. Further, arrangement was made with Station WSFA at Montgomery for an exchange of programs.

The city of Birmingham, until late 1931, contributed not more than twenty thousand dollars a year for operating expenses of the station, the remainder of such expense being prorated among the three institutions owning the station and in proportion to the amount of interest each held. Eventually, because of financial conditions within the city government, Birmingham withdrew its support and left the educational institutions with a burden which it was impossible for them to carry.

Consequently, on August 1, 1932, the station was leased for a period of five years to the WAPI Broadcasting Corporation, with provision that the institutions holding ownership be given, free of charge, six hours per week in the daytime and one hour per week at night.

Because of the high cost of telephone lines it was soon found impossible for the institutions interested in the station to make use of its facilities, even though free time was available. On August 1, 1932, the Alabama Polytechnic Institute was forced to discontinue its broadcasting. Of this Mr. P. O. Davis says:

We discontinued our educational broadcasting because of the tragic condition of State finances. Many school salaries were more than a year in arrears. . . . While schools are working under such conditions the radio artists and engineers will not for they can't. Consequently, we had to discontinue the operation of station WAPI. Before doing so we had made it a quasi-commercial station but this was unsatisfactory because it put state institutions in commercial business in competition with other stations in the State and some of the newspapers felt we were competing with them.³

The other institutions owning the station or co-operating in the state unit system found that the expense of getting pro-

³ Quoted from a letter by Mr. Davis, dated March 11, 1933.

grams to Birmingham was too great and were forced to discontinue their broadcasting activities, except for one weekly program by Alabama College.

In summing up his experience with Station WAPI, an experience which had its beginning with the earliest establishment of Station WMAV on the campus of the Alabama Polytechnic Institute and continuing over a period of ten years, Mr. Davis says:

My experience causes me to conclude that a state educational institution is out of its place when it tries to operate a radio station. Instead of operating a station, we should present programs the same as we present news features in newspapers.

We were never able to work out a satisfactory system of educational broadcasting because we never had the funds for it. With us it was a matter of keeping the station going in order to hold our place on the air. No one of the three institutions owning WAPI ever made provision for presenting creditable programs. Each one did it in a fashion but only as a makeshift, the person in charge of programs having it in addition to other duties.⁴

Further, Mr. Davis states:

Successful broadcasting is a highly specialized business and no institution should undertake it in a regular way without employing at least one person well qualified for this particular work. Without adequate planning and ample provision it will fail.⁵

Since 1932 the station has been operated by the WAPI Broadcasting Corporation under lease agreement. However, on May 4, 1936, a new lease was drawn with interests headed by Mr. Ed. L. Norton, by which the station was leased by these interests for a period of fifteen years, with the understanding that the lessee instal new equipment to operate with 50,000 watts power. The station is to be taken over by the new lessee at the expiration of the present lease agreement.⁶

⁴ *Ibid.*

⁵ Quoted from the statement made by Mr. Davis.

⁶ Data furnished by Mr. P. O. Davis, executive secretary of the Alabama Polytechnic Institute, and files of the Federal Communications Commission.

AMORC COLLEGE OF THE UNITED STATES OF AMERICA

TAMPA, FLORIDA

FOR some time prior to 1927 Amorc College of the United States of America leased Station WJBB through which facilities programs of interest to the College were broadcast. When the licensee of this station gave notice of not renewing the lease, the College made application for a broadcast license to operate its own transmitter.

This license was granted on October 10, 1927, authorizing transmission on 1,260 kc, with power of 250 watts, sharing time with Station WJBB. The call letters WQBA were assigned.

In the application for this license it is stated that the station was "to assist the studies of the 30,000 or more students and 50,000 or more friends of the branches of Amorc College in all states of the United States of America" and to "give to the public general instruction on health, hygiene, civics, music, fine arts."¹

However, the station endeavored to become politically affiliated in Tampa. This caused considerable opposition with the result that fraternal and civic bodies joined in a request that the College cease broadcasting.

Further, all broadcasts were promotional in nature and some "were not very nice in character, consisting of letters concerning domestic problems."² There was never any attempt to broadcast material of an educational nature over the station.

As a result of these conditions the College planned to move its transmitter to San Jose, California, and application was made for permission to effect this removal. The Federal Radio Commission denied this request on the grounds that the area into

¹ Files of the Federal Communications Commission.

² Quoted from a letter by Mr. G. H. Whitley, Jr., of the Brewster Vocational School, Tampa, Florida, dated October 12, 1936.

which it was proposed to move the station was already oversupplied with broadcasting facilities.

Consequently, when the license expired, March 1, 1928, no application for renewal was made, and the station was deleted by the Commission on May 9, 1928.³

³ Data furnished by Mr. Whitley and files of the Federal Communications Commission.

ANTIOCH COLLEGE

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YELLOW SPRINGS, OHIO

LICENSED by the federal government on January 27, 1923, to operate a radio station on 360 meters (834 kc), with 200 watts power and with time "unlimited," Antioch College formally opened its new station on March 16 of that year. The call letters assigned were WRAV. On May 1 the power was reduced to 100 watts.

The station was shifted, January 21, 1924, to 1,240 kc, and was again shifted on December 18 to 1,140 kc. It remained on this frequency until June 1, 1927, when it was shifted to 880 kc.

Radio reception during those years was not good and the audience attracted by the station was small. Consequently officials of the College did not believe that the returns from the project justified the expenditure necessary. Further, money was not available for employing necessary program talent or purchasing the new equipment required by the Federal Radio Commission.

In view of these facts the station was shut down after June 12, 1927. It was hoped, however, that some solution of the problem might be discovered. Thus the station license was renewed during the summer and fall of that year. On July 29, 1927, the station was taken from "unlimited" time and ordered to share its frequency with Station WAFD; however, on October 1, with the opening of the fall term of school, it was placed back on "unlimited" time.

The last license issued to the station was dated November 1, 1927, and placed the assigned frequency at 1,010 kc, to be shared with Station WSMK. No way having been found to meet the financial burden of the station, when the license expired on December 31, 1927, no application for renewal was made and the station was deleted by the federal government.

Commenting upon the experiences of the College with broadcasting, Dr. Arthur E. Morgan, president, states:

We did not have the time or money to put on programs that would compete with larger stations. At the time we could not see that expense was justified. However, I am inclined to believe that it was a mistake to discontinue it, and if we now had the station installed I think we should continue its operation with distinctly educational programs.¹

During the years of its existence practically no statistics of the station's activities were kept. The programs consisted largely of talks and music, educational in intent. However, response to these educational features was, on the whole, disappointing.²

¹ Quoted from a letter by Dr. Arthur E. Morgan, dated March 9, 1933.

² Data furnished by Dr. Walter Kahoe, assistant dean of Antioch College, and files of the Federal Communications Commission.

UNIVERSITY OF ARIZONA

TUCSON, ARIZONA

BEGINNING March 8, 1922, the University of Arizona conducted a series of experiments in radio for the purpose of demonstrating the feasibility of broadcasting, testing peculiar local conditions, and determining the type of equipment necessary for a station adequate to serve the state. These experiments were concluded on May 24 of the same year. Equipment used was a small 50-watt transmitter, largely student built.

No salaries were paid, the entire work being cared for by students and other volunteers under the direction of Mr. Max P. Vosskuhler and Dr. Paul Cloke.

Programs went on the air twice a week. Musical and entertainment features were supplied by the University's College of Music. News and discussions of an informational type were broadcast by staff members from the University's Agricultural Extension Service, agricultural experimental farms, the Arizona Bureau of Mines, the Home Economics Service, and other departments. Sport and general news concerning the work of the University and the University community were broadcast. Also, weather bulletins, United States Department of Agriculture agriograms and United States Public Health bulletins were used whenever necessary. Talks on various educational topics were presented by members of the instructional staff of the University.

This experiment was essentially satisfactory and demonstrated the feasibility of future work in the field.

As a result a broadcast license was applied for and granted on December 9, 1922, giving the University right to operate a station on 360 meters (834 kc), with 250 watts power and on "unlimited" time. The call letters KFDH were assigned. When the

license of March 7, 1923, was issued, the power was reduced to 150 watts.

Further, Mr. Vosskuhler and Dr. Cloke were asked by the University to prepare specific recommendations as to the equipment and staff needed to establish an adequate radio station under this license. Their recommendation included a minimum expenditure of \$25,000 for equipment, the erection of a 1,000-watt station, an acoustically treated studio, the purchase of a piano and victrola, and the employment of a full-time announcer and program arranger and a technician.

The University authorities considered the matter carefully, but eventually decided that "the initial cost together with the cost of operation and maintenance" was "too great to be seriously considered." In fact, Mr. Vosskuhler points out: "We still feel the University would scarcely be warranted in making the expenditure necessary to procure and operate a station the size which we would like to have for our programs."¹

However, the federal license was renewed in the expectation that some means would be found for establishing a radio station on the University campus. On April 14, 1924, the power was reduced to 50 watts and the frequency assigned at 1,120 kc. This frequency was shifted to 1,160 kc on January 19, 1925.

When it became obvious that the establishment of a University radio station was impossible because of the cost involved, the license was allowed to expire, November 11, 1925, and the station was deleted by the federal government on November 4 of the same year.

At present the University is presenting a fifteen-minute program twice weekly over Station KVOA in which an attempt is being made to give a cross-section of the work carried on by staff members of the institution. The Agricultural Extension Department is conducting an eight-minute program twice weekly as part of the regular 4-H broadcast of the federal government.

¹ Quoted from a letter by Mr. Max P. Vosskuhler, director of the extension division of the University of Arizona, dated December 12, 1935.

EDUCATION'S OWN STATIONS

Time for these programs is given free by the local station. Plans are being formulated for a more extensive broadcast program under direction of the various departments of the University.

The University has found the local stations "quite generous" in giving time and valuable hours for educational features under its sponsorship.²

² Data furnished by Mr. Max P. Vosskuhler, director of the Extension Division of the University of Arizona; Dr. Paul Cloke, dean of the College of Technology at the University of Maine; and files of the Federal Communications Commission.

UNIVERSITY OF ARKANSAS

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FAYETTEVILLE, ARKANSAS

EXPERIMENTAL work in wireless telegraphy was begun by the College of Engineering of the University of Arkansas as early as 1897 and continued without interruption for many years.

In 1912 the University obtained a license to operate a wireless station with power of 2,000 watts and on 200 meters.

The federal government took over the station in 1916 because of war conditions, using it for the training of United States Army Intelligence Corps operators. At this time a Class 4 technical and training school license was issued to cover the station and the call letters 9YM assigned.

In 1920 a new license was granted the station and the call letters changed to 5YM.

Operation of this station continued until December 4, 1923, when the University was granted a broadcast license to operate its newly installed transmitter on 1,140 kc, with power of 100 watts and "unlimited" time. The call letters KFMQ were assigned. On December 31, 1924, the station was shifted to 1,090 kc and permitted to increase its power to 500 watts. Another shift, to 1,000 kc, was made on February 7, 1925. On August 26 of the same year a power increase to 750 watts was authorized.

On July 19, 1926, the call letters were changed to KUOA. The power was decreased to 500 watts on April 26, 1927, and on June 1 of the same year the station was shifted to 1,010 kc. On March 23, 1928, the power was placed at 1,000 watts.

On October 30, 1928, a license was issued placing the station on 1,390 kc and ordering that it share time with Station KLRA, a commercial station located at Little Rock, Arkansas. The two stations were requested to agree between themselves as to the hours each was to use. Such an agreement was made almost immediately.

EDUCATION'S OWN STATIONS

However, owing to the fact that the University often desired to broadcast events at hours assigned to KLRA, a special contract was drawn and approved by the Federal Radio Commission, allowing KLRA to use a certain amount of the University's time provided the University was allowed to use an equal amount of KLRA's time. A clause in the contract provided that either party might terminate the agreement at will by giving a thirty-day notice of his intentions.

After a time the University gave notice to Station KLRA that it wished to take back the hours given under the contract and return to the original basis of sharing time equally on the assigned frequency. Upon Station KLRA's refusal to honor this notice the case was placed before the Federal Radio Commission which "flatly refused to do anything about the matter." Consequently appeal was made to the federal court at Little Rock and a decision rendered in favor of the University.

Shortly after this decision Station KLRA asked the Federal Radio Commission for permission to use all the time on 1,390 kc then shared with the University. Though a decision was rendered for the University, it was necessary for representatives of the University to appear before the Commission at Washington to argue the case. This was at considerable expense to the University.

Later Station KLRA renewed its appeal and it was necessary for the University to send representatives to Washington again and spend large sums of money in fighting the appeal. The result of this second appeal was that Station KLRA was given three-fourths of the time on the assigned frequency, including all the night hours and practically all the best daytime hours. The Commission ordered the two stations to file a signed agreement fixing definite hours to be used by each, with the understanding that, until such agreement should be filed, Station KUOA was restricted to daylight hours and to operation on an assigned schedule which included only six hours per week suitable for broadcasting University lectures. Station KLRA refused to sign any agreement, and Station KUOA was forced to continue using the above-mentioned hours.

This condition made operation of the University station practically impossible. According to Dr. A. M. Harding, director of Extension Service of the University, "with its arms, its legs, and its head cut off, station KUOA then died a natural death and 'voluntarily withdrew from broadcasting' "¹

Consequently, on May 20, 1932, the equipment was leased to the Southwestern Hotel Company with the provision that the University was to remain in control of the operation of the station and to use thirty minutes each day for broadcasting its programs.

On April 28, 1933, the station was sold to the KUOA, Incorporated, with the proviso that the University was to have a thirty-minute free period each day for five years from March 1, 1933. For various reasons this period has not been used by the University.

At time of the sale the station was licensed to operate on 1,260 kc and with 1,000 watts power. The hours of operation were specified in the license.

On December 10, 1935, the station was again sold, this time to John Brown University. Though it is operating as KUOA, Incorporated, the station is owned by John E. Brown, representing the University. The University of Arkansas still has the privilege of a thirty-minute period each day as provided for in the first sale contract.

The broadcasting experience of the University is characterized by Dr. J. C. Futrall, president, as "very discouraging." Three reasons are given by him for this condition.

First, the University did not have sufficient funds to build a station that would be adequate to reach and serve the entire state properly.

Second, though at first the University was given a good place on the dial and full time for broadcasting, from time to time its frequency was shifted and the allotted time reduced until, finally, the station was located so far down the dial as to make reception under the most favorable conditions uncertain over large sections of its service area, and only about one-quarter of

¹ Quoted from a letter from Dr. A. M. Harding.

EDUCATION'S OWN STATIONS

the original time for broadcasting was allowed, and this the poorest of the day, the best hours being given to Station KLRA as stated above. After the station was sold its commercial owners were able to get full daylight time on a wave length as good as that held by the University in 1925.

This experience convinced the University authorities that the Federal Radio Commission was not going to treat the educational radio stations in such a way that they could function efficiently, but that it gave all the advantage to the commercial stations. We never knew when we would be put to a considerable expense to hold our place on the dial or to get and keep satisfactory hours for broadcasting.²

Third, after the novelty wore off, it was difficult to get a continuous supply of satisfactory educational programs. Members of the faculty were not interested in preparing papers, lectures, and courses of study for the radio. Consequently it became necessary to use considerable material from other sources, such as United States Department of Agriculture reports, electrically transcribed records, and the like.

In view of these facts President Futrall states:

A small university like ours, located in a small town, cannot, without undue expense, maintain and operate a radio station that would cover its territory and give its people the kind of programs that they would expect from an institution of this type. . . . Under present conditions, I doubt whether the University of Arkansas would accept a radio station even if someone offered to give us free of charge a good one.³

² Quoted from a letter by Dr. J. C. Futrall, president of the University of Arkansas, under date of February 5, 1936.

³ Quoted from a letter by President Futrall dated December 7, 1935. Data used herein furnished by President Futrall, Dr. A. M. Harding, director of the General Extension Service of the University of Arkansas, and files of the Federal Communications Commission.

ASHLAND COLLEGE

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ASHLAND, OHIO

ON DECEMBER 20, 1926, Robert A. Fox, an alumnus of Ashland College, was granted a broadcast license to operate a radio station on 1,360 kc for "unlimited" time and with 15 watts power. The call letters WLBP were assigned. The frequency of this station was shifted to 1,480 kc on June 1, 1927.

Finding that he did not have sufficient financial backing to operate the station, Mr. Fox, on August 19, 1927, gave the equipment to Ashland College and application for transfer of license was made to the Federal Radio Commission. This application was denied on September 16, 1927, since the College found that, because of its low power and limited radius, the station was not of sufficient value to warrant the expenditure of funds necessary for its operation.

Consequently Mr. Fox allowed the license to expire and the station was deleted. No educational broadcasting was attempted by the College.¹

¹ Data furnished by Dr. Edward G. Mason, dean of Ashland College, and files of the Federal Communications Commission.

ATLANTIC AUTOMOBILE SCHOOL

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RED OAKS, IOWA

THE Atlantic Automobile School was granted a broadcast license on December 1, 1923, to operate a radio transmitter on 1,100 kc, with power of 10 watts and on "unlimited" time. The call letters KFLZ were assigned. The station was planned as a service to farmers, broadcasting information as regards stock disease, weather conditions, crop reports, and the like.

On February 12, 1924, the power was increased to 100 watts. Permission was granted to change the call letters to KICK on October 20, 1926.

On June 1, 1927, the frequency was shifted to 650 kc, and on September 19 of the same year the station was ordered to share time with Station WIAS.

On September 28, 1927, the Red Oaks Radio Corporation leased the station, and on October 23, 1928, this corporation purchased the station from the Atlantic Automobile Company, operators of the school.¹

¹ Data obtained from files of the Federal Communications Commission.

ATWOOD TOWNSHIP HIGH SCHOOL

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ATWOOD, ILLINOIS

ON DECEMBER 20, 1926, Mr. E. Dale Trout was licensed to operate a broadcast transmitter on 1,300 kc, with 25 watts power "unlimited" time. The call letters WLBQ were assigned. The function of the station, as stated in the application for this license, was to broadcast "school events, athletic events, church services, etc.," in connection with the Atwood Township High School.

On June 1, 1927, the station was placed on 1,480 kc, and, on November 28 of that same year, it was moved to 1,370 kc.

Mr. Trout withdrew from the faculty of the school in June, 1928, and broadcasts from this institution ceased at that time. Deciding that the station, minus school broadcasts, was not being operated in "public interest, convenience, or necessity," the Federal Radio Commission refused application for renewal of its license and deletion followed on August 1, 1928.¹

¹ Data furnished by Mr. C. E. Rogers, acting principal of Atwood Township High School, and files of the Federal Communications Commission.

AUGSBURG SEMINARY

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MINNEAPOLIS, MINN.

DURING the winter of 1916–17 Dr. R. B. Nell, a newcomer to Augsburg Seminary as a member of the faculty and a licensed radio operator, opened an amateur radio station on the campus using the call letters 9AEE. The equipment consisted of a 500-watt transmitter wound to 25,000 volts. A rotary spark and a directly connected tuned antenna were used. Later, under government requirements, an inductive connected antenna was used.

With this equipment conversations were carried on with ships at sea and in the Gulf of Mexico, and with other amateur operators.

In 1922 students of the Seminary raised funds for the purchase and installation of an experimental broadcast transmitter with an input of 200 watts and adjusted to operate on 360 meters (834 kc). The call letters used were WCE. This station was under the direction of Dr. Nell, then of the Seminary's Department of Education. It presented a regular schedule of broadcasts of an educational nature.

On May 10, 1923, the Seminary was granted a license to operate this broadcast transmitter on 1,150 kc, with 100 watts power and for "unlimited" time. The call letters assigned were KFEX. This station was operated, broadcasting entertainment features, educational programs, and religious services, until January 5, 1925, when the license was allowed to expire and the transmitter abandoned. Since no application for renewal of license was made, the station was deleted on March 4, 1925.¹

¹ Data furnished by Dr. R. B. Nell, dean of administration and registrar at Hamlin University, and files of the Federal Communications Commission.

BANCROFT SCHOOL

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HADDONFIELD, NEW JERSEY

DURING the school year 1918-19 a student at the Bancroft School built an amateur broadcasting station on the campus. This was "more of a toy for some of the boys and was never used for educational purposes." All work from this transmitter was done in the Morse code.

Though the school never held a broadcast license, it was granted two temporary permits. The first covered the period May 7-10, 1923, while the second was for the seven days May 11-17, 1924. Call letters used during both periods were WRAQ. These permits were used to broadcast events during the School's commencements.¹

¹ Data furnished by E. A. Farrington, M.D., of the Bancroft School, and files of the Federal Communications Commission.

BELOIT COLLEGE

BELOIT, WISCONSIN

BROADCASTING at Beloit College received its impetus from an offer made by Mr. Charles H. Morse, a member of the Board of Trustees of the College and also of the firm of Fairbanks, Morse and Company, to the effect that he would give the College certain fundamental equipment for the erection of a radio station provided such station could be operated in conjunction with the Fairbanks, Morse plant located nearby. This offer was accepted and the station erected.

A broadcast license was issued by the federal government to cover this station on October 9, 1924, permitting operation on 283 meters and with power of 500 watts. No limit was set as to the time the station might be on the air. Call letters WEBW were assigned.

Broadcasting was begun immediately, the chief feature of the station being the weekly vesper service at 4:30 P.M. Sundays. Gradually the program offering of the station was expanded to include entertainment features, debates, athletic contests, and the like. Talent from the various organizations on the campus was used.

On November 10, 1924, the station was shifted to 268 meters. Again, on July 27, 1926, a shift was made to 1,120 kc. On November 1, 1926, the station was permitted to increase its power to 750 watts. This was reduced to 500 watts on April 27, 1927.

When, on June 1, 1927, the Federal Radio Commission effected a general reallocation of radio stations, Beloit College was ordered to use 1,160 kc, with 500 watts power.

On July 9, 1928, the College was summoned before the Commission to prove that operation of Station WEBW was in "public interest, convenience, or necessity." The Commission was seeking to reduce the number of stations then operating, and had summoned Beloit College, along with other operators of transmitters, to justify its use of the air.

The result of this hearing was that, on October 30, 1928, the station was placed on 600 kc, a frequency that was shared with the Dominion of Canada, and permitted to operate only during the daytime and on power of 350 watts. As the station was ordered to shut down at 4:30 p.m., broadcasting of the Sunday vesper service was made impossible. President Irving Maurer of the College protested, but the Commission reaffirmed its decision.

Consequently program offerings were confined to lectures, talks, and musical features presented during the daytime hours.

On November 11, 1928, the station's power was reduced to 250 watts, but was returned to 350 watts on January 22, 1929. On November 27, 1929, the station was shifted to 560 kc and permitted to increase its power to 500 watts. On this frequency it divided time with Stations WIBO and WPCC.

Due to the advances that were being made by commercial radio and the rising level of program content throughout the country, it became evident that "it was not possible, unless the College organized a department for broadcasting and financed it to the extent of thousands of dollars, to carry on a high grade program which would be at all worthy of the dignity of the College."¹ This the College did not feel it was in a position to do.

Consequently the station was sold to the Wisconsin State Journal Company, Madison, Wisconsin, and authority granted by the Federal Radio Commission to transfer the license to this company on April 16, 1930.

Dr. Maurer points out:

Station WEBW did not, during its short life, function in the way of systematic educational courses. It did continue 20-minute talks by various members of the faculty on topics in their fields for information to the general public, and these were well received.²

¹ Quoted from a letter by Dr. Irving Maurer, president of Beloit College, dated December 20, 1933.

² Quoted from a letter by Dr. Maurer, dated October 15, 1936. Data furnished by Dr. Maurer and files of the Federal Communications Commission.

BENSON POLYTECHNIC SCHOOL

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PORTLAND, OREGON

ON MARCH 23, 1923, the student body of Benson Polytechnic School, a standard boys' high school offering courses in the mechanical arts and functioning as a unit of the Portland, Oregon, school system, was licensed by the federal government to operate a radio station on 360 meters (834 kc), using 200 watts power for "unlimited" time. The call letters assigned were KFIF. Broadcasting was begun over the station on May 3 of that year.

Since its beginning the station has been operated on a strictly noncommercial basis, serving the interests of the public schools of Portland and the various community organizations of the area.

On June 27, 1923, the power was reduced to 100 watts. On August 27, 1924, the license was changed from the student body to the School. On December 16, 1924, the station was shifted to 1,210 kc. Permission to increase its power to 150 watts was granted on October 6, 1926. The power was put back to 100 watts on April 26, 1927, and reduced to 50 watts on June 1, 1927, when the station was shifted to 1,400 kc and ordered to share time with Station KFEC. When, on February 20, 1928, the station was shifted to 1,310 kc, it was placed on a time-sharing basis with Station KTBR. On October 25, 1928, it was again shifted, this time to 1,420 kc, where "unlimited" time was granted. A permit to increase the power to 100 watts was granted on January 15, 1929. On November 8, 1929, the station was removed from "unlimited" time and ordered to share its frequency with Station KXL.

On April 22, 1930, the call letters of the station were changed to KBPS.

Throughout its history the station has emphasized the broadcasting of educational materials. Further, its facilities have been granted to many organizations and groups in the com-

munity for special broadcasts. The Daughters of the American Revolution, 4-H clubs, grade-school teachers, Parent-Teachers Congress, Insurance Underwriters Bureau, Oregon Music Teachers' Association, Izaak Walton League, Public Health Bureau, Doris Smith Theatrical Guild, *Daily Journal of Commerce*, the *Tech Pep*, Reed College Science Department, E. A. Smith, patriotic instructor, and the grade and high schools of the Portland Public School System all have used the facilities of this station. Time is also given to the auditorium classes of the grade schools.

Owing to the fact that Station KOAC, of the Oregon State Agricultural College, Corvallis, Oregon, is not heard clearly in the area served by Station KBPS, the latter has, in recent years, rebroadcast a number of the programs originating at the state institution. This service has added greatly to the educational efficiency of the station.

During the daytime hours in summer the station covers an average radius of more than one hundred miles. This is increased considerably at night. During the winter months the daytime coverage is more than squared, while night programs have been heard as far away as New Zealand.

A number of the programs broadcast from the station are publicized throughout the entire Portland school system and reach approximately fifty thousand children.

The station is managed by the faculty of the School. By means of it students are trained as operators and announcers. It is estimated that practically every station in the northwest has had a graduate from the School on its staff at some time. Faculty members direct the studio work for which they receive no compensation other than their regular salaries.

Equipment of the station is characterized as "the best and its signal strength is adequate to cover all local needs." Present plans are to expand the work of the station and use more broadcasting time.¹

¹ Data furnished by Mr. W. D. Allingham, manager of Station KBPS, and files of the Federal Communications Commission.

BILLINGS POLYTECHNIC INSTITUTE

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BILLINGS, MONTANA

BILLINGS Polytechnic Institute was licensed, November 7, 1922, to operate a radio station on 360 meters (834 kc), with 100 watts power for "unlimited" time. The call letters assigned were KFED.

Equipment for this station was meager, consisting of make-shift parts, using two Western Electric VT-2 tubes as oscillators and two small tubes as modulators. Plate voltage was obtained by connecting all available direct current generators in series.

Broadcasts were largely in the form of tests, no scheduled programs having been presented. Practically all the music sent out was from phonograph records. A homemade electric pickup was used in broadcasting these records. This consisted of a single-button carbon microphone mounted on the reproducing arm of the phonograph. The vibrations of the needle were transmitted directly by a metal arm to the microphone button. It is believed that this was the first electric pickup to be used in broadcasting work.

As the station was not supported financially, the license was allowed to expire on February 6, 1923, and was deleted by the federal government on February 8, 1923.

The work of the station was under the direction of the Electrical Engineering Department of the Institute, and no educational work was attempted.¹

¹ Data furnished by Dr. G. E. West, assistant professor of electrical engineering at Billings Polytechnic Institute, and files of the Federal Communications Commission.

BLISS ELECTRICAL SCHOOL

•

TAKOMA PARK, WASHINGTON, D. C.

LICENSE to operate a broadcast station was granted the Bliss Electrical School on January 29, 1925. The station was placed on 1,350 kc and permitted to use 100 watts power with "unlimited" time. Call letters assigned were WBES. On June 1, 1927, the station was shifted to 1,010 kc, and on November 1 of the same year was again shifted to 1,130 kc.

The equipment was purchased from Woodward and Lothrop, a large Washington department store which had decided to abandon broadcasting.

For several years the facilities were used by the School for broadcasting general information and educational materials as well as some musical and entertainment programs by students and faculty members. Usually the schedule during the school year was from 10:30 P.M. to midnight daily. The radius of the station was estimated to vary from one hundred to one thousand miles.

In April, 1927, the Federal Radio Commission issued an order insisting that the station use the entire time allowed to it on the air. The financial burden placed upon the School by this order—expenditures necessary for preparing suitable programs and employing talent—was more than could be borne.

Consequently, on May 28, 1928, the license was transferred to Tom F. Little, consummating sale of the station to interests represented by him.

Commenting on the sale, President Louis D. Bliss says: "We did not think it worth while to put the time and money required into continuing the operation of the station."¹

The new owner removed the station to Cape Charles, Maryland, and established it there as a commercial project.²

¹ Quoted from a letter by Mr. Bliss, dated May 25, 1933.

² Data furnished by Mr. Louis D. Bliss, president of the Bliss Electrical School, and files of the Federal Communications Commission.

INDEPENDENT SCHOOL DISTRICT OF BOISE CITY

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BOISE, IDAHO

ON JULY 18, 1922, the federal government issued a license to the Independent School District of Boise City to operate a radio station on 360 meters (834 kc), with 5 watts power and on "unlimited" time. The call letters KFAU were assigned. The power was increased to 200 watts on October 24 of that year, and then reduced to 100 watts on January 26, 1923, and again to 50 watts on April 14, 1923.

The station was one of the pioneers in the field of school broadcasting, presenting programs in which talent from the student body was used. It was also employed in experimental work by some of the students.

On May 25, 1923, the station was shifted to 270 meters and its power increased to 150 watts. This was again increased on September 5, 1924, to 500 watts. Another shift was made on December 8, 1924, to 275 meters. On June 29, 1925, the frequency was placed at 278 meters. On November 6, 1925, the power was increased to 750 watts and the station placed on 282.8 meters. This place was held until July 19, 1926, when a shift was made to 290.2 meters and the power increased to 1,000 watts. On November 30, 1926, the station was placed on 280.2 meters and its power reduced to 750 watts.

Following this three power changes were ordered: On October 23, 1926, an increase to 1,000 watts; on January 10, 1927, an increase to 5,000 watts; and on April 21, 1927, a decrease to 4,000 watts.

On June 1, 1927, the station was ordered to broadcast on 285.5 meters, using 4,000 watts power to "local sunset" and 2,000 watts power at night.

On March 1, 1928, the station was placed on 1,050 kc where it shared time with Station KOB. This arrangement was changed on November 11, 1928, when the station was ordered to share

time with KDYL at night and to operate simultaneously with that station during the daytime hours.

The station was installed and operated under the direction of Mr. Harry E. Redeker, a member of the faculty of the district. When he left the work there was no one in the regular faculty to carry it forward. Further, the school district considered that it was not the function of the public schools to continue the station in that commercial advertising had become necessary in order to meet the expenses of operation and maintenance. The authorities were not willing to enter the commercial field.

Consequently, on September 15, 1928, arrangements were made to sell the station to C. G. Phillips and Frank L. Hill, owners of Station KORE at Eugene, Oregon. On November 11, 1928, the license was officially transferred to these men under the business name of the Boise Broadcasting Station and the letters changed to KIDO.¹

¹ Data furnished by Mr. W. D. Vincent, superintendent of the Independent School District of Boise City, and files of the Federal Communications Commission.

BOONE BIBLICAL COLLEGE

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BOONE, IOWA

On January 26, 1927, the Boone Biblical College, a unit of the Biblical College and Associated Institutions, was granted a federal license to operate a broadcast transmitter on 999.4 kc, with 10 watts power, for "unlimited" time. The call letters KFGQ were assigned.

The station was purchased by the College from the Crary Hardware Company and was used at that time for broadcasting services from the College and other features of value to the institution and to those in the community.

On April 19, 1927, the frequency was shifted to 1,000 kc. A further shift was made on June 1, 1927, this time to 1,430 kc. On November 5, 1928, the station was placed on 1,310 kc where it was ordered to share time with Stations KFJY and KWCR. At this time its power was increased to 100 watts. Later, on May 6, 1932, the station was ordered to operate during specified hours.

Three other changes of frequency have been made: April 20, 1934, to 1,370 kc; May 25, 1934, to 1,310 kc; and June 26, 1934, to 1,370 kc.

At present the station is operated on a purely noncommercial basis, devoting its work to broadcasting features of an educational and religious nature. All programs are nonsectarian. Many addresses on "practical every-day Christianity" are featured, and expressions of interest are received from many listeners in the area served. The fundamental purpose of the station, according to College authorities, is "to arouse interest in individual evangelism and practical every-day Christianity and also to encourage Christian training for children."¹

¹ Data furnished by Miss Lois Crawford, president of Boone Biblical College, and files of the Federal Communications Commission.

BRADLEY POLYTECHNIC INSTITUTE

PEORIA, ILLINOIS

A "RADIO PHONE" station was formally opened on the campus of Bradley Polytechnic Institute on Sunday, January 29, 1922. This event caused considerable comment, since the station was one of the best within a large radius and the proposed schedule of broadcasts was ambitious.

License, however, was not granted by the federal government until April 21 of that year. This license placed the station on 360 meters (834 kc) and permitted it to use 250 watts power with "unlimited" time. Call letters WBAE were assigned.

Early broadcasts from the station were heard easily within a 300-mile radius, and reports from greater distances came to the Institute that its transmitter was reaching far beyond this limit.

The federal government selected the station as one of its sub-stations for the broadcasting of government reports, weather bulletins, and the like.

Besides lectures and educational features, the station, through the co-operation of the *Journal-Transcript*, a local newspaper, broadcasts news stories and comments. Concerts, market bulletins, and special programs from a local theater and from the Conservatory of Music were broadcast. Some of these were brought by wire to the station's transmitter.

Station WBAE was financed largely by private citizens in the community who were vitally interested in the project and in radio generally. Their concern was largely to discover the future possibilities of radio.

Considerable difficulty was experienced in obtaining the proper tubes and other equipment and a great deal of make-shift material was used. Further, program talent of the type desired by the Institute was found to be scarce and difficult to secure.

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Therefore, when the license expired on July 20, 1922, no application for renewal was made and the project was abandoned. The equipment was sold to a local party soon thereafter and no further attempt was made by the Institute to operate a station.¹

¹ Data furnished by Mr. E. G. Shalkhauser, former member of the Physics Department of Bradley Polytechnic Institute, and files of the Federal Communications Commission.

BRANT RADIO POWER COMPANY

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TERRE HAUTE, INDIANA

ON MAY 13, 1927, the Brant Radio Power Company was licensed by the federal government to operate a portable radio station on 1,470 kc, using 100 watts power and on "unlimited" time. Call letters KGFO were assigned.

The purpose of establishing this station was to demonstrate radio transmission to the schools of Indiana. The transmitter would be set up in a school and the students shown the operation of a station and permitted to broadcast their own voices. It was also to be used in times of emergency, going direct to the seat of trouble and broadcasting warnings, information, and the like.

This station was in operation until late in 1928. However, when, on July 1, 1928, the Federal Radio Commission issued General Order No. 34 banning all portable transmitters from the air, the station was ordered to cease broadcasting. A protest was filed and set for hearing on September 10, 1928. When no representative of the Brant Radio Power Company appeared at the hearing, the protest was denied.

Meantime, the Brant Radio Power Company had been put in the hands of a receiver, who found the radio station as one of the assets. In settling the business affairs of the company, the receiver sold the equipment to Mr. S. McCroy, of the Banks of Wabash Broadcasting Company.¹

¹ Data obtained from files of the Federal Communications Commission.

BRENAU COLLEGE

GAINESVILLE, GEORGIA

ON AUGUST 31, 1922, Brenau College was granted a license to operate a broadcast station on 360 meters (834 kc), with 20 watts power and on "unlimited" time. Equipment for this station had been purchased from a party in Atlanta, Georgia, for the sum of \$500, and installed on the College campus. Call letters assigned were WKAY.

Broadcasts went out from the station at uncertain intervals and no attempt was made to establish a definite educational program. The transmitter was operated by a young man who had had some practical experience in handling such apparatus but who was not a licensed operator.

As the early work with the station was largely experimental, the cost to the College was nominal.

When, however, it became necessary, because of government regulations, to employ a licensed operator, and when it was evident that proper functioning of the station made necessary the purchase of additional and more modern equipment, the expense involved was seen to be greater than the College could afford.

Further, the development of commercial broadcasting, with its attractive programs, had become such as to make the College officials feel the impossibility of a station such as this one competing for a listening audience.

Consequently, when the license expired on January 2, 1924, no application for renewal was made and the project was abandoned.

Commenting on this move, President Pearce, of the College, says: "As I see it now, it would have been well if we had gone to some additional expense and continued the station, but at that time, I did not consider it of very great value."¹

¹ Quoted from a letter by Dr. Pearce, president of Brenau College, dated January 17, 1933. Data furnished by Dr. Pearce and files of the Federal Communications Commission.

BROWN'S BUSINESS COLLEGE

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PEORIA, ILLINOIS

ON JUNE 13, 1922, Brown's Business College was licensed to operate a broadcast station on 360 meters (834 kc), using 200 watts power and for "unlimited" time. The call letters assigned were WFAP.

The station was installed with the help of private financial interests in the city interested in the advances that seemed possible in radio. Experimental work was encouraged over the station, and many young men were trained here for professional radio work.

A number of instructional programs were presented, including lessons in English, letter-writing, business law, and book-keeping. No arrangements were made for charging the listeners for these courses. In addition, the *Peoria Journal-Transcript*, a local newspaper, co-operated with the College by furnishing news broadcasts and giving space in its columns for announcement of radio programs. This daily radio column was one of the first in the United States.

Talent for suitable programs was difficult to procure. Further, there was no way of telling the number of listeners or the effect of programs upon them. Consequently the school became convinced that the station was not a "paying proposition" and that the amount of money necessary to keep the project at a level believed necessary was more than the College felt justified in expending.

In view of these facts no application for renewal was made when the license expired on December 15, 1922, and the equipment was turned over to the *Peoria Journal-Transcript* where it remained in storage for some time until it was sold to Mr. Donald W. Evans, of Peoria.¹

¹ Data furnished by Mr. C. J. Harvey, principal of Brown's Business College, the *Peoria Journal-Transcript*, Inc., and files of the Federal Communications Commission.

BUCKNELL UNIVERSITY

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LEWISBURG, PENNSYLVANIA

FOR several years prior to 1924 some members of the faculty and a number of students at Bucknell University carried on experimental work in wireless and amateur radio transmission.

In December of 1924 an instructor in electrical engineering, Professor C. W. Halligan, built a small radio transmitter and made application through the University for a federal license. A temporary license was granted on an amateur basis early in 1925 and the call letters WJBQ assigned. The station was permitted to operate on a power of 50 watts.

Additional improvements were made during the year, and, on November 6, 1925, the station was granted a broadcast license to operate on 1,420 kc, with 100 watts power, for "unlimited" time. With the issuing of this license the call letters were changed to WJBU.

On October 31, 1928, the station was shifted to 1,210 kc and ordered to share time with Station WBAX.

Football games and other athletic events, lectures by visiting persons of prominence, special addresses, and musical programs constituted the material broadcast from the station.

In 1929, at the opening of the fall semester, George R. Faint was employed as program director and the technical supervision of the station was placed in the hands of Associate Professor G. A. Irland, of the Department of Electrical Engineering, who had been active in the University's radio work for several years. Further, an effort was made to improve the quality of the programs and to maintain a regular schedule of broadcasts.

Again, in 1931, extensive improvements were made in the station. At this time, because of financial conditions within the University and because those in charge desired to continue radio work, the station was put on a limited commercial basis as a means of raising revenue to defray necessary expenses. How-

ever, no large amount was secured in this way and the University faced an increasing deficit for broadcasting.

Orders issued early in 1932 by the Federal Radio Commission necessitated considerable changes in the equipment of the station involving a large expenditure of money. At this time business conditions were such as to make impossible any material increase in the amount of commercial work done by the station. In addition, the University was faced with demands from the American Society of Composers, Authors, and Publishers for payment of royalty on much of the material used in broadcasts.

A further difficulty arose when the Federal Radio Commission requested that the University amend its charter so as to provide for the operation of a commercial radio station. To have complied with this requirement would have opened the way for taxation on all University property.

In the face of these conditions it was found that adequate and efficient operation of the station was impossible, and there seemed to be no alternative other than to dispose of the equipment and abandon the project. Consequently, on May 12, 1933, the station was sold and the license transferred to Charles S. Blue, who moved the equipment to Sunbury, Pennsylvania, and set it up as Station WKOK. Later it was sold to the Sunbury Broadcasting Corporation.

The last program broadcast by the University over its own station was the commencement program on June 5, 1933. However, arrangements were made so that the University might broadcast occasional talks and other educational features through the station at Sunbury.¹

¹ Data furnished by Professor George R. Faint, of the Administrative Department at Bucknell University, and files of the Federal Communications Commission.

UNIVERSITY OF CALIFORNIA

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BERKELEY, CALIFORNIA

ON MAY 4, 1922, the University of California was licensed to operate a broadcasting station on 360 meters (834 kc), with power not to exceed 1,000 watts and on "unlimited" time. Call letters were KQI. This license was issued "for educational service and entertainment" broadcasts.

However, the station was on the air one evening only, and then for experimental and instructional purposes. No educational broadcasting was attempted.

When the license expired on June 29, 1923, no attempt at renewal was made since the University had no desire to present regular programs, and the station was deleted by the federal government on December 10, 1923.

Another license, for experimental purposes only, was applied for by the University on June 27, 1927, but not issued.

In 1929 the University was licensed to operate Station W6XM. This license was held only a short time and was not renewed since the station was not needed.

Since December 3, 1931, the University has made use of commercial facilities in Berkeley for broadcasting its educational programs on a weekly schedule.¹

¹ Data furnished by Hale S. Sparks, radio administrator of the University of California, and files of the Federal Communications Commission.

CARLETON COLLEGE

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NORTHFIELD, MINNESOTA

ON DECEMBER 22, 1923, Carleton College was licensed to operate a broadcasting station on 1,060 kc, with 500 watts power and on "unlimited" time. The call letters KFMX were assigned. Broadcasting began over this station on January 16, 1924.

According to College officials: "The original purpose in establishing the station was to share with the people of [the] region some of the cultural and general educational advantages which are enjoyed by those who are in actual attendance at the College."¹ This objective was foremost throughout the life of the station. Appreciation of this educational service, free from commercialism and from "cheap" entertainment, was expressed often by listeners by means of letters and personal visits to the station.

No time was ever sold over the station, the facilities being used by the College and other organizations of value to the life of the community.

Broadcasts consisted of popular and informative lectures, "high-grade" music, addresses by eminent speakers, and an accurate time service furnished from the Goodsell Observatory on the College campus.

The equipment used primarily for broadcasting purposes represented an investment by the College of approximately \$10,000. In addition, the College had an investment in excess of \$150,000 in equipment used only in part for this project. This latter included the high-frequency research and development laboratories on the campus, together with the astronomical equipment of Goodsell Observatory.

In addition to their use for regular broadcasting purposes, the station and equipment were utilized in connection with both

¹ Quoted from a brief history of Station KFMX prepared by Dr. C. A. Culver, director of the station.

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theoretical and practical education of advanced students in the fields of high-frequency communication engineering, electro-acoustics, and other related subjects. Thus it served as an important agency in the training of radio and acoustic engineers.

Further, the equipment was employed for technical training purposes in the art of radio communication. A number of important devices and methods were developed there, devices which are now covered by United States and foreign patents.

On January 26, 1925, one year after the station began broadcasting, the frequency was shifted to 890 kc and the station permitted to increase its power to 750 watts. This was reduced to 500 watts on August 5, 1925. During the time that the station operated on this frequency, reception throughout Minnesota and adjacent states was satisfactory and the station was making definite progress in the work which it had undertaken. However, on June 1, 1927, the Federal Radio Commission shifted the station to 1,270 kc and ordered it to share time with Station WCAL. On October 15, 1928, the station was again shifted to 1,250 kc where it shared time with Stations WRHM and WCAL. Station WLB was also placed on this frequency on October 29, 1928. On January 7, 1929, the power rating was increased to 1,000 watts.

Early in 1931 the transmitting equipment was completely rebuilt and modernized in line with the latest requirements of the Federal Radio Commission.

However, constant shifting of the frequency had brought the station into a place where its nighttime broadcasts were interfered with by Station WDSU at New Orleans, Louisiana, so as to make impossible any satisfactory operation after sundown. Further, the hours of daytime operation were so restricted as to limit seriously the station's actual service to its listeners. These two factors mitigated against adequate financing of the project, since money was hard to secure for a project which was necessarily of as little value as the station had become.

A further source of trouble was the fact that Carleton College, St. Olaf College, and the State University of Minnesota were all assigned to the same channel with the commercial station

WRHM, located in Minneapolis. While the educational institutions were able to co-operate with each other amicably, and were anxious to work in the same way with the commercial station, the latter desired to secure exclusive use of the channel. As a result the educational institutions were involved in long and expensive litigation to maintain their position on the air.

President Donald J. Cowling, of the College, states that had the frequency assignment been more favorable and such as to avoid the interference from Station WDSU, and had Station WRHM been willing to co-operate as to hours of broadcasting and not sought by litigation to obtain the exclusive use of the channel, "the College would undoubtedly have put forth a greater effort to provide for the expense of operation than it felt justified in making under the circumstances."²

However, in the light of these facts, Carleton College permitted its broadcast license to expire on April 1, 1933, and the station was deleted by the federal government on April 25 of the same year.

The rights to the station were turned over to the University of Minnesota and St. Olaf College without compensation and the time divided by the Federal Radio Commission among the two remaining educational institutions and Station WRHM.

That popular sentiment was opposed to the limiting of Station KFMX is shown by an editorial which appeared in the *Pioneer Press*, St. Paul, Minnesota, on April 25, 1932:

The application of radio station WRHM for the exclusive use of the radio channel it now shares with the broadcasting stations of the University of Minnesota, Carleton College, and St. Olaf College certainly should be rejected by the Federal Radio Commission. Such educational stations as those operated by these Minnesota schools are performing the real function of radio. Their broadcasts illustrate the possibilities of the radio for enlightenment and instruction. In the hands of the authorities of schools and colleges, the radio becomes a medium of education and learning. It is the vehicle through which the people of the state, who have been unable to share in the advantages of a college education, may participate in some of the benefits to be gained through these institutions.

² Quoted from a letter by Dr. Donald J. Cowling, president of Carleton College, dated December 30, 1935.

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To crowd such stations off the air in order to make room for more of the usual fare of the average broadcasting studio would reproach the judgment of the Commission. Unless the time WRRM has on the air can be increased without diminishing the hours or disorganizing the facilities of WLB, WCAL, and KFMX, its application should by all means be rejected. The country would be better off if there were more such stations like these three and if each of them had more time on the air.

Commenting on the experience of Carleton College, Dr. C. A. Culver, director of Station KFMX, says:

As the result of our experience of nearly a decade, we are convinced that there are almost unlimited educational possibilities inherent in broadcasting, and that these possibilities can never be realized until the Federal Government sets aside definite frequencies for the exclusive use of educational institutions.³

Further, Dr. Culver is certain that "educational and commercial broadcasting will not mix."⁴

Three factors outlined in the above may be pointed to as reasons for the final abandonment of broadcasting by Carleton College. These are (1) unsatisfactory frequency assignment, (2) continuous and expensive litigation with the commercial station operating on the same frequency, and (3) expense of operation, particularly under the above-indicated conditions.⁵

³ Culver, *loc. cit.*

⁴ *Ibid.*

⁵ Data furnished by Dr. Donald J. Cowling, president of Carleton College; Dr. C. A. Culver, director of Station KFMX; and files of the Federal Communications Commission.

CARTHAGE COLLEGE

CARTHAGE, ILLINOIS

ON MAY 15, 1922, Robert E. Compton and the *Quincy Whig-Journal* were jointly licensed to operate a radio station on 360 meters (834 kc), with 300 watts power and on "unlimited" time. The call letters assigned were WCAZ.

Later, on September 5, 1922, Mr. Compton became the sole licensee of the station. Then, on December 29, 1922, Carthage College became joint licensee with Mr. Compton and the power of the station was reduced to 100 watts.

On September 24, 1923, Carthage College became sole owner of the station, having purchased it from Mr. Compton. At this time the station was shifted to 1,220 kc and the power reduced to 50 watts.

On July 10, 1924, the College allowed the license to expire and the station was deleted by the federal government on September 8, 1924.

Two months later, on November 8, 1924, a new license was issued to Carthage College permitting it to operate a broadcasting station on 1,220 kc, with power of 50 watts and on "unlimited" time. Call letters were the same as those of the former license—WCAZ. This license was allowed to expire on September 28, 1925, and the station was deleted November 2, 1925.

A third license was issued to Carthage College on September 11, 1926, with frequency, power, and call letters the same as those of the previous license. On June 1, 1927, the station was shifted to 880 kc, and on November 16, 1927, it was again shifted to 1,200 kc.

On November 8, 1928, the station was moved to 1,070 kc and limited to daytime hours for broadcasting.

Throughout the time the license was held by the College the station was operated solely as an educational project. Since the College "did not care to go into the financial expense of main-

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taining the station as a first-class commercial broadcasting” enterprise, on February 21, 1930, the station was sold back to Mr. Compton and his associates doing business as the Superior Broadcasting Company. It was agreed in the sale contract that the College was to have time on the station for presenting seven programs each week. This agreement is in effect at the present.¹

¹ Data furnished by Dr. Rudolph G. Schulz, president of Carthage College, and files of the Federal Communications Commission.

CATHOLIC UNIVERSITY OF AMERICA

WASHINGTON, D.C.

EARLY in 1921 members of the Department of Electrical Engineering at the Catholic University of America built a transmitter with which to do experimental work in connection with the course then being offered in radio communication and electronics.

Success of this early experiment was such that the University made application for a broadcast license. This was granted on February 20, 1923, placing the station on 360 meters (834 kc) and permitting it to use 5 watts power on "unlimited" time. The call letters WQAW were assigned.

Broadcasting was begun immediately, the programs consisting of phonograph records, occasional "live" talent, talks, and discussions. Considerable interest was shown in the work of the station.

However, with the growth of commercial broadcasting, the University authorities felt that Station WQAW was "hopelessly outclassed." To furnish programs at regular hours and in keeping with the dignity of the University was found to incur so great an expense as to be prohibitive. Though there was some talk of the necessary funds being made available by friends of the University, it was felt that such money, if given, should be used as part of the University's general fund and for other more vital units of its program.

This feeling on the part of the University authorities is expressed by Dr. Thomas J. MacKavanagh:

When the large broadcasting stations were put into operation in this city we were hopelessly outclassed and I decided to close down. Then, too, every morning brought a flood of mail I could not attend to.

I felt we had no business on the air unless we could keep regular hours, and could do things in keeping with the dignity of the school. The cost of doing so would be prohibitive. . . .

The large stations would be available to us for lectures if things went along as I anticipated, and no university could justify the expense of a well-equipped station unless the commercial stations ceased to consider themselves as servants of the public.¹

¹ Quoted from a letter by Dr. Thomas J. MacKavanagh, professor of electrical engineering at the Catholic University of America, dated June 19, 1933.

Consequently, when the station license expired, August 30, 1923—a license which had placed the station on 1,270 kc and permitted it to use 50 watts power—no application for renewal was made and the station was deleted by the federal government on June 11, 1924.

Commenting further on the abandoning of broadcasting by the University, Dr. MacKavanagh says:

We went off the air when broadcasting grew out of its swaddling clothes. We felt that the local station of the telephone company was educating the public so that it would look more and more for technical excellence. We could not afford either the equipment or the personnel to give something comparable, and we did not want to make it appear that we were not alive to the progress that had been made. We believed that the reputation of the department would suffer, and that we had better leave room in the air for worth while stations.²

Dr. MacKavanagh feels that his position has been justified by the attitude and policies of commercial stations toward educational institutions. The Catholic University of America has used all of the local stations in the Washington area to broadcast talks and musical programs. Several “national hookups” have been made available by the chains. It is felt by the University that commercial stations have been adequately generous in their gifts of time and their co-operation in broadcasts. Thus Dr. MacKavanagh holds: “The business of running a broadcasting station is, to me, no more a part of the University function than the running of some other sort of business that peculiarly belongs in the public utility field, not because of its very nature, but because of the public attitude toward it.”³

The University is operating an experimental station for radio telephony and has been doing some pioneering work in the high and ultra-high frequencies. However, no educational broadcasting is being undertaken with this transmitter.⁴

² *Broadcasting*, I, 15. Published by the National Broadcasting Company, 1935.

³ Quoted from a letter by Dr. MacKavanagh dated December 18, 1935.

⁴ Data furnished by Dr. Thomas J. MacKavanagh, professor of electrical engineering at the Catholic University of America, and files of the Federal Communications Commission.

CENTRAL MISSOURI STATE TEACHERS COLLEGE

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WARRENSBURG, MISSOURI

THE Central Missouri State Teachers College was licensed, on November 3, 1924, to operate a broadcast station on 1,280 kc, with 50 watts power, for "unlimited" time. The call letters KFNJ were assigned.

This station was maintained "in a small way" by the College for less than one year. Since it was felt, however, that the project was of little or no value, appropriations for its operation were discontinued, and when the license expired, on May 12, 1925, no application for renewal was made. Later the equipment was sold. The station was officially deleted by the United States Department of Commerce, Radio Division, on June 4, 1925.

Authorities at the College, along with other educators in the state, feel that Missouri should have educational broadcasting from some one of its state-supported institutions, it being held that the logical place is the University of Missouri at Columbia, since here is the material and personnel to handle such a project efficiently.¹

¹ Data furnished by Dr. Paul R. Utt, head of the Music Department at the Central Missouri State Teachers College, and files of the Federal Communications Commission.

UNIVERSITY OF CINCINNATI

CINCINNATI, OHIO

ON JULY 6, 1922, the Department of Engineering at the University of Cincinnati was granted a license to operate a broadcast station on 360 meters (834 kc), with 250 watts power and for "unlimited" time. The call letters WHAG were assigned.

This equipment was used largely as a laboratory for electrical engineering students who were particularly interested in radio communication. However, programs were broadcast at irregular intervals. These included talks, music, and other events which were thought to be of interest to listeners. All broadcasting was done from the Electrical Engineering Laboratory, no formal studio ever being constructed.

Station WHAG was one of the first in the Middle West to broadcast a football game.

On October 28, 1922, the power was reduced to 20 watts. On May 17, 1923, the station was shifted to 1,350 kc and the power increased to 100 watts. An increase of power to 200 watts was granted on August 20, though on November 14 the power was reduced to 100 watts. On November 26, 1924, the station was placed on 1,290 kc, where it remained until December 27, 1925, when its license was finally allowed to expire and the project abandoned.

The University of Cincinnati withdrew from broadcasting because several stations in the immediate area were coming to the fore on a commercial basis, and the authorities recognized that it would be too expensive for them to attempt to maintain a station. Further, the expense necessary for constructing an adequate studio was far more than the University could well afford.

Since 1925 the University has operated several experimental and training stations for students. Other broadcasting activities have been conducted with the co-operation of Station WLW, whose facilities have been given generously for programs originating at the University.¹

¹ Data furnished by Dr. V. H. Drufner, chairman of the University Radio Committee at the University of Cincinnati, and files of the Federal Communications Commission.

CLARK UNIVERSITY

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WORCESTER, MASSACHUSETTS

EARLY in 1914, under direction of the Physics Department of Clark University, members of the University Radio Club, a student organization, built and began the operation of an amateur sending and receiving wireless set, using a rotary spark gap. Experimental work with this equipment continued until the session of 1921 when a radio telephone was installed and several 5-watt Western Electric tubes added to the equipment.

In the fall of 1921 Mr. P. M. Roope, an instructor in the University, broadcast material to the New England Fair, at the opposite side of the city, where a receiver had been installed in one of the buildings. This material consisted of weather reports obtained by code from Arlington, Virginia, and agricultural information.

Success of this project resulted in the installation of a 2,000-volt, 2,000-watt Westinghouse motor generator, two 250-watt tubes, and other modernized equipment. This material was obtained partly by grant from the University and partly by donations from several business firms in Worcester. Call letters used at this time were I-XZ.

On March 21, 1922, the station was granted a federal license to operate on 360 meters (834 kc), with power not to exceed 1,000 watts and during specified hours. The call letters WCN were assigned. On June 21 of that year the power was increased to 2,000 watts and the station granted "unlimited" time on the air. On December 21 the power was reduced to 600 watts.

Although the station was purely experimental, it was thought advisable to operate it to as great an extent as possible, employing an operator and running on a definite schedule. Mr. Ralph Clark was employed as operator with a salary met by donations from several of the Worcester business men and radio stores. All other members of the staff worked without compensation.

The upkeep of the station was cared for by a fund supplied by the Physics Department.

A player piano and a phonograph, both loaned to the station, were used in transmitting programs every afternoon except Sunday. On each Wednesday evening a formal program was presented, usually including an address and vocal and instrumental numbers. Occasionally a local band would give a concert for the entire evening.

Cards and letters received by the station indicated that its signals were being heard at great distances from Worcester.

The first large aerial used was of the umbrella type. After this collapsed in a severe ice storm an L-shaped aerial was erected between two windmill towers on the roof of the physics building. A counterpoise was used forty feet below the aerial.

Broadcasting from this modernized station was continued through the spring of 1923. Toward the close of 1922 the operating room, or studio, was moved from the physics building, where it had been from the beginning of radio activities on the campus, and installed in the tower of Jonas Clark Hall, the main building of the University.

On June 21, 1923, the license had been allowed to expire and the station was deleted by the federal government.

However, on April 12, 1924, a new license was issued, permitting operation of the transmitter on 1,260 kc, with 250 watts power and for "unlimited" time. The call letters assigned were WCBT.

Very soon replacements and new features to improve the quality of the station's offerings were needed. The expense necessary, together with the cost of power, could not be borne by the Physics Department alone. The several local business men who had been donating money to meet the salary of the operator were approached but did not feel able to take on the additional financial load.

Nevertheless, every possible means was used to keep the station on the air. On February 9, 1925, the call letters were changed to WCUW.

With all this endeavor, however, it soon became evident that

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the station could not be operated efficiently by the University. Consequently, when, on November 20, 1925, the license expired, no application for renewal was made and the station was deleted by the federal government on December 14, 1925.

An attempt was made a year or so later to obtain a license to do educational broadcasting at specified intervals. Although the importance of such work was stressed by University officials, the Federal Radio Commission held that the granting of such a license would not be in "public interest, convenience, or necessity" and therefore refused the request.¹

¹ Data furnished by Dr. R. H. Goddard, of the Physics Department at Clark University, and files of the Federal Communications Commission.

CLEMSON AGRICULTURAL COLLEGE

CLEMSON COLLEGE, SOUTH CAROLINA

ON FEBRUARY 24, 1923, the Clemson Agricultural College was licensed to operate a broadcast station on 360 meters (834 kc), with 500 watts power and for "unlimited" time. The call letters WSAC were assigned.

The equipment installed was, from the beginning, antiquated and inefficient. Programs were hard to obtain and interest in the work of the station was decidedly disappointing.

On March 11, 1924, the station's power was reduced to 250 watts. However, on June 13, it was restored to 500 watts. On January 26, 1925, the station was moved to 890 kc.

Not feeling in a position to instal the necessary modern equipment or to spend the money required to secure programs of adequate quality and listener interest, the College, on October 14, 1925, allowed its license to expire and abandoned broadcasting. The equipment was discarded and the towers sold.

In recent years the College has made daily use of the facilities of a commercial station at Anderson, South Carolina, and occasional use of other stations at Greenville, South Carolina, and Charlotte, North Carolina.¹

¹ Data furnished by Dr. E. W. Sikes, president of the Clemson Agricultural College and files of the Federal Communications Commission.

CLEVELAND HIGH SCHOOL

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ST. LOUIS, MISSOURI

THE Cleveland High School, a unit of the St. Louis public school system, was granted a federal license on September 30, 1924, to operate a radio station on 1,270 kc, with 20 watts power and for "unlimited" time. The call letters assigned were KFRG.

Plans which had been made before receiving the license did not materialize as had been expected. Consequently no broadcast transmitter was built. A few portable sets were used, but no systematic broadcasting was attempted. Experiments with these portable transmitters were not satisfactory.

Consequently, when the license expired, no application for renewal was made and the station was deleted by the federal government on December 26, 1924.

An experimental license was granted the School on April 5, 1932, and a small transmitter was built by the School's radio club. This equipment was used in communicating between members of the club in their homes and for conducting experiments within the club. No other broadcasting was attempted.

This experimental work was continued until early in 1935 when the license was surrendered. The transmitter was dismantled and members of the club have devoted themselves since then to operating receiving sets.¹

¹ Data furnished by F. W. Moody, sponsor of the radio club at the Cleveland High School, and files of the Federal Communications Commission.

COLORADO STATE COLLEGE OF EDUCATION

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GREELEY, COLORADO

BROADCASTING from the campus of the Colorado State College of Education began in 1921. During this early period the College presented a variety of informative programs describing the curriculum offerings of the institution.

Success of this venture was so marked that application was made for a broadcast license. The federal government granted this license on June 4, 1923, permitting the College to operate its transmitter on 1,210 kc, with 50 watts power for "unlimited" time. The call letters assigned were KFKA.

On April 23, 1924, the station was shifted to 1,100 kc. Three years later, on April 22, 1927, the power was increased to 100 watts. On June 1 of that year the power was increased to 200 watts and the frequency shifted to 750 kc. On November 1 the station was again shifted to 550 kc and on December 1 another shift was ordered to 1,200 kc.

On March 1, 1928, the station was permitted to use 1,000 watts power to "local sunset" and 500 watts during the night. On November 11 of that year it was placed on 880 kc and ordered to divide time with Station KPOF.

During the latter part of the school year 1928-29 the College broadcast a number of vocational talks to neighboring high schools with great success. This led, in 1930, to a series of "auditorium programs" designed as a frank "exhibit of the advantages of teaching as a profession and of the Colorado State Teachers College as a desirable place to prepare for teaching." Mr. G. A. Irvin, of the Extension Department of the College, was delegated to care for details of the programs. Associated with him were Mr. C. F. Valentine, professor of physics and in charge of technical operation of the station, and Dr. F. L. Whitney, director of the Department of Educational Research. The Intermountain Majestic Company, of Denver, Colorado, financed the undertaking in part.

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Seven forty-five-minute auditorium, or assembly, broadcasts were presented on consecutive Fridays from 11:00 to 11:45 A.M. The series as presented was as follows:

1. March 28, 1930—"A Place To Prepare for Teaching."

This broadcast was presented by Dr. T. J. Mahan and included a description of the Colorado State Teachers College campus and buildings, the courses offered, and the various student activities. It also included information relative to the cost of room, board, books, and tuition. Possibilities for student employment for those wishing to work their way through college were suggested.

2. April 4, 1930—"College Life—Sharps and Flats on the Campus."

This program was presented by Mr. E. E. Mohr and consisted of a description of the College Conservatory and an outline of the courses offered for those wishing to major in music. The Schumann club was described and its members presented a selection. The girls' glee club, the mixed quartet, the band, and the orchestra, with the functions of each, were described and presented by means of a recital number. Possible employment for music majors was discussed and the types of jobs available were outlined.

3. April 11, 1930—"The Dramatic Club."

This broadcast was presented by Miss Margaret Blackburn and described the work done by the College students in play production. A typical play was presented by the group.

4. April 18, 1930—"The Athletic Coach and His Job."

Mr. G. A. Cooper and Mr. W. H. Saunders presented the broadcast, discussing coaching as a profession, describing the College gymnasium and athletic equipment and courses offered in physical education.

5. April 25, 1930—"The Classroom Teacher."

Dr. W. D. Armentrout was the broadcaster, picturing the opportunities for various types of classroom service and reporting on the question of teacher salaries.

6. May 2, 1930—"The Principal and His Job."

This broadcast was presented by Dr. O. L. Troxel and consisted of a description of the functions and duties of the school principal and a list of the places where graduates of the College were serving as principals. The question of salaries and opportunities for promotion were discussed.

7. May 9, 1936—"The Superintendent and His Job."

Mr. I. E. Stutsman was the broadcaster, describing the position of superintendent and telling of places where graduates of the College were serving as such. The question of salaries was also discussed.

Announcements of these programs were sent to a total of 380 high schools located in Colorado, Nebraska, and Wyoming.

Inclosed with these was a report form for the principal to use in rating the following factors:

- a. Pupil attitude during the broadcast—attentive, thoughtful, responsive, continued actively interested throughout the broadcast
- b. Subject matter of the radio program—closely related to the pupils' needs, suitable, valuable, proper amount presented, well organized
- c. The radio lecturer's method of presenting the lesson—should be a skilful presentation before the microphone; style clear, sufficient, repetition and proper emphasis; vocabulary suitable, common, vivid words; program plan and objectives clear to the broadcaster
- d. Personality of the radio lecturer—manner attractive, forceful, vital, stimulating, likeable; voice pleasing, magnetic, clear, expressive, natural, distinct enunciation, intonation varied, and stimulating
- e. Results of the radio program—attitudes of the pupils: stimulated the imagination, aroused curiosity, awakened interest, provoked thinking, stirred ambition
- f. General estimate of the value of the radio program

Reports were received from a total of 150 high schools, nearly 40 per cent of the original mailing list. A majority of these did not have radio sets in their buildings. Ten of the high-school principals reported that they had radios but found it impossible to tune in at the time the program was broadcast. Fourteen said that they were unable to get the program. The most frequent comment was that daylight broadcasting from the station did not come in clearly.

Fifteen high-school principals returned satisfactory reports. These revealed that a total of 1,645 pupils had been reached and that nearly three-fourths of these had been influenced to attend some college or university after graduation, and perhaps one-fifth had chosen teaching as a lifework. The average rating given the broadcasts and the pupils' attitudes was "good" to "fair."

In general,

it may be said that Colorado State Teachers College believes that the series of radio programs has been worth while. They have served to bring the College into touch with its clientele in an intimate way almost equal to personal visits of the high school groups to the campus in Greeley. They have

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served also as a source of information to the College faculty about the status of that part of the secondary schools in the Rocky Mountain region for which they are preparing teachers.¹

Another venture in radio education made by the College was a "radio conference correspondence course" conducted from the campus in the form of lectures given weekly over Station KFKA during the winter quarter of 1930. Eligible students enrolled ahead of the scheduled time for the first lecture by paying the enrolment fee of \$5.50. This entitled them to study units and objective tests for each lecture. These materials were studied and the test prepared immediately following the lecture and mailed to the Extension Department of the College. Here they were corrected and graded and returned to the student for his further study. An examination was given at the end of the course. All qualified students completing the work and passing the examination were allowed two quarter-hour College credits.

Even though the two experiments outlined above were progressing satisfactorily and the station was attracting many serious and interested listeners, the expense necessary to carry the work forward on the necessary scale was more than the College could afford. President Frasier states: "During the last two or three years, we have found it [the radio station] to be a financial burden to the institution. We are very enthusiastic about radio and we like to own and operate a station, but at the present time we can not afford to pay the expenses."²

Consequently, on April 11, 1930, the station was sold to the Mid-Western Radio Corporation, with the College reserving time for broadcasting its own programs.³

¹ Quoted from a report of the project prepared by Dr. Frederick L. Whitney, director of the Department of Educational Research, Colorado State Teachers College.

² Quoted from a letter to the Federal Communications Commission by Dr. G. W. Frasier, president of the Colorado State College of Education, dated March 14, 1930.

³ Data furnished by Dr. Frederick L. Whitney, director of the Graduate School at the Colorado State College of Education, and files of the Federal Communications Commission.

UNIVERSITY OF COLORADO

BOULDER, COLORADO

ON JUNE 30, 1922, the Electrical Engineering Department of the University of Colorado was licensed to operate a radio transmitter on 360 meters (834 kc), with power not to exceed 1,000 watts and for "unlimited" time. The power was reduced to 250 watts on October 23 of that year and on January 11, 1923, the power was again reduced to 100 watts. On April 9, 1924, when the station license expired, no application for renewal was made and the station was deleted by the federal government on May 31, 1924. The call letters used throughout this period were KFAJ.

This early station was used almost entirely for experimental work by the Department of Electrical Engineering and as a means for instruction in radio communication.

On June 18, 1924, another license was issued to the University under the same call letters but permitting operation of the station on 261 meters, with power of 100 watts and for "unlimited" time.

Early in December of 1924 interest in the possibilities of radio as a teaching medium had become such on the campus of the University of Colorado that a meeting of the Extension Council was called to discuss a plan for the use of the station in the extension field. President George Norlin, of the University, appeared before the Council urging that the station be used for the broadcasting of important scientific and informational lectures and of wholesome entertainment.

As a result of this meeting a Radio Committee was appointed. Members of this committee were Elmore Petersen, George F. Reynolds, T. D. A. Cockerell, Harry M. Barrett, Clinton DuVall, and Ralph L. Crosman. Upon recommendation of this committee an appropriation of \$400 was made for the purchase of new equipment and for furnishing the studio.

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During the session of 1924–25 ten programs were put on the air. These consisted of phonograph records, concerts by campus talent, talks by the president of the University and faculty members, athletic events, and “lessons” under the direction of the Extension Department of the University. Though little interest was shown in “educational” programs, the response to dance orchestras and athletic events was good.

Difficulties soon arose which made any further attempts in this direction impossible. Paramount among these was the existence of Station KOA, a powerful commercial station in Denver. The signals from this station were such that the University station could be heard only when KOA was silent. Further, it was impossible to secure from the University faculty enough talent to arrange a long-time series of programs. Also the University lacked funds to carry on the necessary development and construction work to keep the station up-to-date. Finally, the limited number of responses from listeners convinced those in authority that the University programs “served no great purpose nor met any great demand.”

Consequently the project was abandoned and the radio committee recommended that: “If broadcasting on any considerable scale is to be undertaken in the future it is recommended that it be done through KOA, either from the station in Denver, or, and preferably, by means of a direct wire from Boulder to Denver.”¹

As a result of this decision the station license was permitted to expire on December 20, 1925, and the station was deleted by the federal government on January 28, 1926.

The present Radio Committee of the University has established a University of Colorado quarter-hour through the facilities of Station KOA with the purpose of from year to year presenting a series of programs which will educate the people of the state in matters of interest primarily to the residents of Colorado. The 1936–37 series is entitled “New Adventures in the

¹ *Report, University of Colorado Extension Division, July 1, 1925, to June 30, 1936*, p. 50.

World of Thought” and is planned as a tour of the various departments of the State University. During 1935–36 the “Industries of Colorado” were portrayed and discussed, and in 1934–35 the series was entitled “Trails Through Romantic Colorado.”²

²Data furnished by the late Dr. Erwin F. Meyer, former chairman of the University Radio Committee, University of Colorado; Dr. W. L. Cassell, associate professor of electrical engineering at the University; Dr. Laurence W. DeMuth, chairman of radio programs at the University; and files of the Federal Communications Commission.

CONCORDIA COLLEGE

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MOORHEAD, MINNESOTA

CONCORDIA College, because of the interest of a few students in radio experimentation, was granted a license, on December 15, 1922, to operate a broadcast transmitter on 360 meters (834 kc), with 20 watts power and for "unlimited" time. The call letters WPAU were assigned.

Programs broadcast were educational, musical, and religious in nature.

On March 14, 1924, the power of the station was reduced to 10 watts and on June 24 of that year the station was shifted to 1,050 kc.

Interest in the project became less as the difficulty of securing adequate program material increased. Finally, when the license issued on February 3, 1925, placing the station on 1,160 kc, expired on May 2, 1925, no application for renewal was made and the project was abandoned. The station was deleted by the federal government on March 14, 1925. All equipment of the station was turned over to the College Physics Department.

Since then the College has made use of the facilities of Station WDAY at Fargo, North Dakota, broadcasting its chapel programs.¹

¹ Data furnished by Dr. J. N. Brown, president of Concordia College, and files of the Federal Communications Commission.

CONNECTICUT STATE COLLEGE

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STORRS, CONNECTICUT

ON JUNE 1, 1923, the Connecticut Agricultural College was licensed to operate a broadcast station on 283 meters, with 100 watts power and for "unlimited" time. The call letters assigned were WABL.

The station was shifted to 275 meters on January 8, 1925. Four months later, on May 15, 1925, the power was increased to 500 watts and the call letters changed to WCAC.

On June 1, 1927, the station was ordered to share time with Station WDRC. Soon thereafter, on August 27, 1927, the station was shifted to 560 kc and ordered to share time with Station WTIC. A further shift was made on October 29, 1928, when the station was put on 1,330 kc where it divided time with Station WDRC.

On January 21, 1929, a further shift was made to 600 kc, the power reduced to 250 watts, and the station ordered to share time with Station WTIC. On January 9, 1930, Station WGBS was placed on this frequency to share with Station WCAC. On April 25, 1930, Station WICC became the sharing station on this frequency and on May 8 of that year this station was replaced by Station WGBS. On March 3, 1931, this station was removed from the frequency and Station WICC returned to share with Station WCAC.

On February 2, 1934, the power of Station WCAC was increased to 500 watts and the name of the licensee changed to the Connecticut State College.

This frequent shifting of sharing stations and the difficulties of adjusting time division on the frequency were a constant menace to the educational work of the College. Hours on the air were gradually reduced, many of the best being taken by sharing stations.

Consequently the College decided to abandon its attempt at

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conducting a radio station and wrote to the Federal Communications Commission as follows:

The Connecticut State College has operated a broadcasting station and maintained an educational broadcasting service since 1923. During that period of thirteen years the work of the station has been continued under difficulties which vitiated to a large extent the efforts of the educators who contributed their time to the project. Interference on the channel and lack of sufficient power prevented the development of a state-wide service. In the face of the many difficulties the service was continued for one purpose: to hold the right to a broadcast channel in the hope that future federal radio policies would make a place for state educational broadcast service.

Since the differences between the fundamental motivating forces in educational broadcasting and those in commercial broadcasting forever render competition on an equal basis impossible and since no federal policies have been adopted to equalize the competition for radio facilities, there is little hope that the WCAC service can ever develop into a significant state educational project.

Recognizing the interest of the Federal Communications Commission in fostering a cooperative system between educators and commercial broadcasters, plans have been made to confine the educational broadcast activities of Connecticut State College to the use of time grants from commercial stations. A full and impartial test of the practicability of such a system will be made. Under the proposed system programs originating from the State College campus will be relayed by short-wave transmission to the Hartford, Connecticut, stations WTIC and WDRC. Both stations have promised full cooperation. Application for additional short-wave pick-up licenses needed to complete the project will be made within the next few weeks.

PETITION

The Connecticut State College respectfully requests permission to discontinue the operation of WCAC, April 30, 1936, and to relinquish the WCAC license without prejudice.¹

Acting upon this request the Federal Communications Commission canceled the license and deleted Station WCAC, effective April 30, 1936.²

¹ Quoted by special authority of the Federal Communications Commission from a letter to the Commission written by Dr. A. N. Jorgensen, president of the Connecticut State College, under date of April 20, 1936.

² Data furnished by Mr. Daniel E. Noble, manager of Station WCAC, and files of the Federal Communications Commission.

CORNELL UNIVERSITY

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ITHACA, NEW YORK

A BROADCASTING station for the purpose of experimental radio-telephone communication was first operated at Cornell University in 1906. The transmitter used was of the spark type. With this communication was established with many amateur and educational stations throughout the country.

In 1910 a Poulsen-arc transmitter was constructed and used for radio communication and experimental work.

During the year 1910-11 the first radiotelephone experiments were begun on the campus of Cornell University, using the Lepel-arc apparatus. Experimentation in this field was continued until 1912 when the first federal law was passed requiring that all stations be licensed.

At this time a license was granted permitting the University radio station to continue its experimental work. The call letters assigned were 8YC. These letters were later changed to 8XU.

During the World War the University held a special permit under the War Department and the station was used in connection with a military unit established on the campus. At the close of the War the station was returned to the University and the call letters 8XU were assigned.

Experimental work with this station was continued until May 27, 1922, when the University was granted a broadcast license to operate its radio station on 360 meters (834 kc), with 1,000 watts power and for "unlimited" time. The call letters assigned were WEAI. On January 30, 1923, the power was reduced to 500 watts and on May 17 of that year the station was shifted to 1,050 kc. A further shift to 1,180 kc was made on December 15, 1924. On January 11, 1927, the power was reduced to 250 watts.

On June 1, 1927, the station was shifted to 620 kc and the power placed at 250 watts.

The work done over this station up to and including 1927 was largely experimental and was conducted by the School of Elec-

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trical Engineering. At this time the Westinghouse Electric and Manufacturing Company and the General Electric Company gave the University the necessary equipment for construction of a modern and up-to-date broadcasting station. However, for a period of approximately two years the station was inoperative as there were insufficient funds to put it into operation.

During this early period a feature of the station's work was the broadcasts presented by members of the faculty of the College of Agriculture.

On July 26, 1929, a new license was issued to the University, permitting it to operate its radio station on 1,270 kc, with 500 watts power, during daytime hours. The call letters WEAI were assigned. Broadcasting, under this license and over the equipment that had lain idle for two years, was begun on August 15, 1929.

The transmitter and studio were located in the most inaccessible part of the University farm. Two 165-foot towers were placed between coops of fine chickens and the entrance to the broadcasting building was through the yard where these fowls roamed. Once when a window inadvertently was left open during a broadcast "the crows of several interested roosters mingled with the oratory of the professor speaking." This caused so much comment that the call of the poultry was adopted as the identification mark of the station, and this was continued until the studio was moved to a more convenient and spacious location.

On December 1, 1929, the first printed programs appeared, outlining the schedule of the station broadcasts. Also at this time, on December 9, 10, and 11, the first "short radio school" was instituted at the University. At approximately the same time the College of Agriculture syndicated brief agricultural material to Stations WGY, WHAM, WGR, and WCAD.

On August 15, 1929, farm programs were inaugurated during the noon hour. On special occasions these programs have been enlarged. At times more than two thousand items—addresses, announcements, warnings, and cultural features—are presented during the year in this noon-day program.

On March 21, 1930, the station was permitted to use 1,000 watts power during the daytime for experimental purposes. This was successful, with the result that, on September 1, 1931, the station was allowed to use 1,000 watts power during the daytime permanently and 500 watts power at night.

At about the same time new studios were equipped on the campus and the "Homemakers' Hour" added to the program. With these more adequate studios it was possible to present, in addition to the agricultural programs, a "University Hour." This program was built about such features as music appreciation, father-and-son chats, "Your Boy and Athletics," and similar topics.

On June 1, 1931, the College of Agriculture, co-operating with the United States Department of Agriculture, was sending "brief" service to five stations, in conjunction with syndicated material from the United States Office of Agriculture.

For a little over two years after the new station was put in operation programs were developed and broadcast by the University, but the station could be kept on the air for only a few hours each day due to lack of broadcasting material. Since the rule of the Federal Radio Commission made it imperative that a station use all the broadcasting time granted under its license or forfeit such time as was not used, arrangements were made during the summer of 1932 with the *Elmira Star Gazette*, of Elmira, New York, whereby that organization was to lease all surplus time not required by the University for its educational programs. Operation on this new basis was started on October 1, 1932.

At this time the newspaper made request that the call letters be changed to WESG. This request was granted on November 1, 1932. Since that date the newspaper has used all the broadcast time not required by the University.

On November 16, 1932, the station was shifted to 1,040 kc and granted 1,000 watts power for daytime operation.

In February, 1933, new studios were equipped in an old model rural schoolhouse located approximately in the center of

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the campus. Completely remodeled, the building was assigned for the exclusive use of those interested in broadcasting.

In the latter part of 1933 four stations—KRLD, WTIC, WBAL, and KTHS—developed a so-called experimental plan under which KRLD and WTIC proposed to take the wave-length of 1,040 kc and operate simultaneously, and WBAL and KTHS proposed to take a wave-length of 1,060 kc and operate simultaneously. In working out this experiment the Federal Radio Commission assigned Cornell University to 680 kc. This assignment was never used as all radio engineers agreed that, with the Canadian Station CFRB, located at Toronto, Canada, operating on the 690 kc frequency, it would be impossible for Station WESG to use this position on the dial.

Through courtesy of the Columbia Broadcasting System permission was granted Station WESG to operate on the 1,090 kc frequency, that being the clear channel of Station KMOX, the System's midwestern outlet. This new assignment was found to be unsatisfactory during cold-weather months because of interference in a portion of Station WESG's primary coverage.

Consequently application was made for an assignment of 850 kc. This was first denied and 1,000 kc assigned. The engineers in charge of WESG, however, advised that operation on that frequency was impossible since two large stations—WOC and WHO—were already there. A short time later a wave assignment of 850 kc was granted for temporary use. Immediately following this a contract between the Columbia Broadcasting System and Cornell University was completed, allowing Station WESG to use portions of the Columbia System's sustaining programs as desired.

During all this time the College of Agriculture has continued to expand its syndicate service until, at the present, it is offering to twenty-four stations throughout the state considerable material from the College, the Geneva Experiment Station, and the United States Department of Agriculture. The portion of this material from the College consists of eighteen talks, mimeographed and averaging in length from one to two minutes broadcast time. The Geneva Experiment Station material usually

consists of four or five items a week of two to three minutes broadcast duration. And the United States Department of Agriculture's contribution constitutes a briefing of the regular farm flashes sent from Washington and not exceeding three minutes broadcast time.

A continually recorded mail return survey has definitely indicated that this system is effective. Over two thousand letters are received at the College each month as a result of these syndicated broadcasts.

Actual broadcasting is carried on at the New York State College of Agriculture through Station WESG. This, at present, consists of: during six days of the week a one-hour agricultural program is broadcast from 12:15 to 1:15 P.M.; Tuesday morning an additional fifteen-minute broadcast is supervised by the Home Demonstration agent; Thursday morning another program entitled "This Week in Nature," conducted by Dr. E. L. Palmer of Cornell University, is broadcast directly to rural schools throughout the state. In addition, various afternoon broadcasts of student organizations are continually being undertaken.¹

¹ Data furnished by Louis C. Boochever, director of the Department of Public Information, Cornell University, and files of the Federal Communications Commission.

COYNE ELECTRICAL SCHOOL

CHICAGO, ILLINOIS

ON OCTOBER 10, 1923, the Oak Leaves Broadcasting Station was licensed to operate a radio transmitter on 1,330 kc, with 15 watts power and for "unlimited" time. The call letters WTAY were assigned.

This station was purchased by Mr. H. C. Lewis, president of the Coyne Electrical School, on April 6, 1925, and operated by him for the School, though the name, Oak Leaves Broadcasting Company, was continued. The station was then operating on 1,200 kc, with 500 watts power and for "unlimited" time. Mr. Lewis changed the call letters to WGES.

The experience of President Lewis and the School in operating this station was "wholly unsatisfactory." At the same time that contracts were totaling around \$4,000 a month, the station was averaging a net loss of \$3,500 a month. Furthermore, since the station was located in the heart of Chicago and was operating with 500 watts power, it drowned out every other station in the area. As the School drew its business from amateurs who were interested in hearing every station possible, and as the prominence of Station WGES was creating considerable ill-will, the venture proved a detriment rather than an asset.

Consequently, after making several attempts to sell, Mr. Lewis "practically gave" the station to Joseph L. Guyon of Guyon's Paradise, and the license was transferred to him on October 5, 1929.

Commenting on the experience, Mr. Lewis says: "I could never trace any benefit from it [the station]—quite the contrary. . . . I see absolutely no value in a school operating a radio station.¹

¹ Quoted from a letter by President H. C. Lewis, of Coyne Electrical School, dated May 31, 1933. Data furnished by President Lewis and files of the Federal Communications Commission.

CULVER MILITARY ACADEMY

CULVER, INDIANA

EARLY in the development of radio a small, low-powered transmitter was installed at the Culver Military Academy for experimental purposes.

On February 24, 1925, the Academy was licensed to operate a broadcast transmitter on 1,350 kc, with 100 watts power and for "unlimited" time. The call letters WHBH were assigned. On July 30, 1926, the station was shifted to 1,160 kc, the power increased to 500 watts, and the call letters changed to WCMA.

Formal opening of the station was held on November 29, 1926. The purpose of the station was to give publicity to the Academy, and no specific educational programs were broadcast. Concerts by the Culver Cadet Band, musical selections by cadets and faculty members, and football games made up most of the program material.

The only program broadcast that might be termed definitely educational was a map problem conducted over a period of several weeks and for the benefit of the reserve officers living within the range of the station. It is believed this was the first time that a broadcast of this nature was attempted.

On April 21, 1927, the station was shifted to 1,050 kc and on June 1 of the same year to 1,160 kc and the power reduced to 250 watts.

On November 16, 1927, the station was returned to the 500-watts power on 1,150 kc where it shared time with WOOD. A year later, on November 2, 1928, the station was moved to 1,400 kc where it shared time with Stations WBAA and WKBF.

Maintenance of the station was constantly becoming a greater burden on the Academy. In 1929 a station at Mooseheart, Indiana, was purchased and moved to the campus where it was added to the equipment already in use by Station WCMA. This added equipment did not reduce maintenance cost or increase the promotional value of the station sufficiently to justify the

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expense necessary for its operation. Further, because of the development of commercial broadcasting and the national networks, Station WCMA was unable to compete successfully for listeners.

Consequently, on June 24, 1930, the station was closed and the license assigned to the General Broadcasting Corporation. The tower and other equipment was turned over to the state and became part of the state police network.

The fundamental purpose of the station was to give publicity to the Academy. When it was found that broadcasts which were presented did not influence enrolment, the station's value was questioned. As Colonel Allen R. Elliott says: "We found that the station was entirely non-productive from the standpoint of procurement and that it did not justify the expense in connection with its operation. For this reason the station was discontinued."¹

¹ Quoted from a letter by Colonel Allen R. Elliott, post adjutant, Culver Military Academy, dated March 27, 1933. Data furnished by Colonel Elliott and files of the Federal Communications Commission.

DARTMOUTH COLLEGE

HANOVER, NEW HAMPSHIRE

INTEREST in wireless communication at Dartmouth College can be traced back to 1908 when members of the Physics Department put into operation on the campus a receiving set for code messages. In 1914 a code transmitter was added to the equipment and experimental broadcasting begun. When the federal government made licensing of amateur stations obligatory the College applied for and was granted a license to operate this equipment as a technical and training station. This license is still active.

For more than twenty years the College has sponsored a Radio Club, the members of which have been active in sending and receiving wireless messages. In the early days of broadcasting members of the club were primarily interested in making and testing receiving sets.

In 1924, the club requested permission of the College to establish a broadcast transmitter. This permission was granted by the administration and application made for a broadcast license. This was granted on October 18, 1924, permitting the College to operate a transmitter on 1,170 kc, with 100 watts power and for "unlimited" time. The call letters WFBK were assigned.

When the license issued on February 10, 1925, expired, no application for renewal was made and the station was deleted on July 15, 1925. However, on September 23, 1925, a new license was granted the College, permitting use of the same frequency and power as of the previous license, but changing the call letters to WDCH.

It was the intention of those interested in the station to broadcast programs sponsored by the Music Department of the College or by the dramatic and musical clubs as well as the chief athletic events of the season. It soon became clear, however, that there were various limitations to the realization of

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this plan. The transmitting station was a small penthouse, known as the “radio shack,” on the roof of the Wilder Laboratory. The concerts originated in various other buildings. The college telephone system used to bring these broadcasts to the transmitter was not built to accommodate accurate and undisturbed transmission of music. Further, capable personnel for operating the station was limited.

Consequently, when this second license expired on December 22, 1925, no application for renewal was filed. Thus, on January 9, 1926, the station was deleted by the federal government as “inactive for a period of several months and not financially able to resume operation.”

This experiment proved, according to Dr. Gordon F. Hull, that “though members of the Radio Club might be able to make a transmitting set capable of broadcasting voice and music, the broadcasting of reasonably ambitious programs called for time, energy, and technical skill not generally available in a small group of undergraduates.”¹

¹ Quoted from a letter by Dr. Gordon F. Hull, of the Department of Physics at Dartmouth College, dated June 29, 1933. Data furnished by Dr. Hull and files of the Federal Communications Commission.

DAYTON COOPERATIVE INDUSTRIAL HIGH SCHOOL

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DAYTON, OHIO

BROADCASTING activities at the Dayton Cooperative Industrial High School were begun when a group of boys in the School became interested in amateur radio. Out of this interest grew applications for two licenses, both of which were granted.

One license was for amateur telegraphy and was issued in the name of the Parker High School.¹

The other license was granted on October 7, 1924, permitting the School to operate a radio transmitter on 1,110 kc, with 5 watts power and on "unlimited" time. The call letters WEBT were assigned.

Equipment used on the station was secured from a junked World-War destroyer and was assembled and added to by the boys of the School who were interested in radio and who spent all their spare time working with experimental hookups suggested by radio magazines and in rebuilding parts of the transmitter. Thus the station furnished valuable training for the boys, many of whom later on became licensed radio operators.

On December 15, 1924, the station was shifted to 1,170 kc.

Five school programs were broadcast during the year from this station and its signals were heard clearly in the surrounding country.

When the boys who had been most interested in the work graduated, there were no others to continue the project. Further, the Federal Radio Commission felt that the School was not making sufficient use of the station to justify its continuation consistent with public interest. Other stations, able to use the frequency more consistently, were asking for the facilities held by the School. As conditions were such as to make it impossible

¹ See Parker High School, Station WABD.

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for the School to expand its program offering to meet the demands of the Commission, it was deemed advisable to abandon the project.

Consequently, when the license expired on December 1, 1925, no application for renewal was made and the station was deleted by the federal government on December 7, 1925.²

² Data furnished by S. W. Thompson, Department of Vocational Education, Dayton Public Schools, and files of the Federal Communications Commission.

DENISON UNIVERSITY

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GRANVILLE, OHIO

ON MAY 3, 1923, Denison University was licensed to operate a radio station on 1,380 kc, with 10 watts power and for “unlimited” time. Call letters WJD were assigned. This license was held until December 7, 1925, when the station was deleted by the federal government.¹

¹ Data secured from files of the Federal Communications Commission.

EASTERN RADIO INSTITUTE

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BOSTON, MASSACHUSETTS

THE Eastern Radio Institute was organized in 1913 by Mr. A. D. Moulton and Mr. F. D. Pitts, who were then wireless operators on board ship, for the purpose of training young men as radio operators in marine work.

This enterprise grew and its success was such that application was made for license to operate a broadcast station. The United States Department of Commerce, Radio Division, granted such a license on April 10, 1922, authorizing operation on 360 meters (834 kc), with 100 watts power, for "unlimited" time. The call letters WAAJ were assigned.

The transmitter was a DeForest 20-watt phone instrument with a night range of approximately one hundred miles. Consequently, though permitted 100 watts power, the station did not use more than 20 watts.

This was the second broadcasting unit to go on the air in the Boston area. It presented musical and educational programs on Monday, Wednesday, and Friday evenings between nine and ten o'clock. The educational broadcasts consisted of lectures on matters of timely interest.

Mr. Moulton was station manager and Mr. H. M. Wallingford was engineer and chief operator. Mr. J. G. Porter was the station announcer.

On January 13, 1923, the licensed power was reduced to 20 watts to conform to the power that the transmitter was actually using.

Several months after the station opened, Mr. Moulton joined Mr. Pitts, who had established a wholesale radio parts store in Boston, as his field representative, and Mr. T. B. Croke took over his work at the Institute. With this change the station was discontinued because of inadequate time and added expense, and the license was allowed to expire on April 12, 1923.¹

¹ Data furnished by Mr. L. C. Kentfield, of the Eastern Radio Institute, Inc., and files of the Federal Communications Commission.

EMMANUEL MISSIONARY COLLEGE

BERRIEN SPRINGS, MICHIGAN

IN 1922 Mr. John E. Fetzer, a student at Emmanuel Missionary College, being interested in wireless, began experimenting with radio communication in his dormitory room. Several other students became interested and co-operated in building a 10-watt broadcasting station in an upper room of the College tower. A rude megaphone made of paper and a telephone mouthpiece served as the first microphone.

The initial broadcast over this equipment was received at a distance of fifty miles from the College. After repeated experiments it was reported that the station was heard in France.

This work increased interest in radio at the College, and search was begun for apparatus that would be more modern and better serve the interests of the institution. A station that had been abandoned in Indiana was donated and installed in place of the original primitive equipment. Six months were spent in rebuilding and improving these facilities, and the station went on the air under a license issued on April 23, 1923, using the call letters KFGZ, the "Radio Lighthouse."

From February to July, 1924, programs were broadcast regularly and the station was heard from Edmonton, Alberta, to Florida and from Quebec to Texas. In July word was received that the broadcasts from the station were picked up by the wireless operator on the Dutch ship "Batavia" in the North Sea.

On January 26, 1925, the call letters were changed to WEMC.

In the spring of 1925 the United States Department of Commerce issued an order setting certain standards for all broadcasting stations. This necessitated a complete rebuilding of the station at Emmanuel Missionary College. During the summers of 1925 and 1926 a campaign was pushed which resulted in the raising of \$18,000 to cover the cost of new material. Plans for the new station were completed and construction started in September, 1925. The staff was enlarged, new studios built, and

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the most modern 4,000-watt transmitter then available was purchased and installed. In February, 1926, the first programs were broadcast over this new equipment.

In a souvenir booklet published at this time the following are stated as objectives of the station:

To broadcast only that which is beneficial and uplifting; to make radio more practical to the thinking men and women of America; to broadcast only the best music; not to commercialize radio; to broadcast inspiring Christian talks on the fundamentals of Christianity; not to fail in our efforts to serve humanity; no toll advertising, no politics, no jazz.

During September, 1926, the power of the station was increased from 500 watts to 1,400 watts, and on October 5 of that year the frequency was shifted from 1,120 kc to 950 kc.

Nothing was paid for musical talent during the first few years of the station's existence. In later years, however, a nominal amount was allowed student musicians for their work in broadcasting. Since the station received no income from advertising, the operating cost became an ever increasing burden, amounting to from \$11,000 to \$13,000 a year. This amount was subscribed by various conferences of the Seventh-Day Adventist denomination.

Appealing to the public over the air for funds or the acceptance of money for advertising was never looked upon with favor by the management of the station. Consequently it was inevitable that the operating burden of the station would in time become too great for the College to carry. Though the purposes of the station "were realized to an encouraging extent," the fact that the Federal Radio Commission restricted the time the station could broadcast—first by ordering that it divide its frequency with Station WSBT and then with Stations WCFL and WLTS, and then that it operate only during the daytime hours—and decreased its power so as to greatly limit its field of service eventually caused the College authorities to conclude that the expense of operating the station was altogether too great for the value received.

Consequently the station was discontinued and the equip-

ment sold to WKZO, Incorporated, and the license assigned to this organization on August 29, 1930.

Among the various programs broadcast over the station during the seven years of its ownership by the Emmanuel Missionary College were a Sunday evening studio service, "Cousin Betty's Children's Hour," "The Pastor and the Professor," "Afternoon Bible Study," "Hymn Time," "Beacon Light Hour," Department of Agriculture farm and crop reports, weather reports, orchestra concerts, community broadcasts, the annual Blossom Week broadcast, better English talks, weekly bird chats, and home economics chats. The "Children's Hour" consisted of true children's stories and songs. "The Pastor and the Professor" was a dialogue based on Bible topics. "Hymn Time" was a period for the singing of old hymns similar to the famous Seth Parker broadcasts. The "Beacon Light" service consisted of inspirational chats usually based on Scripture but of a nonsectarian nature. Agricultural material supplied by the federal government was broadcast twice a week. Various cities and communities comprising the St. Joseph Valley were invited to broadcast programs from their localities. Time was given each year for the broadcasting of material from the Blossom Week festival. In the better English talks common errors in speech were discussed by a member of the College faculty.¹

¹ Data furnished by Dr. Lynn H. Wood, former president of Emmanuel Missionary College, and files of the Federal Communications Commission.

EMORY AND HENRY COLLEGE

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EMORY, VIRGINIA

ON OCTOBER 24, 1929, Emory and Henry College was licensed to operate a broadcast station on 1,370 kc, with 100 watts power and for "unlimited" time. The call letters assigned were WEHC. The entire cost of installation of the transmitter and studios was borne by the College. Operation and maintenance costs were met by direct appropriations from the College plus income from advertising sold on the station.

On March 14, 1930, the station was shifted to 1,200 kc and on June 30 of that year it was permitted to use 250 watts power to "local sunset" and 100 watts thereafter. Approximately a year later (July 31, 1931) the station was shifted again, this time to 1,350 kc where it was privileged to use 500 watts power but allowed to broadcast only during the daytime hours.

Educational programs offered by the station consisted of addresses, classical musical numbers, and broadcasts of the College activities. These programs received many favorable responses. Though carefully selected, the commercial advertising sold on the station caused a great deal of criticism. It was felt by many that such programs had no right place on a station operated by the College and in the interest of college standards.

When business conditions became so bad that it was no longer possible to secure sufficient advertising income to meet enough of the operating expense to make possible adequate support of the station, the College found it necessary to abandon the project. Thus broadcasting was concluded on December 2, 1932, and the equipment moved to Charlottesville, Virginia, during the first half of 1933. Here the intention was to rebuild the station and operate it as a commercial venture. Before this was accomplished the transmitter was sold to the Community

Broadcasting Corporation and the license transferred on July 28, 1933. The College retained an interest in the station by holding some of the stock of the corporation. Later this stock was redeemed and the College gave up all interest in the station.

No broadcasting is being done by the College at present.¹

¹ Data furnished by Dr. James N. Hillman, president of Emory and Henry College, and files of the Federal Communications Commission.

EUREKA COLLEGE

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EUREKA, ILLINOIS

EUREKA College was licensed on July 23, 1924, to operate its broadcast transmitter on 1,250 kc, with 50 watts power, for "unlimited" time. The call letters WFBB were assigned. On December 22 of that year the power was increased to 100 watts.

The equipment of the station was mechanically inferior and never worked satisfactorily. Further, the task of preparing regular programs of a quality comparable with the standards of the College was found too great for so small an institution.

Consequently, after a year's work with the station, College authorities were convinced that such broadcasting as was possible with their limited financial resources did not pay. Therefore, when the license expired on June 17, 1925, no attempt at renewal was made and the station was officially deleted by the United States Department of Commerce, Radio Division.¹

¹ Data furnished by Dr. Clyde L. Lyon, president of Eureka College, and files of the Federal Communications Commission.

FEDERAL INSTITUTE OF RADIO TELEGRAPHY

CAMDEN, NEW JERSEY

IN 1921 Mr. John Hill, proprietor of a radio supply store in Camden, New Jersey, was granted an experimental license with call letters 3XI. This was followed in 1922 by a similar license with call letters 3YQ, a license which was held for one year.

After some experimental work under these licenses Mr. Hill organized, in connection with his store, the Federal Institute of Radio Telegraphy, for the purpose of teaching radio operation and conducting experiments in the field of radio communication.

On March 21, 1922, the Institute was granted a license to operate a broadcast transmitter on 360 meters (834 kc), with power not to exceed 1,000 watts, for "unlimited" time. The call letters assigned were WRP.

Later in this same year the station was leased to the United Radio Publicity Corporation and the lessee operated it for three months as a commercial venture. However, at the end of the period, the station was turned back to the Institute and operated as formerly.

During the ensuing period a feature of the station's offerings was a seventeen-week series of lectures on health delivered weekly by Dr. R. T. Fox, a local physician.

However, the expected returns to the Institute were not forthcoming and Mr. Hill became convinced that operation of the station was not worth the money or the time. Consequently, when the license expired on March 6, 1924, no application for renewal was filed and the project was abandoned.¹

¹ Data gathered from personal conversation with Mr. John Hill and from files of the Federal Communications Commission.

FLINT CENTRAL (SENIOR) HIGH SCHOOL

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FLINT, MICHIGAN

EARLY in 1925 the Flint Central (Senior) High School constructed a broadcast transmitter to operate on 600 meters. On March 20, 1925, this transmitter was licensed to operate on 218.8 meters, with 250 watts power, for "unlimited" time. The call letters assigned were WTHS.

The attempt to reduce the wave-length to that required under the station license failed. This was evidence that to complete the station so that it would conform to federal regulations would involve a considerable expenditure of funds. The Board of Education was unwilling to make such funds available.

Consequently, when the license expired on June 19, 1925, no application for renewal was made and the station was deleted on October 1, 1925.¹

¹ Data furnished by Professor J. T. Ackerman, assistant principal of the Emerson Junior High School, Flint, Michigan, and files of the Federal Communications Commission.

UNIVERSITY OF FLORIDA

GAINESVILLE, FLORIDA

THE 1927 session of the Florida legislature passed an act authorizing the University of Florida to erect a high-powered radio station for educational purposes and for the broadcasting of information helpful to farmers and growers in the state.

Under this act and with the money appropriated by the legislature for this purpose, the University purchased Station WHBN from the First Avenue Methodist Episcopal Church of St. Petersburg, Florida, and moved it to the campus at Gainesville. Necessary new equipment was added and the station was erected at the south end of the University grounds.

On October 6, 1928, the University was granted a federal license to operate the station on 1,480 kc, with power of 5,000 watts, sharing time with Station WTFF. The call letters WRUF were assigned. On November 2 of that year the University was granted "unlimited" time on the frequency assigned, 1,470 kc.

After one year's operation on this frequency it was proved conclusively that climatic conditions, sandy soil, and other local factors made efficient service here impossible. Consequently the University was permitted, on November 4, 1929, to shift its station to 830 kc where it operated until sunset time at Denver. The station has remained on this frequency until the present.

When first started the station was placed under the General Extension Division of the University, which division was in complete charge of all program offerings. The technical operation of the station was placed in charge of the College of Electrical Engineering.

During the first year of the station's operation numerous experiments in educational broadcasting were carried on. Members of the faculty of the University co-operated with the General Extension Division in inaugurating a series of lectures

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on various subjects taught in the classrooms. Courses were given in Spanish, psychology, and various phases of teacher training. Groups of students listened to these lectures in their homes and at the end of each day wrote a summary of what had been said during the lecture periods. These papers were sent to the instructor for correction and criticism. University credit was given for satisfactory completion of these courses.

This class work was carried on for approximately a year and a half. As far as the classes were concerned, the broadcasts were considered successful. However, it soon became evident to the Board of Control and the University officials that changes were necessary in the organization and presentation of radio programs.

In September, 1929, Dr. John J. Tigert, president of the University, called Garland Powell, then of Washington, D.C., to take over this assignment. Major Powell had seen a law practice interrupted by a call to service during the World War and, as a result of several crack-ups during his career in the air service, was prevented from returning to his chosen profession. With his technical school training, the experience of several years at the bar, and a first-hand knowledge of radio broadcasting gained from close association since the beginning of the industry, Major Powell was peculiarly fitted to take over the work. Under his guidance the radio station has been firmly established as an independent department of the University, but is closely associated with all schools and colleges through the co-operation of faculty members.

A survey made shortly after Major Powell was installed as director showed that classes for credit reached only a very few individuals, but that a general educational policy would make the station of service to large groups throughout the state. This led to the inauguration of an educational program aimed to serve the common interests of as many as possible. The faculty members participating in these programs under the various colleges of the University sought to present their material so as to reach the largest possible number of listeners. These

broadcasts met with wide acceptance and served to increase the popularity of the station.

A special farm program, presented during the noon hour each day, was prepared to give information particularly relative to growers in semitropical sections of the country. These broadcasts dealt with the soil and climatic conditions existing in these areas. They were conducted and supervised by the College of Agriculture, the State Plant Board, and the Agricultural Extension Division. Questions concerning soil conditions, plant diseases, and the like were sent to the station by interested listeners, turned over to the Research Division of the College of Agriculture, thoroughly studied, and then answered from the station so that all might have the benefit of the information obtained thereby. It is estimated that "this program has saved the growers and farmers of Florida so much money that the station should be operated for that reason if for no other."

Educational programs under the direction of the College of Arts and Sciences, College of Business Administration, Teachers College, the Department of Physical Education, the Engineering College, and the College of Education, as well as the broadcasts under the Music Department, have grown rapidly in popularity and evoked much favorable comment from listeners.

Since Florida, during the winter season, is so definitely a playground, Station WRUF has conceived its function as partly entertainment of the state's winter residents and visitors. Consequently the director has assembled a record library of more than 18,000 surfaces of the finest music obtainable. These have been imported from France, England, Germany, Italy, and other countries, as well as purchased from companies in this country. Included in this library is music dating back to the early Greeks. This is used in broadcasting to the public schools each week-day morning from 9:00 to 9:45 A.M. A number of schools in the state co-operate in this project. As a result of this broadcast the voice instructor at the University holds that students entering the University are better qualified to take part in the musical activities on the campus.

Daily schedules also present sheriff and police reports in

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co-operation with state peace officers, Associated Press News Service, weather forecasts, time signals, emergency storm and freeze warnings, and many programs presenting University student talent.

A commendable feature of WRUF's service to the state of Florida is its program of student training. Not only is the finest theoretical instruction available, but the best in technical experience under actual working conditions is given to students employed at the radio station. This is true in administration, production, and technical work. During 1935-36 fifteen University students received part-time employment which allowed them to attend school. Three full-time employees of the radio station were engaged in part-time University study. Results of this training are reflected in the placing of graduates in radio stations all over the United States. It is planned to inaugurate a school of radio as a department at the University in which even more thorough instruction may be given to a greatly increased number of students. In this way training can be given to those other than regular employees.

An annual series of weekly broadcasts sponsored by the parent-teachers associations of the state is carried by WRUF, and the daily schedules always include a number of programs of classical music which are closely followed by a faithful audience.

The "Home Demonstration Period," or "Home Economics Period," is presented each week day by the home demonstration agent. This program deals with conditions peculiar to Florida and is designed especially for the women of Florida.

In 1930 the Institute of Inter-American Affairs was established at the University. Its purpose was to foster better relations and a more sympathetic understanding between the island republics of the West Indies, the Latin-American countries of South America, and the United States. Station WRUF has presented regular programs designed to assist the efforts of the Institute. Spanish students are used to present programs by the Institute of Inter-American Affairs and in the presentation of broadcasts which have for their purposes the establishing of

better relations between the Central and South American countries and the United States.

Other educational programs carried by the station are: sports events, concerts by the University orchestra, the University band, the University glee club, dramatic productions by students, special convocations or addresses by prominent visitors to the campus. Special broadcasts of interest to the people of Florida are presented as often as necessary. It is estimated that more than 40 per cent of the programs presented by the station are educational or have decided educational value.

The station has been repeatedly attacked by commercial interests anxious to get its frequency. Major Powell points out that

the greatest handicap that an educational station of this nature has to meet is the selfish onslaught made by other radio stations in various communities of the state before the legislature, stations bringing great political power to bear upon their representatives to close up a station of this nature, because it takes away their local radio listeners when an educational station's programs are of popular appeal.¹

In furtherance of a desire to serve the people of the state as fully as possible, WRUF operates on a twelve-month schedule and utilizes all of the time made available by its assignment. Daily schedules run from 7:00 A.M. on weekdays and 8:00 A.M. on Sundays to sign-off at Denver sundown, which time ranges from 6:30 in December to 9:30 in June and July.

Among the distinctive services rendered by Station WRUF are:

1. WRUF closely co-operates with the federal government in the dissemination of governmental news, with the United States Treasury Department with regard to matters of taxation, and with the United States Department of Agriculture with regard to matters pertaining to farmers and growers, which are extremely valuable to them in their farm life.

2. It saved the people of Florida \$200,000 in nineteen months in the recovery of stolen property and apprehension of one thousand criminals.

3. The United States weather reports given hourly in cases of emergency have been the means of saving the growers thousands upon thousands of dollars.

¹ Quoted from an article prepared especially for this study by Major Garland Powell, director of Station WRUF.

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4. It presents national and international men visiting the University to those who would otherwise have no opportunity of hearing them.

5. It affords to the young men of Florida an equal opportunity with other universities to obtain a radio education, which is becoming very essential in the radio field.

6. The market reports have been the means of saving Florida growers thousands of dollars.

7. The "Florida Farm Hour," likewise, has been the means of saving farmers and growers many thousands of dollars annually by supplying information through research and the use of experts in the various agricultural matters.

8. The Agricultural College and Agricultural Extension Division are rendering a service through WRUF which would not be possible to render over commercial stations without a great cost.

9. If WRUF were taken off the air large areas of Florida would be without any radio coverage whatsoever.

10. The federal government, in seeking the co-operation of WRUF and the College of Engineering, along with Puerto Rico, was conducting valuable research problems which will probably be the means of saving millions of dollars in the protection of lives and property in the state of Florida and in Puerto Rico, through the outcome of the research problems, from hurricanes. The federal government has turned over to the University very valuable equipment for this purpose.

11. WRUF can present questions of administration of state affairs—and has presented them—by the governor, his cabinet, and other officials at a time that is best suited to reach the people.

12. Educational programs presented by WRUF through the faculty of the University of Florida have rendered a service that cannot be estimated in dollars and cents, and which other radio stations, commercially operated, could not afford to do. It has been the means of giving the people of Florida an opportunity to obtain a liberal education which otherwise would be denied them.

13. WRUF has been the means of bringing directly to the people a description of the championship high-school events held in the University City.

14. It has been the means of broadcasting directly to the people University athletic events which other stations could not afford to do.

15. It brings daily the main events going on in the various sections of Florida to the people of Florida and its visitors, thus giving every section of the state advertising as to what is going on.

16. It co-operates with the various counties in presenting news of their activities and affairs.

17. It co-operates with various civic and fraternal organizations in their community and state work.

18. It is the means of affording winter visitors excellent programs for their entertainment while they are in Florida.

19. It has served the women of Florida through special broadcasts on home economics, domestic sciences, and other programs of problems concerning their daily lives.

20. It has co-operated with the United States Public Health Service and the Florida Medical Association in bringing about better health conditions and preventing diseases.

21. It has been the means of helping the young men of Florida to obtain an education which would otherwise be denied them were it not for the work given at WRUF.

22. Every man who has worked at WRUF and graduated from the University of Florida has obtained employment upon leaving the University, which speaks highly of the training received at the radio station. Four men are now permanently affiliated with either 50,000-watt stations or chain networks.²

² Data furnished by Major Powell and files of the Federal Communications Commission.

FORT BEND COUNTY SCHOOL BOARD

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RICHMOND, TEXAS

ON NOVEMBER 11, 1928, the Fort Bend County School Board was licensed to operate a broadcast station on 1,500 kc, with 50 watts power, for "unlimited" time. The call letters KGHX were assigned.

In the application for this license it was stated that the station was desired for the purpose of broadcasting into the schools of the county instruction and information originating in the office of the county superintendent. In this way the superintendent would be able to keep in close touch with his schools and teachers without making individual trips to each one. Further, in bad weather, when the roads became impassable, the superintendent could keep in touch with the schools, broadcasting educational material, weather reports, agricultural information, and road conditions. Such information, broadcast to the school children, would be taken home to the parents.

After operating the station for a period of one year the license was assigned (November 25, 1929) to the Houston Broadcasting Company and the project was abandoned.¹

¹ Data obtained from files of the Federal Communications Commission.

FURMAN UNIVERSITY

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GREENVILLE, SOUTH CAROLINA

LICENSE to operate a broadcasting station on 236 meters, with 15 watts power, for "unlimited" time, was granted Furman University on December 2, 1924. The call letters WGBT were assigned the station.

The University never succeeded in getting the transmitter into satisfactory operation. Constructed by a local firm in the early days of radio, the equipment was crude and decidedly inferior. Further, it was difficult for the University to comply with federal regulations regarding operators and directors. As a consequence "the station was never really in operation."

Thus, when the license expired on June 26, 1925, no attempt at renewal was made and the station was deleted by the federal government on October 24, 1925.

Though interest in education via radio has been maintained at the University, no further work in broadcasting has been attempted.¹

¹ Data furnished by Dr. W. J. McGlothlin, president of Furman University, and files of the Federal Communications Commission.

GARDENVILLE HIGH SCHOOL

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GARDENVILLE, NEW YORK

DURING the school year 1924-25 a group of students at the Gardenville High School, with the assistance of a local radio "experimenter," constructed a crude transmitter. By special permission of the federal government this was put on the air on June 23, 1925, to broadcast the commencement exercises of the school. The call letters used were WGHS.

Following this broadcast, which was picked up by one or two local receiving sets, the transmitter was dismantled and no further attempt was made to establish a broadcasting unit at the school.¹

¹ Data furnished by T. R. Hopkins, principal of the Gardenville High School, and files of the Federal Communications Commission.

GEORGIA SCHOOL OF TECHNOLOGY

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ATLANTA, GEORGIA

IN 1923 Mr. Clark Howell, editor of the *Atlanta Constitution*, donated to the Georgia School of Technology equipment for a radio station. This was installed on the campus of the School and licensed by the federal government on January 7, 1924, to broadcast on 1,110 kc, with 500 watts power and for "unlimited" time. The call letters WBBF were assigned.

The license was permitted to expire on July 2, 1924, and the station was deleted by the government.

On October 23, 1924, a new license was issued, permitting the station to broadcast as before—using the same frequency, power, time, and call letters. On January 12, 1925, the call letters were changed to WGST.

On June 5, 1927, the station was ordered to share its frequency with Station WMAZ. On October 30, 1928, the station was shifted to 890 kc and permitted to use 500 watts power until "local sunset" and 250 watts power at night. It shared this frequency with Station WMAZ. On October 5, 1929, the power was placed at 250 watts for both daytime and nighttime broadcasting.

During these early years the station was operated by the faculty and student body of the School, all programs being presented by them.

To make the work of the station more efficient and its service to the area more complete, in April, 1930, the School employed as its agents the Southern Broadcasting Stations, Incorporated, to operate the transmitter. The contract made between the School and the operating corporation was to the effect that the School reserve the right to broadcast such educational programs each week as it deemed necessary and advisable, and to use the station for educational training whenever desired.

The School retained supervision over the station, carefully checking all programs broadcast and reserving the right to re-

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fuse the facilities for any purpose not in accord with the standards of the School or the regulations of the federal radio authorities.

On July 7, 1930, the station was permitted to use 500 watts power to "local sunset" and 250 watts power at night. Since May 15, 1931, the station has been allowed full time on its frequency. On March 12, 1934, the daytime power was increased to 1,000 watts and on June 19, 1934, the nighttime power was increased to 500 watts.

The arrangement with the Southern Broadcasting Stations, Incorporated, has been continued until the present. The president of the School is the supervisor of all programs broadcast. Ownership of the station remains in the hands of the School, while the operating agents conduct it as a commercial venture, selling advertising as the means of support. The School contributes nothing to this support, but has the privilege of using what time it deems necessary for its broadcasts.¹

¹ Data furnished by Dr. M. L. Brittain, president of the Georgia School of Technology, and files of the Federal Communications Commission.

GETTYSBURG COLLEGE

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GETTYSBURG, PENNSYLVANIA

GETTYSBURG College has never actually operated a broadcasting station, though it has held two temporary permits for experimental work, each of two days' duration. The dates of these permits are May 30-31, 1924, and November 11-12, 1924. The call letters used were WDBG.

The station equipment is stored in the Department of Physics and, whenever there is a sufficient number of interested students available, the transmitter will be put in operation. The Electrical Engineering Department is planning to introduce a course in radio communication in the near future and will, at that time, use the equipment of the station for instructional purposes.

The College has done some work in broadcasting lectures and college addresses through the facilities of Station WORK at York, Pennsylvania. Topics presented have covered in a general way the field of popular education.¹

¹ Data furnished by Dr. George R. Miller, professor of physics at Gettysburg College, and files of the Federal Communications Commission.

GLAD TIDINGS TEMPLE AND BIBLE INSTITUTE

SAN FRANCISCO, CALIFORNIA

THE Glad Tidings Tabernacle, Incorporated, was granted a license on June 7, 1922, to operate a broadcast transmitter on 360 meters (834 kc), using 500 watts power and for "unlimited" time "or in accordance with local non-interference schedule." The call letters assigned were KDZX. On August 28 of the same year the station was permitted to use "unlimited" time on that frequency and, on December 9, the power was reduced to 250 watts.

On June 12, 1925, the station was shifted to 1,280 kc, the power reduced to 50 watts, and the call letters changed to KFBZ. Another change was made on August 5, 1926, when the station was placed on 1,450 kc and the letters KGTT assigned.

On November 1, 1926, the name of the institution was changed to the Glad Tidings Temple and Bible Institute, and the license issued in that name.

On March 1, 1928, the station was placed on 1,260 kc where it shared time with Station KJBS. A few days later (March 20, 1928) Station KFQU was placed on this frequency and Station KJBS removed. On November 11 of that year the station was shifted to 1,420 kc, still sharing with Station KFQU.

On January 14, 1929, the Institute organized the Golden Gate Broadcasting Company to operate the station, actual ownership of the station remaining in the hands of Robert J. Craig. On March 12, 1929, the call letters were changed to KGGC.

On July 11, 1930, the station was shifted to 1,420 kc and the power increased to 100 watts. Here it shared time with Station KFQU. Station KFQU has since been removed from the air and Station KGGC operates on specified hours alone on the channel. The station is operated as a regular commercial unit, but carries the broadcasts of the Glad Tidings Temple services.¹

¹ Data furnished by Rev. Robert J. Craig, pastor of the Glad Tidings Temple and Bible Institute; Mr. W. N. McGill, general manager of Station KGGC; and files of the Federal Communications Commission.

GRACELAND COLLEGE

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LAMONI, IOWA

DURING the year 1916 a wireless station was constructed on the campus of Graceland College under the direction of Arthur B. Church, a student at the College and a commercial operator. At a cost of approximately \$375, raised largely by popular subscription and proceeds from entertainments, a 100-foot tower was erected to support the antennae and modern transmitting and receiving apparatus was installed, enabling transmission up to distances of 350 miles and receiving up to the distance of 5,000 miles.

One of the paramount purposes of the station was the establishing of communication between Independence, Missouri, and Lamoni, Iowa. The station at Independence was very similar to the one at Graceland College and enabled good communication between these points. Communication was also carried on with the various colleges and other educational institutions throughout that portion of the country, as well as with numerous amateurs. Weather forecasts from Iowa and news from all over the world were received and posted on the College bulletin board daily. These were sources of much interest to the students.

The station was operated by members of the Graceland Radio Club, organized October 19, 1917, the city's first organization for studying and promulgating the science of wireless telegraphy and telephony. Besides the regular equipment of the station, experimental apparatus, testing instruments, etc., were purchased for the use of the club. The club also had its own library consisting of the best books and periodicals on wireless communication, enabling the members to keep thoroughly informed on the latest developments in the science of radio.

During 1917 the College became well known throughout the country, since her messages were received in many different

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states. A great volume of private messages was handled for which no toll charges were made.

Through the efforts of the director of the station, a special license was secured from the United States government under the call letters 9YO. The equipment was rebuilt and improved and a new receiver of the latest and most sensitive type installed.

During this year, 1917, the College instituted a complete operator's course in wireless telegraphy, upon the completion of which students were qualified to pass successfully the government examinations for amateur and commercial operator's licenses.

During the World War, when the government ordered war-time closure of all commercial radio stations, instruction was carried on without the use of the antenna. At this time the College was one of the recognized wireless schools, training registered men for radio service in the Signal Corps. This work was carried on under the supervision of the government. At the end of the radio course students were required to be able to receive correctly at the speed of twenty-five words per minute. Those taking the semester radio course in eighteen weeks were qualified to pass the United States government examination for commercial operators' licenses. Diplomas were offered to students who satisfactorily passed the examinations in international code, theory, adjustment of radio apparatus, and international regulations for radio communication. Men wishing to enlist as radio operators in the Signal Corps were issued certificates for this purpose.

After the war the interest in radio training lulled for a time, but the station continued as before to give private service.

During 1920 a reaction from the big wartime classes seemed to have struck the wireless department of the College. The lifting of government restrictions and consequent reopening of the radio station, together with the unusual interest in radio, resulted in the continuation of instruction in this department the second semester of the school year.

During the school year 1920-21 Mr. Church and Paul Anway

organized the Midwest Radio Institute at Independence. Mr. Durward Harper was in charge of the Graceland station.

Communication was carried on with Station 9ZH, the Independence radio station, until December, 1922, when Station 9YO was discarded for more efficient apparatus.

On March 15, 1923, the College was granted a license to operate a broadcasting station on 360 meters (834 kc), using 250 watts and for "unlimited" time. At 7:00 p.m. on April 21 the official opening of the station, using the call letters KFFV, was celebrated. On June 8 the power was decreased to 100 watts. November 26 of that year the power was reduced to 10 watts.

During this first year of operation the station was heard at a distance of 800 miles from the campus. On Sunday, Tuesday, and Thursday evenings of each week regular programs were broadcast.

On February 11, 1924, the power was restored to 100 watts and on June 9 the station was shifted to the 1,070 kc frequency. On December 12 it was again shifted to the 1,200 kc frequency.

When the license expired on September 18, 1925, no application for renewal was made. The station was deleted by the federal government on November 10, 1925.¹

¹ Data furnished by N. Ray Carmichael, business manager of Graceland College, and files of the Federal Communications Commission.

GROVE CITY COLLEGE

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GROVE CITY, PENNSYLVANIA

DURING the school year 1914-15 there was set up on the campus of Grove City College an amateur radio station using the call letters 8CO. In 1916 this was relicensed as an experimental station with call letters 8YV.

During the World War the station was closed. However, early in 1920 it was reopened.

In early March, 1920, a small radiophone transmitter was constructed at the College, using three V.T.2 tubes, and conversation with amateur key operators was frequently carried on through the months of March, April, and May, over ranges of from 25 to 60 miles, with QST reports of being heard in New York; Bridgeport, Connecticut; and Columbus, Ohio. In April, 1920, Dr. Weir C. Ketler, president of the College, addressed the Rotary Club of New Castle, meeting, about 25 miles from the campus, at its noonday luncheon. Mr. Rex Patch, of New Castle, attended to the reception and amplification of the signals.¹

During the summer of 1922 this equipment was displaced by new and more modern apparatus and, on November 29, 1922, the College was granted a license to operate a broadcast station on 360 meters (834 kc), with 100 watts power and for "unlimited" time. The call letters WSAJ were assigned.

Home basketball games were regularly broadcast during the winter of 1922-23.

On September 11, 1923, the power of the station was reduced to 50 watts and on December 22 was increased to 250 watts. On June 30, 1924, the station was shifted to 1,160 kc and on January 9, 1925, was again shifted to 1,310 kc.

The transmitter was later rebuilt and two No. 204 quarter-

¹ See H. W. Harmon, "Amateur Radiophone Transmitter," in *Radio News*, May, 1920, for description of this equipment and data on its operation and transmission records.

kilowatt power tubes were used. The winter range of this new equipment was from 500 to 1,000 miles, with occasional longer ranges attained.

On June 1, 1927, the station was placed on 1,340 kc.

In 1928 direct crystal control of the transmitter was installed and the station was shifted, on October 31, to 1,310 kc and its power reduced to 100 watts.

In the early fall of 1932, on completion of the new radio laboratory in the Hall of Science, this old equipment was entirely replaced by a specially constructed "Class B" type transmitter of 100 watts capacity with oven thermostatically controlled crystals in both the transmitter and monitor. These crystal units were of Western Electric make and maintained the frequency within a deviation of usually three to eight cycles. The antenna was of the T type, with counterpoise and energized by a 20-foot feeder line.

On January 2, 1932, the station was placed on "specified hours," its time on the air being stated in its license.

The College usually broadcasts from the transmitter each Tuesday and Thursday, beginning at 7:15 P.M. These regular programs are supplemented by concerts sponsored by the College of Music, football and basketball games, and educational features under the direction of the Faculty Radio Committee. The talent used is largely from the student body. Student organizations at times sponsor broadcasts in the interest of student activities on the campus.

Dr. H. W. Harmon, acting radio director, states:

During the last two years the faculty members have become awake to the educational value of such radio work, and the students have entered into it quite enthusiastically, even organizing a Radio Club to support and increase that interest. About 25 students appear before the microphone each week. Town religious and civic organizations often take part in special and holiday programs.²

² Quoted from a letter by Dr. H. W. Harmon, of the Physics Department of Grove City College and acting radio director, dated April 18, 1936.

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The equipment is constantly being modernized and the College programs are growing in popularity. Modernization of the station's transmitter has just been completed. Thus the equipment meets fully all requirements of the Federal Communications Commission, especially those for good engineering equipment, safety, complete shielding, pure carrier wave, and modulation monitor control.³

³ Data furnished by Dr. Harmon and files of the Federal Communications Commission.

UNIVERSITY OF IDAHO

MOSCOW, IDAHO

THE first broadcasting in Moscow, Idaho, was carried on prior to 1916 by two amateurs, Kenneth House and Jack Woodworth. These boys erected a small transmitter and did some experimental work in wireless. By order of the War Department of the United States, this station was dismantled in 1916 and remained silent until 1919 when the transmitter was rebuilt in Mr. Woodworth's garage where it was operated until the garage burned in the winter of 1921-22, destroying all the apparatus.

With the help of an electrical contractor in the city, Jack Lieuallen, the station was again rebuilt and a license issued to the three amateurs on July 6, 1922, under call letters KFAN. This station was on the air irregularly, being heard throughout the United States.

During this same period the Electrical Engineering Department of the University of Idaho was doing some experimental work in radio. An antenna was erected between the towers of the Administration Building and the Engineering Building and later replaced by a high mast on a hill behind the garden just west of the Engineering Building. Only small power was used. Occasional basketball games and other campus activities were broadcast under an experimental license issued to the department.

During the winter of 1923-24 there was considerable agitation for the University to take over and operate the station owned by House, Woodworth, and Lieuallen. In January, 1924, agreement was made whereby the young men and the University were to pool their equipment and the University supply a small sum of money for operating expenses. License for this station was issued in the name of Mr. Lieuallen.

Considerable time was devoted to building of new equipment, but many difficulties were encountered, especially the burning

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out of high-voltage generators. Thus the station only worked occasionally.

On January 28, 1925, the license for this station was issued in the name of the University of Idaho, permitting operation on 1,300 kc, with 50 watts power and for "unlimited" time. This was a better wave-length and greater power than the young men could get without assistance of the University.

However, lack of funds prevented the purchase of reliable factory-built equipment and the broadcasts became more irregular than before. Thus, in the fall of 1925, the federal radio supervisor demanded that a more regular schedule of broadcasts be established or the license surrendered. As no way was found to secure the needed funds, the license was allowed to expire on September 4, 1925, and the station was deleted by the federal government on October 1.

During 1928 plans were formulated by the University for combining with the Washington State College in financing and operating a radio station to be located at the College. Owing to financial conditions attributed to the "depression," these plans were not matured. However, the University has been permitted to use the facilities of the College station, KWSC, whenever it has cared to do so, and in return has been active in helping the College assemble sufficient program material to hold its wave-length and time on the air.

There is still the hope at the University that at some later time funds will be available for the establishing of a radio station with sufficient power to reach the southern part of the state where, because of technical difficulties, clear radio reception is difficult from the point of location of the University.¹

¹ Data furnished by Dr. M. G. Neale, president of the University of Idaho, and files of the Federal Communications Commission.

UNIVERSITY OF ILLINOIS

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URBANA, ILLINOIS

FOR a number of years prior to 1921 members of the faculty and students of the University of Illinois engaged in experimenting with crystal receivers and other radio apparatus. The result of this was that, in October, 1921, the University was granted an experimental license to operate a transmitter on the frequencies ranging from 300 to 360 meters. The call letters assigned were 9XJ.

During the first year, until May, 1922, some athletic contest scores were broadcast from this transmitter. After that date the station was used for experimental and amateur communication only.

On March 28, 1922, the University was granted a broadcast license to operate a radio transmitter on 360 meters (834 kc), with 400 watts power, from 7:00 to 10:00 P.M. daily. The call letters WRM were assigned. The transmitter was constructed in the electrical engineering laboratories on the campus. On June 16 of that year the station was permitted to use "unlimited" time on this frequency.

On January 13, 1923, the station's power was reduced to 100 watts, but on April 16 of that same year it was increased to 500 watts.

During 1924 the University built a new transmitter with power of 500 watts. On October 28 of that year the station was shifted to 1,100 kc, using the new equipment at its maximum power of 500 watts.

During 1924 and 1925 the Electrical Engineering Department at the University used the station's transmitter to experiment with the noncontinuous carrier transmission, wherein no carrier wave was radiated when there was silence at the studio microphone. One of the research engineers had worked out this method of transmission in the laboratory, and it seemed very promising from the standpoint of power economy and in the elimina-

tion of interference between carrier waves. However, the power amplifier tube engineering development was in its infancy and trouble was experienced with such tubes in this system of transmission. Radio engineers believed at that time that it was necessary to modulate a high-power oscillator with a higher rated power modulator, putting this power directly into the antenna without the use of power amplifier tubes. Power amplifier types of radiophone transmitters began to be developed and construction of more efficient transmitters on wave-lengths below 360 meters had been accomplished during the preceding year.

The University patented this noncontinuous carrier of transmission. Since its patent was issued, four United States patents have been taken out covering this particular kind of broadcast transmission, two of them by the General Electric Company. However, at that time radio engineers did not feel that this type of transmission could give as high quality reception as that obtained from the modulated continuous carrier wave. With modern radio frequency power amplifier tubes, using grade modulation, it was believed by the University's radio engineers that there would be demand for such type of transmission in the future in military or naval communication work, particularly in marine or airway navigation service.

On April 14, 1926, President David Kinley, of the University, was informed by Mr. Boetious H. Sullivan, of Chicago, that he wished to honor the fifth anniversary of his father's death by giving the University a radio station to be used "as a means of educational aid to boys and girls of the state of Illinois, to whom my father was so endeared." The station was to be a memorial to the late Roger C. Sullivan. At a subsequent meeting of the University Board the gift was accepted and the station became officially known as the Roger C. Sullivan Memorial Station.

Mr. Sullivan's gift included not only a 1,000-watt Western Electric Type 6A transmitter and towers, but sufficient money to erect a permanent building in which to locate the transmitting apparatus and studios. This building was placed at the south end of Illinois field, facing on Wright Street. It was completed in December, 1926, and the new transmitter went on the air shortly thereafter.

Meantime, on November 24, 1926, the station had been placed on 1,100 kc and given permission to use 1,000 watts power.

The transmitter occupied the first floor of the structure. The main studio and two smaller ones were located on the second floor. At this time arrangements were made so that programs could be broadcast from six other studios. These were located in Smith Memorial Hall, Band Building, the University Auditorium, Lincoln Hall, Bradley Hall, and the electrical engineering laboratories. It was further arranged so that programs could be picked up from other buildings and rooms on the campus. Thus a total of twenty-seven remote control points were arranged for.

On June 1, 1927, the station was ordered to use 1,000 watts power to "local sunset" and 500 watts power at night. It was further ordered to share its frequency with Station WBAA.

On November 8, 1928, the station was shifted to 890 kc using 500 watts power to "local sunset" and 250 watts power at night. It shared this frequency with Stations KUSD and KFNF. At this time the call letters were changed to WILL. On October 20, 1933, the daytime power of the station was increased to 1,000 watts.

On March 12, 1935, the Federal Communications Commission granted the station's application to shift to 580 kc and to operate during daytime hours only with power of 1,000 watts. This grant was protested by Station WIBW, Topeka, Kansas, and, on April 23, 1935, the Commission's grant was suspended and the matter designated for hearing. After listening to the protest of Station WIBW, the Commission, on March 3, 1936, authorized Station WILL to operate on 580 kc during daytime hours, effective May 5, 1936.

In October, 1936, following receipt of approval of construction permit by the Federal Communications Commission, ground was broken for a new antenna system and transmitter building to be located at the extreme south end of the University experimental farms, which location is approximately two and three-quarters miles south of the present towers. The Board of Trustees appropriated \$25,000 to carry out the improvements.

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Vertical radiators 325 feet high, resting on concrete foundations which rise eight feet above the ground level, are being constructed. A buried ground system containing eight miles of copper wire has been installed as part of the antenna design. The second tower is needed to carry out the Commission's order to provide a directional antenna to protect WIBW at Topeka, Kansas, which also operates on 580 kc. WILL will be permitted to use daytime hours only.

In addition to the towers a new transmitter building is being constructed on the new site. All transmitting apparatus will, of course, be moved there, although the present building will continue to house the control room and the studios that are now in the building, plus the addition of a smaller one which will occupy a portion of the vacated area. Studios in other places on the campus will remain as they are now.

The radio station is recognized as a separate department of the University and derives its operation and maintenance funds through the usual administrative channels. As a separate department it is subject only to the nonpolitical governing body of the institution—the Board of Trustees, elected by the people of the state. Nine elective members and two ex officio members—the governor and the state superintendent of public instruction—comprise the Board. The trustees have always been solidly behind the work of the station and have provided generously for its operation and maintenance.

The University receives most of its money through state appropriations, although there is a considerable sum which comes from student fees and other miscellaneous sources. It also receives large grants from the federal government to carry on its work. During 1934-35 this grant amounted to \$409,525.52.

The commercial replacement value of the radio station exceeds \$100,000 (as of December 1, 1936, after present improvements). While conforming in every way to Federal Communications Commission requirements and being modern in every respect, such as high fidelity, 100 per cent modulation, etc., a great deal of the station's equipment has been built by the staff

at a fraction of what it would cost to buy it commercially. Consequently, in the University's official inventory, the book value of the station is presented at only \$55,046.27, exclusive of land, for which, of course, no charge is made.

The operating budget for the station totaled \$12,609 in 1936-37. This figure includes \$9,280 for salaries and \$3,329 for operation and maintenance. However, budget figures do not include any charges for power, rent, telephones, etc., as all such items are absorbed by the University. Neither does the budget include any provision for talent. Programs come from the student body of some 14,000 and from the faculty of approximately 1,500. Further, only a portion of the salaries of those connected with Station WILL are charged to the radio station budget.

The present transmitter is a 1,000-watt Western Electric 6A instrument and, although installed late in 1926, has been modified and constantly brought up to date as rapidly as the art of broadcasting has developed. It has embodied in it the various technical devices that are found in the best commercial stations. The station is equipped with the latest type of microphones and high-fidelity speech input equipment including all A.C. operated program and monitoring amplifiers and pre-set relay switching. Approximately twenty high-grade velocity, dynamic, condenser, and crystal microphones are regularly used in picking up the studio and outside programs. Two complete portable pickup equipments are available for programs requiring complicated microphone arrangements, and additional portable equipment is available for ordinary remote broadcasts.

Two sets of studio equipment are maintained in other buildings to provide switching and mixing facilities where several studios are involved in ordinary programs. A complete high-fidelity studio input system is permanently installed to take care of six rooms in the Smith Memorial Hall (music building) which are permanently wired for radio. Lincoln Hall also is equipped with permanent amplifiers and mixing facilities to take care of the two classrooms and the theater.

Sufficient equipment is maintained to make complete tests of the operation of the equipment at frequent intervals. A West-

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inghouse magnetic oscillograph is provided for making modulation measurements and fidelity tests. An audio-frequency generator is also included in the station's equipment. An RCA frequency monitoring device and the newly required modulation monitor (also RCA) are part of the regular equipment. A cathode ray indicator is also used for a visual check of modulation at all times. In addition, the facilities of the various laboratories on the campus are available for special work.

Access to any of the University buildings is provided quickly and conveniently by means of a system of underground lead-covered telephone cables. This makes it possible to broadcast any University lecture or special feature on short notice.

Station WILL is the only state-owned radio station in Illinois and the only strictly educational station in the state. It belongs to the people of Illinois and is supported, as is the University, through taxation. The University is the center of much of the state's educational activity. Numerous state conventions of various organizations are held on the campus each year. It is likewise the center of many high-school activities. The annual High School Principals and Teachers Conference, the annual State High School Band Contest, the annual State High School Orchestra Contest, the annual State Basketball Tournament, the annual State High School Track and Field Meet, and other such events all occur on the University campus.

In addition to the Agricultural Experiment Station and the Engineering Experiment Station, there is maintained at the University a Bureau of Business Research, a Bureau of Educational Research, a Bureau of Community Planning, the State Natural History Survey, the State Water Survey, the State Geological Survey, and the Illinois Historical Survey. The only radio service available to all of these agencies is Station WILL.

Further, most radio stations feature one specialist or at most a comparatively few authorities. Station WILL has, in the staff of the College of Agriculture alone, a corps of 190 specialists, each an authority in his own field and each with facts and information of value and importance to farmers, homemakers, and citizens in general. Many of these specialists are constantly

traveling about the state giving lectures and demonstrations, but their teaching is extended manyfold as they use the facilities of Station WILL.

The University programs, in general, are not purely entertainment, but are rich with talent whether the broadcast is educational or entertaining. Entertainment is offered on the University programs because it is a belief of those in authority that it is the duty of a radio station to present a varied program for the convenience or necessity of the listening public, a public that is responsible for the University. The programs contain information and factual material sought by the people of the state and of definite value to them. No station in the state has as direct and immediate access to these facts as has WILL.

Talent is available at the University that is not available to many radio stations, commercial or noncommercial. The teaching staff, in addition to instructing the student body, has the obligation of aiding the state and nation with its scientific discoveries, its research findings, and its teachings. National and international authorities in the fields of politics, finance, engineering, literature, social science, law, and agriculture can and do broadcast over Station WILL. Faculty members and students of the University's School of Music offer, through the station, a caliber of music available only to radio stations in more metropolitan centers.

The University's three bands, its orchestra, Choral Society, men's and women's glee clubs, and other musical organizations are used constantly by the station. Many campus dance orchestras are featured in lighter entertainment programs. Student and faculty dramatic societies present plays, readings, debates, and dialogues over the station.

Classroom lectures of regular courses taught in the University are often selected for broadcasting. In making such selection, however, the type of lecture, its preparation, and the radio personality of the teacher are all taken into consideration. Such offerings are numerous throughout the year.¹

¹ Data furnished by Frank E. Schooley, assistant to the director of Station WILL and assistant to the director of public information at the University of Illinois, and files of the Federal Communications Commission.

IOWA STATE COLLEGE OF AGRICULTURE AND MECHANIC ARTS

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AMES, IOWA

IOWA State College was actively engaged in experimental wireless communication as early as 1913 when the Electrical Engineering Department, under Professor F. A. Fish, operated a "highly efficient" amateur station using the call letters 9YI. The 240-cycle note of its synchronous spark transmitter was well known throughout the Middle West long before the beginning of voice transmission.

When the first regular broadcasts from Station KDKA had demonstrated the possibilities of radio communication, the Department determined to construct a broadcasting station. Mr. Harmon B. Deal, a graduate of the Massachusetts Institute of Technology, was chosen to supervise the project. He was assisted by one of the engineering students at the College, Mr. A. G. Woolfries, now chief announcer of the station. Early in October, 1921, work was begun on a 50-watt set—a "super-power" outfit for the time. Plans were soon changed to increase the output to 100 watts. With this power the station first went on the air the evening of November 21, 1921, using a frequency of 375 meters and call letters 9YI.

On April 28, 1922, the station was granted a federal broadcast license to operate on 360 meters (834 kc), using 1,000 watts power and for "unlimited" time, with call letters WOI. It was also authorized to broadcast government reports on 485 meters.

In 1922 all broadcasting stations operated on 360 meters—in theory at least. Actually it was the custom for stations to deviate slightly above or below this channel according to the severity of interference. However, all government reports were transmitted on 485 meters. Thus, when a weather report was to be given, both stations and listeners changed to the lower wave; afterward they scrambled back to 360 meters for the balance of the program.

Almost immediately upon its inception the station inaugu-

rated a schedule of service reports consisting largely of weather forecasts and livestock market news. The forecasts were sent by commercial wire from the United States Weather Bureau. The market reports were copied from a long wave code broadcast by Station NAJ, the government station at the Naval Training School near Chicago. This service from Station NAJ was continued for nearly three years, after which it was supplemented by commercial telegraph reports. Later, by July, 1926, the United States Department of Agriculture leased wire service was made available.

The 100-watt transmitter proved inadequate to cover the state, so plans were made for a more powerful set. This was constructed and, on July 7, 1922, was licensed to operate with 500 watts power. On October 26 of the same year the power was reduced to 400 watts and on January 10, 1923, the power was again reduced to 100 watts. When, however, the new transmitter was completed on March 8, 1924, the station was permitted to use the 500 watts power.

This new equipment gave a fair coverage of the central portion of the state and was heard in all parts of Iowa under favorable conditions.

A small studio was secured, the "new" double button microphone was installed, the schedule of program offerings was expanded, and Station WOI forged to the front in midwest radio circles.

Constant expansion within the station soon brought a demand for additional room for studio and transmitter. As a result a large laboratory adjoining the original quarters was made available. In 1924 this was partitioned into a suite of rooms and the studio moved to its present location.

On January 13, 1925, the station was shifted to 1,110 kc. As the station grew in importance, provision was made to increase the power to 750 watts. Permission to make this increase was granted with the issuance of the station license on August 26, 1925.

During this time Station WOI had far outgrown its original function as an experiment of the Electrical Engineering De-

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partment. Thus the station was recognized in 1925 as part of the Iowa State College and operated from funds supplied by the Agricultural Extension Service, Engineering Extension Service, and the College, and under the direction of Professor D. C. Faber, director of engineering extension. Professor W. I. Griffith was named as program director, while Professor F. A. Fish remained in charge of the technical operation of the station. Within a year this setup was simplified by placing the entire station under the direction of Professor Griffith.

The following year, 1926, the importance of the station's market news service was recognized and augmented when the United States Department of Agriculture installed a leased wire to supply a comprehensive service of livestock market information. This service, together with a program of music, dramatics, talks, athletic events, and the like gave the station a distinctive offering which appealed to a large group of listeners.

With this growing value of the station to the state it was recognized that added power was necessary if the transmitter was to reach all sections of the area that should be served. Consequently a 5,000-watt transmitter was designed and built by the station staff headed by Mr. Ralph Knouf, an Iowa State College graduate who had been employed by the General Electric Company. On February 11, 1927, this new transmitter was licensed to operate, using 5,000 watts power.

Again Station WOI boasted one of the most powerful and up-to-date stations in the country. Automatic crystal control of the frequency was one of the features installed and used by only eight other stations.

On April 22, 1927, the station power was reduced to 3,500 watts. However, on June 1, 1927, the station was shifted to 1,130 kc where it shared time with Station WSUX. At this time the power was placed at 5,000 watts to "local sunset" and 2,500 watts at night. This new frequency was soon found to be undesirable because of severe interference from nearby stations on adjacent channels.

To remedy this condition, on November 1, 1928, the station was shifted to 560 kc, sharing time with Station KFEQ. Here

it was permitted to use 3,500 watts power during the daytime only. The resultant coverage was vastly superior to that obtained on the former frequency.

On October 21, 1929, the station was permitted to use 5,000 watts power as an experiment.

Relations with Station KFEQ were most friendly. However, this station, of commercial necessity, sought full time on the shared frequency. As a result, on November 27, 1929, Station WOI was shifted to 640 kc where it was authorized to use 3,500 watts power with 5,000 watts for experimental purposes and to broadcast during the daytime hours only. On July 8, 1932, the station was permitted to use 5,000 watts power during daytime hours permanently.

Station WOI continues to the present to operate on this schedule. The same channel is used by KFI at Los Angeles, California, and WAIU at Columbus, Ohio. While a certain amount of nighttime broadcasting would be acceptable, it is felt that the present assignment is generally satisfactory and every effort is being made to utilize these facilities to the utmost.

A flattering proof of the station's following was received recently when a nationally known radio magazine conducted a contest to determine the most popular station in each state. In Iowa Station WOI took first place in competition with several excellent commercial and chain stations.¹

¹ Data furnished by Mr. A. G. Woolfries, chief announcer of Station WOI; Mr. W. I. Griffith, director of Station WOI; and files of the Federal Communications Commission.

IOWA STATE TEACHERS COLLEGE

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CEDAR FALLS, IOWA

EARLY in 1923 the Iowa State Teachers College became interested in the installation of a radio station on the college campus.

At this time radio art was developing rapidly. Many new stations were being established, some with power as low as 5 watts and a few with power as high as 500 watts. By the spring of 1923 stations had been installed at the State University of Iowa and at the Iowa State College, as well as in a number of the cities of the state. Each of the two stations mentioned were broadcasting, on a definite but not very extensive schedule, material of considerable interest to the people of the state.

Thus it seemed to some members of the College faculty that the Iowa State Teachers College should also enter the field "in a modest way." It was thought that the departments of music, art, the social sciences, and English, in particular, could assist in presenting programs that would be of considerable interest to listeners within range of the station. It was also thought that a transmitter located on the College campus would serve as a valuable piece of instructional equipment.

When the project was presented to President Homer H. Seerley, of the College, his first reaction was unfavorable, the chief objection being the expense involved. He believed that the cost of a station having a power equal to that of the other educational stations in the state, completely installed and equipped, would be between \$15,000 and \$18,000, and that to operate it satisfactorily would require the full-time service of a man technically well trained and probably of a full-time helper. The decision, therefore, was against the installation of a station equal to those operating at other institutions in the state.

However, it was found that a 50-watt station could be procured for but a fraction of the sum mentioned. It was also believed that a station of this smaller power would reach perhaps 90 per cent of the territory from which the student body of the

College came. Consequently it was decided to ask the approval of the state Board of Education for the establishment of such a station. Approval of the Board was obtained and money provided to purchase the equipment. This amounted to about \$600.

There was no provision made, however, for anything beyond the bare materials. The College was to make use of these in whatever way it could, without addition, either permanently or temporarily, to the personnel. The technical information necessary for installing and operating the transmitter had to be slowly gleaned by persons having other full-time duties and whose training had not included radio in any of its phases.

The main burden of construction fell upon Mr. A. K. Anderson, then full-time assistant in physics. He was also the first announcer. After his withdrawal Mr. F. V. Lammey, a student at the College, became part-time assistant and operator. He continued in this capacity until his graduation in 1925.

The station was eventually installed and license was granted by the federal government on September 13, 1923, to operate it on 1,310 kc, with 50 watts power, time "unlimited." The call letters KFJX were assigned.

Immediately difficulty was found in getting onto the air any program which included more than a musical solo, or other material provided by more than one individual. This was due in part to the limitations of the pickup and amplifying equipment and in part to the lack of room for a suitably equipped studio. As a result only a small number of broadcasts were attempted.

On May 23, 1924, the station was shifted to 1,070 kc and on November 22 of that same year it was again shifted to 1,160 kc. The last license held by the station expired on February 15, 1926. At this time the federal radio authority ruled that the station was "not rendering such service to the public as required of all broadcast stations." Consequently it was deleted on December 16, 1925.

While the station never "got into production" in any satisfactory manner, it has, from the beginning, served a useful purpose as a piece of laboratory equipment. The transmitter is still

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used for demonstration purposes in connection with an elementary course in radio offered once each year. The motor generator which was installed to supply power for operating the transmitter is often used separately to generate high direct voltage for other purposes.¹

¹ Data furnished by Dr. W. H. Kadesch, professor of physics at Iowa State Teachers College; Dr. O. R. Latham, president of the College; and files of the Federal Communications Commission.

STATE UNIVERSITY OF IOWA

IOWA CITY, IOWA

BROADCASTING from the campus of the State University of Iowa began in 1911 when a 2,000-watt transmitter for code communication was set in operation on a regular schedule. This equipment operated under the call letters 9YA.

When radio telephony was first conceived the University engaged in considerable experimental work in the field. The result was the installation in 1919 of what is believed to be the first radiotelephone transmitter broadcasting on regular schedule west of the Mississippi River. Included in this equipment were some of the first power vacuum tubes manufactured. This station broadcast on a wave-length of approximately 475 meters using the same call letters as the earlier code equipment, 9YA.

Keeping pace with the rapidly developing industry and art of radio communication, the University was constantly adding new equipment and expanding the facilities of its station.

On June 26, 1922, the station was licensed by the federal government to operate on 360 meters (834 kc), using 1,000 watts power, for "unlimited" time. The call letters WHAA were assigned. On November 8 of that year the station power was reduced to 200 watts. On February 10, 1923, the license was issued in the name of the State University of Iowa, Electrical Engineering Department, and on May 10 of that year the station was shifted to 1,060 kc and power reduced to 100 watts.

The license issued on February 13, 1924, was in the name of the State University of Iowa, College of Applied Science. At this time the station was placed on 620 kc and permitted to use 500 watts power.

In 1923 the University installed the best possible radiotelephone transmitter then available, a Western Electric 1-B instrument of 500 watts power.

On January 29, 1925, the call letters of the station were changed to WSUI. Between this date and December 3, 1929, there were

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six changes of the station's frequency: June 1, 1927, to 1,130 kc where time was shared with Station WOI; June 15, 1927, to 710 kc, which the station was permitted to use exclusively; November 1, 1927, to 630 kc; November 1, 1928, to 580 kc, which was shared with Station KSAC; November 15, 1929, to 600 kc, sharing with Station WMT; and, finally, on December 3, 1929, to 880 kc, on which the station was permitted to use three-sevenths of the time.

In the experience of station authorities these frequent shift-ings of frequency caused no end of confusion and militated against the building-up of a regular audience and the conducting of continuous educational programs, since those who wished to avail themselves of the station's services were often at a loss to know where the station could be found on the dial. Considerable dissatisfaction at this action of the Department of Commerce, Radio Division, was voiced during these years by station authorities and listeners.

Since December, 1929, the station has remained on the 880 kc frequency where, however, there has been experienced constant interference from stations operating on adjacent channels.

The station has kept pace with the most recent developments in the field of radio by installing new equipment as often as such has come on the market and seeking to carry out to the letter every requirement of the federal licensing authorities. In March, 1934, the most modern high-fidelity speech amplification equipment and microphones were installed with special instruments to serve two large new studios in the Music Building. On December 11 of that year application was made to the Federal Communications Commission for permission to increase the power of the station to 1,000 watts during the daytime hours while continuing to broadcast with 500 watts power at night, and to increase the time on the air to "unlimited." This request was granted by the license issued February 12, 1935. As a result the station now operates on an average of twelve hours a day, except Sundays.

The station maintains several well-equipped studios as well as remote equipment set up in numerous classrooms in prac-

tically every University building, at the Iowa Stadium, and at the Field House where all important athletic events are held. There are two large studios in addition to those mentioned above—one in the Engineering Hall where the transmitter is located, and one in the Iowa Memorial Union. The station offices are in this latter building. A special studio, control room, and observation booth have been fitted out in the building occupied by the Department of Speech. This latter equipment is used by the department in connection with courses for training radio announcers. Here the students may rehearse and receive criticism from the instructor. Several theaters, churches, and other public buildings in the city have been equipped for remote control broadcasts through the University facilities. The station has its own private broadcast and telephone lines carried in tunnels under the University campus.

In 1921 Mr. Carl Menzer, owner of a small private radio station and a graduate of the University, was put in charge of broadcasting. During the early years of the station's history he had full responsibility for all operations. As the activities of the station expanded, its control was placed in the University Extension Division. Later a University Radio Board, consisting of five faculty members plus the director of extension and the station's director-announcer, was appointed. This board determines the policies of the station, and the chairman, the director of extension, is in direct charge of the station and its programs.

Three other full-time people are on the station staff—a program director, a secretary, and an operator. As assistants to these is a class in radio in the College of Engineering and several students training for radio careers through courses in the Public Speaking Department under the direction of Professor H. Clay Harshbarger, production manager of the station.

Since the station is owned and operated by the University, the policy is to emphasize educational broadcasting and to introduce only those entertainment features which have the University as a background and serve to enhance the educational work of the station. The programs are, in general, designed to supply 50 per cent entertainment and 50 per cent educational

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material. These entertainment features are in the nature of musical programs, athletic contests, and special events. Material for these features is supplied by members of the University staff, students, and persons from the surrounding community.

The fundamental principle of policy in the operation of the station is that it shall supply to those off the campus educational information such as the outstanding men and women on the faculty can furnish. Thus material is offered through the Extension Division for college credit. Other features which may be classed as educational are presented as desirable for students and adults but without college credit. Various methods are used in presenting this material, such as lectures from the studios, classroom lectures supplemented with student participation, and music appreciation courses illustrated by the playing of pertinent compositions. Courses in practically every subject have been broadcast with special effort to adapt this work to the requirements of listeners.

In 1930 the Speech Department inaugurated a course for the training of radio announcers. This course includes not only instruction in proper radio speech but also training in program arrangement, continuity writing, and technical problems of production. Students taking this course are given regular periods of broadcast from the station. In these they arrange and present programs.

The University is experimenting with the use of electrical recording in connection with educational broadcasting. Equipment has been developed in the station's laboratories for recording on both wax and metal disks which may be used for future broadcast features. This device offers possibilities for the preservation of important educational programs.

Some experimental work has been done with television transmission over Station W9XK, owned by the University and licensed on May 27, 1932, to operate on the 2,000-2,100 kc frequency, using 100 watts power and for "unlimited" time. On November 13, 1934, this station was granted permission to use also the frequency bands 42,000-56,000 kc and 60,000-86,000 kc. The aim here is to explore the educational possibilities of this type of broadcasting.

Broadcasting from the classroom was begun in 1929 as an experiment with two courses offered, one in astronomy taught by Professor C. C. Wylie and one in the English novel taught by Professor Sam Sloan. These were one-hour broadcasts and consisted of the professor's lecture and the questions and comments of students. Arrangements were made so that listeners who took careful notes and sent them in along with evidence that they had done the assigned readings might take the regular class examinations and, if these were passed, be given credit for the course. Though the actual enrolment for this work was small, evidence was available to convince the University authorities that a large audience was availing itself of the opportunities of such work. Professors doing the actual teaching of such courses reported that their lectures were greatly improved by having to be prepared with a radio audience in mind and that the effect upon the classes was most favorable. Another value of such work was felt to be the fact that persons throughout the state were given a better idea of what was being done by the University.

In 1934 the staff of the station was increased so as to include a program director and a production manager in addition to the director-announcer, staff announcer, assistant announcer, studio hostess, assistant studio hostess, secretary, chief operator, and two assistant operators.

Among the features presented by the station in 1936 were, in addition to classroom broadcasts, programs by the Iowa Congress of Parents and Teachers, the Community Theatre, the Iowa Federation of Women's Clubs, the American Society of University Women, radio aids for high schools, college of the air, fine arts news, American Legion Auxiliary, speech clinics of the air, drama hour, Radio Child Study Club, Baconian lectures, guest artist programs, University newspaper of the air, Junior Academy of Science, and public health broadcasts. A number of University departments co-operate in the arrangement of programs, courses in program presentation, arrangement, and direction, as well as in announcing, radio speech, and the like. Other courses in technical subjects dealing with radio are offered by the College of Engineering, and the relations of

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newspapers and radio broadcasting are covered by courses in the School of Journalism.

The following is a detailed statement of courses offered in 1936 by the University and dealing with various phases of radio work:

1. ENGINEERING AND TECHNICAL ASPECTS

- a) *Radio communication*: The construction, operation, and design of radio communication apparatus for the transmission and reception of voice, telegraph signals, and pictures. Two recitations and one laboratory period per week.
- b) *Telephone communication*: Fundamentals of telephone communication; experimental work on artificial lines; electrical filters; transmission of waves on lines having distributed inductance, resistance, capacitance, and leakage; mechanism of reflection at terminals; acoustics, etc. Two recitations and one laboratory period per week.
- c) *Television*: Principles of operation of present-day television systems, including scanning disk, revolving mirror, and cathode ray tubes. Characteristics of photoelectric cells, amplifiers, and neon lamps. Synchronizing methods. Laboratory demonstrations including studio technique.
- d) *Radio theory and design*: Elementary radiation theory; design of oscillators and amplifiers; modulation and demodulation; design of transmitters and receivers. Two recitations and one laboratory period per week.

2. ADVERTISING AND WRITING

- a) *Radio advertising*: This subject, as treated in the School of Journalism, supplements the course in radio broadcasting which has to do in the main with radio production. The course also fills out a gap in the advertising course sequence for such students as are majoring in advertising, as well as meeting the needs of certain journalism majors who wish to point their course toward radio.

The course has been offered both terms during the regular session for the past three years, two hours' credit being given. Where there are enough students to warrant advanced study in the work, those having had one term's study may continue through the second term under the instructor's personal supervision.

An effort has been made to restrict the work to a few select students who particularly desire the work and who have had the necessary background courses in advertising, speech, or journalism.

In the main the course aims to give a complete picture of radio as a means of disseminating information and "adformation" together with the techniques and point of view necessary to satisfactory results.

- b) *An incidental radio project* emanating from the School of Journalism is the News Broadcasting Group. Here a group of reporters, under the direction of a student editor, cover beats, gather and write news items entirely independent of the student publications reporters. The results of their efforts are incorporated into a daily 15-minute résumé of news from town and campus, broadcast through the University station. The work augments the reporting laboratory activity for which students are given laboratory credit. While no formal radio instruction is given this group as yet, results suggest that such instruction may be included, at which time a specific credit course will be offered.

3. TECHNIQUE AND WRITING

- a) *Speech in radio broadcasting*: Given in the Department of Speech; open to upperclassmen in the Department of Speech and School of Journalism who meet the prerequisites; class meets in departmental broadcasting studio; students gain experience in building and producing all types of programs in which speech plays an important part, thus gaining experience in writing, casting, announcing, sound effects, rehearsal, direction, and production; more talented students are regularly connected with WSUI programs.
- b) *Speech in radio broadcasting: plays*: Objectives of this section are concerned with arranging materials, providing the opportunity for variety in characterization, and training in provision for the background of sound effects; the plays used are those that have been performed on the legitimate stage; students work out projects in abridging and adapting such plays for the medium of radio; an effort is made to give each student training in variety of characterization; principles of good reading are discussed and the students are urged to enrich the characterization vocally; the plays are presented weekly from WSUI.
- c) *Problems in speech*: A limited number of students are allowed to register for this course in order to pursue intensively the study and application of certain problems in speech and radio broadcasting.
- d) *Graduate work in radio in the Department of Speech*: Opportunity is provided for interested students to work out theses at the graduate level in the field of speech in radio.¹

¹ Data furnished by Dr. Bruce E. Mahan, director of the Extension Division and chairman of the Radio Board at the State University of Iowa, and files of the Federal Communications Commission.

JAMES MILLIKIN UNIVERSITY

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DECATUR, ILLINOIS

EARLY in 1922 the Department of Physics of the James Millikin University assembled a small transmitter and applied for a federal license to broadcast. This was granted on April 25, 1922, authorizing operation on 360 meters (834 kc), with 500 watts power, for "unlimited" time. The call letters WBAO were assigned to the station. On October 22 of that year the power was reduced to 200 watts and on January 4, 1923, a further reduction was made to 50 watts.

On August 25, 1924, the station was shifted to 1,090 kc and on December 4 of that year was authorized to increase its power to 100 watts. A further shift in frequency was made on September 25, 1925, when the station was moved to 1,110 kc.

No regular program of transmission was ever worked out. Offerings of the station consisted of phonograph records, entertainment features presented by local talent, and basketball games. It was hoped that the announcement over the air of "WBAO, Millikin University at Decatur" would increase the enrolment in the University, but this hope never materialized.

The wavemeter that kept the transmitter on its assigned frequency was homemade and was calibrated by the radio inspector when he visited the station.

Further, as there was very little money available for the purchase of tubes and for other expenses and services, the station "became more or less of an annoyance" to those who liked the offerings of larger and better-equipped stations. Thus the equipment gradually became obsolete with the result that the license was permitted to expire and the station was deleted on December 7, 1925.

However, on January 7, 1926, the station was authorized to operate again using the same frequency, power, and call letters formerly assigned. On June 1, 1927, the station was shifted to 1,120 kc.

Broadcasts during this second period were intermittent and of poor quality. Consequently the Federal Radio Commission, not satisfied that operation of the station was in "public interest, convenience, or necessity," called the College authorities before it to justify their continued holding of a license. As a result Station WBAO was consolidated with Station WJBL, and the two were operated under license and call letters of the latter station after October 1, 1928.¹

¹ Data furnished by Mr. Fred D. Townsley, formerly professor of physics and head of the Department of Physics at the James Millikin University, and files of the Federal Communications Commission.

JOHN BROWN UNIVERSITY

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SILOAM SPRINGS, ARKANSAS

THE Rev. Lannie W. Stewart was the owner of a radio station in Cartersville, Missouri. From 1924 this station was supported by funds supplied by the John Brown College and by donations. It operated under the call letters KFPW.

In the early part of 1928 Rev. Stewart was elected to conduct a Department of Instruction and Broadcast for the John Brown College. Consequently he moved the station to Sulphur Springs, Arkansas, on June 15, 1928, and the station license was issued in the name of the John Brown College, Rev. Lannie W. Stewart, manager.

On June 9, 1930, the station was licensed to the John Brown schools to operate on 1,340 kc, with 50 watts power and during daytime hours. This license was issued following settlement of a dispute over the ownership of the station.

Since the country was sparsely settled in the area of the station, the school found its operation of little or no value. Thus, on December 16, 1930, it was sold to the Southwestern Hotels Company and the license transferred to this organization.

Following this transaction the school purchased time on a large station at commercial rates and presented daily broadcasts of a religious and educational nature.

On December 10, 1935, the John Brown University purchased Station KUOA from KUOA, Incorporated. This station was formerly owned by the University of Arkansas¹ and was sold by that institution to KUOA, Incorporated, on April 28, 1933. At the time it was purchased by the John Brown University it was licensed to operate on 1,260 kc, with power of 1,000 watts and for specified hours. Later the power was increased to 2,500 watts during daytime hours. The station was moved to the campus of the John Brown University, Siloam Springs, Arkansas, and a new Western Electric 5-kw trans-

¹ See history of University of Arkansas.

mitter installed with a 450-foot vertical radiator. The new transmitter building is one of the most modern in the Southwest, housing an apartment for the engineer, a workshop, and a laboratory. The studios are equipped with the most modern Western Electric facilities. As the "University of the Air" this station is now asking the Federal Communications Commission for permission to increase the power to 5,000 watts.

A clause in the purchase contract permits the University of Arkansas free use of thirty minutes on the station daily for a period of five years from March 1, 1933. This date is that upon which the station was given up by the University, and the clause protects an arrangement made by the University at that time.²

² Data furnished by Dr. John E. Brown, president of the John Brown University, and files of the Federal Communications Commission.

KALAMAZOO COLLEGE

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KALAMAZOO, MICHIGAN

ON NOVEMBER 24, 1922, Kalamazoo College was licensed to operate a broadcasting station on 360 meters (834 kc), using 50 watts power and for "unlimited" time. The call letters WOAP were assigned.

The station was installed under the supervision of the Physics Department of the College as an experiment by Dr. Louis Thompson, then professor of physics. Mr. Leonard Ashby, then an instructor in the department, was placed in charge of operation.

Programs consisting of musical selections by the College and city musical organizations and talks by local persons were broadcast during the afternoons and evenings. Occasionally members of the College faculty were presented in discussions of popular interest.

On October 6, 1923, the station was shifted to 1,250 kc.

After something more than a year of broadcasting, during which the development of the radio industry advanced rapidly and commercial stations were being established in large numbers, it became evident to those in authority at the College that the institution was not financially able to purchase the needed equipment to keep the station up to date or to maintain program quality at a level in keeping with the dignity of the College. Further, the signals of the station were such as to interfere constantly with local reception of other stations in the area. Complaints of this latter fact were coming to the College daily.

Consequently it was agreed that any attempt to continue operation of the station would be unwise. Thus, when the license expired on April 13, 1924—a license which had placed the station on 1,060 kc—no attempt at renewal was made and the station was deleted by the federal government.¹

¹ Data furnished by Dr. H. H. Severn, dean of Kalamazoo College; Dr. Charles T. Goodsell, acting president of the College; and files of the Federal Communications Commission.

KANSAS STATE COLLEGE OF AGRICULTURE AND APPLIED SCIENCE

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MANHATTAN, KANSAS

ON APRIL 6, 1922, a license was issued by the federal government to the Kansas State Agricultural College permitting operation of a broadcast station on 485 meters for the transmission of weather reports only. This station was authorized to use 1,000 watts power and to operate "in accordance with the weather bureau schedule." The call letters WTG were assigned. On May 3, 1924, the station was placed on 1,100 kc and authorized to use 50 watts power for "unlimited" time.

On December 17, 1925, when the license expired, no attempt was made at renewal and the station was deleted by the federal government on December 19 of that year.

Meantime, employing the facilities of Station KFKB, at Milford, Kansas, by remote control, more or less intermittent and experimental broadcasting was conducted by the College during 1923. Regular broadcasting, using the same facilities, was begun on February 11, 1924. This arrangement was continued until December 1 of that year when the College began broadcasting on an "unlimited" time basis by special permission of the acting secretary of commerce, using its new 500-watt station, operating on 880 kc with call letters KSAC. This station was granted a broadcasting license on January 27, 1925.

From the very beginning Station KSAC was conceived as an educational station, its sole purpose being to project the College teaching and research into the rural and urban centers of the state, furnishing timely information and instruction to the people of the state.

Beginning with the first regular broadcasting through Station KFKB, the College authorities conducted, for a period of ten weeks, courses, supplemented by mimeographed copies of the lectures, in crops, livestock, dairying, poultry, agricultural economics, home economics, foods, and engineering. At the same time five-week courses were offered in clothing, interior decorating, radio, rural architecture, and farm mechanics.

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That this service was desired is evidenced by the fact that a total of 967 enrolments for this first College of the Air was received from thirty-nine states and thirty-eight from Canada. Of those enrolled 311 took examinations in 488 courses and were awarded certificates. The total enrolment in Kansas was 394 for 1,151 courses, with enrolment divided as follows:

Agricultural courses	1,378
Agricultural engineering	464
Home economics	353
Agricultural economics	251
Total	2,446

These earliest broadcasts proved so successful that the College definitely launched upon a program of education and service via radio which was expanded and enriched as the experience of each succeeding year indicated.

SEPTEMBER 15, 1924—JULY 1, 1925

The program schedule broadcast by Station KSAC during this year included twenty-seven College of the Air Extension courses—five in agriculture, four in home economics, six in engineering, and twelve in general science.

These courses were transmitted from Station KFKB until December 1, 1924, when Station KSAC went on the air. They were then transferred to the College's own station and concluded through these facilities on April 24, 1925. Broadcasting of such material was between 7:30 and 8:00 P.M. daily.

Enrolled in this featured school were 1,771 students taking an average of 6.8 courses each. These courses were designed by the instructors to contribute fundamental knowledge and to permit of as great practical application as was possible. The lectures were mimeographed and an average of 79.5 radio lectures were sent to each individual enrolled. The total enrolment by courses was 11,431, requiring the distribution of 140,986 lectures each month to College of the Air students. Table 1 indicates the participation of four divisions of the College in the 32-week school.

A feature which was started on December 1, 1924, when Sta-

tion KSAC was initiated, proved to be one of the station's most popular programs. It was the Noon Farm Program, broadcast at 12:30 P.M. This consisted of a musical introduction, two seven-minute timely talks, and a question box. As many as twenty-five to fifty concise answers to seasonal questions on such subjects as spray dates, insect outbreaks and control, warning of livestock diseases, announcements, and the like were given, for example, on one day's program. Specialists of the Division of Extension, aided by professors in the Division of Agriculture, conducted the program.

TABLE 1

College Division	Number of Courses	Number of Lectures	Days Broadcast	Enrolment
Agriculture.....	5	128	Monday and Tuesday	3,671
Engineering.....	6	64	Wednesday	1,132
Home Economics.....	4	64	Thursday	1,935
General Science.....	12	60	Friday	4,693
Total.....	27	316	11,431

Starting on February 2, 1925, two additional features were broadcast: the Rural School Program from 9:00 to 9:25 A.M., and the Housewives' Half-Hour from 9:55 to 10:55 A.M.

The Rural School Program, broadcast from February 2 to March 16, 1925, was comprised of "good" music and discussions of educational subjects presented to inspire rural-school pupils. It also included short lessons in music and a short period of calisthenics.

The Housewives' Half-Hour, broadcast from February 2 to March 30, 1925, met with the immediate approval of the women listeners. Domestic science specialists of the Extension Division and personnel from the Division of Home Economics sustained this program.

From the time Station KSAC started broadcasting in the fall of 1924 the press of the state was provided with reports of program schedules by the editor of the College's Extension Division.

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OCTOBER 5, 1925—APRIL 12, 1926

College of the Air courses equal and superior to those previously broadcast were offered during this year on a 6:30–7:30 P.M. schedule, with subjects as of the year before—agriculture, engineering, home economics, and general science. It was found impossible to continue issuing mimeographed copies of lectures to those registered in these courses.

The Matinee Program was a new feature started this year, providing an opportunity for broadcasting material of a popular nature not exactly relating to any of the other four programs, such as Boys' and Girls' 4-H Club programs, college events, homemakers' programs, women's club programs, talks on landscape gardening, musical programs, debates, athletic talks and football, basketball, and baseball lecture courses, announcements, Home-Study Service lectures, lessons in color and design, and high-school credit courses.

Otherwise the broadcast schedule during this year was practically the same as that of the year before.

From the time Station KSAC began using its own equipment a catalogue of the programs scheduled for the year by the program director has been available to those wishing to know when they might hear certain talks or feature programs. As many as 3,500 of these program catalogues a year have been requested in response to a circular letter mailed to a radio list by Dr. H. Umberger, dean of the Division of Extension. This list was originally compiled in 1926 by county and home demonstration agents, vocational agricultural teachers, and bankers to whom was addressed a request for the names of families with radio sets. Five thousand program schedules are printed each year. County agricultural and home demonstration agents have distributed over 1,000 copies each year.

SEPTEMBER 20, 1926—AUGUST 1, 1927

Station KSAC's daily program (except on Saturdays and Sundays and generally observed holidays) was broadcast during this year as follows:

KANSAS STATE COLLEGE

Rural School Program	9:00-9:25 A.M.
Housewives' Half-Hour	9:55-10:55 A.M.
Noon Farm Program	12:35-1:05 P.M.
Matinee Program	4:30-5:00 P.M.
College of the Air	6:30-7:30 P.M.

The Matinee Program was discontinued the latter part of the summer of 1927.

The Boys' and Girls' 4-H Club Program was inaugurated in October, 1926, and presented on Mondays, Wednesdays, and Fridays. Its content was a variation of music, inspirational and practical talks by members of the College faculty, and miscellaneous items including club reports, announcements, travel talks, and discussions of outstanding features.

A total of 277 Noon Farm Programs with 554 talks by thirty Extension specialists lecturing and answering an average of ten questions a day or a total of 2,770 questions for this broadcast year, with an average daily audience of 944, is credited to this program.

During the same year the Rural School Program was expanded to include the teaching of music by a member of the College's Music Department, the provision of words for the songs, talks on nature study, travel, biography, good books, current events, and calisthenics directed by an instructor from the Physical Education Department of the College.

This year the College of the Air Program consisted of a continuation of the lectures—a new series designated as Extension courses. These courses were prefaced with the market reports and a fifteen-minute period of short "opportunity talks," lectures on special and Home-Study Service courses, and College talks and activities of general interest. During the last half of the hour, on Mondays and Tuesdays, agricultural subjects were covered; Wednesdays, engineering; Thursdays, home economics; and Fridays, subjects in the Division of General Science.

This same College of the Air Program outline was followed until the beginning of the broadcast year, September 1, 1929. During the year September 1, 1929—August 15, 1930, the College of the Air Program was not broadcast.

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On Thursdays the first half of the College of the Air Program was composed largely of entertainment—band concerts, orchestra music, student recitals, faculty recitals, and debates.

Station KSAC's broadcasting schedule was enlarged during this year to include a total of 1,050 lectures aggregating 210 broadcast hours.

On June 1 of this year the station was shifted to 900 kc.

A radio survey conducted by Extension workers of the College showed that of a total audience of 11,680 persons 2,316 of which had radio receiving sets, 2,384, or 20.4 per cent, listened occasionally or regularly to the educational programs broadcast by the station. These results were an indication of the large audience interested in securing information by way of the State College's radio station.

SEPTEMBER 1, 1927—AUGUST 1, 1928

Station KSAC was "on the air" on an average of thirty hours a week during this year, as shown by the following schedule for all days except Saturdays, Sundays, and generally observed holidays:

Rural School Program	9:00-9:25 A.M.
Housewives' Musical Program	9:25-9:55 A.M.
Housewives' Half-Hour	9:55-10:25 A.M.
News Service (Saturdays also)	12:20-12:35 P.M.
Noon Farm Program	12:35-1:20 P.M.
Music Appreciation	4:00-4:30 P.M.
College of the Air	7:00-8:00 P.M.
Boys' and Girls' 4-H Program	
6:30-7:00 P.M., Monday, Wednesday, Friday	
Organ Recital	6:30-7:00 P.M., Tuesday
One-Act Play	6:30-7:00 P.M., Thursday
Radio Fans' Program	12:35 P.M. (time unlimited), Saturday
College Organizations' Program	7:30-8:30 P.M., Saturday

The Housewives' Musical Program was introduced on September 26, 1927, to acquaint listeners by orthophonic recordings with a higher quality of music than may have otherwise been obtainable. This program has been broadcast regularly ever since.

Certain days were named, beginning this year, for the treat-

ment of specified subjects on the Housewives' Half-Hour Program: Monday, foods and nutrition; Tuesday, clothing and textiles; Wednesday, the home—its management and decoration; Thursday, health; Friday, the child—its care and training.

The News Service Program was started daily, including Saturdays, on November 14, 1927, for the dissemination of state, national, and international news, about 80 per cent of which was agricultural in aspect.

The Noon Farm Program discussions went on a definite subject-matter schedule at the start of this broadcast year. Animal husbandry was discussed on Mondays, crops on Tuesdays, dairy and poultry on Wednesdays, horticulture and gardening on Thursdays, and miscellaneous items on Fridays.

Market reports were given at the beginning of the Noon Farm Program, with student talent providing various entertainment features between scheduled talks.

Since it was started on October 14, 1927, the Music Appreciation Program has been continued. It was begun as a varied program tending toward a series of lessons in the appreciation of the better class of music under the supervision of a member of the College's Music Department.

The Boys' and Girls' 4-H Club Program was continued on Mondays, Wednesdays, and Fridays from 6:30 to 7:00 P.M.

On Tuesdays at 6:30 P.M. there was presented a half-hour program of organ music from the Wareham Theater in the city. This period was used on Thursdays for the presentation of a one-act play sponsored by the Public Speaking Department of the College.

When broadcasting started in September of this year a new program, on Saturday at 12:35 P.M., appeared on the schedule, although it had been started sometime the year before. This was the Radio Fans' Program and its accompanying question box. This program consisted of discussions of radio receiving and transmitting by the station operator. It was designed to help radio fans obtain better reception from their receivers.

The first College Organizations' Program was broadcast on Saturday evening, October 22, 1927. Its purpose was that of

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social education and entertainment and to give the radio fans, with boys and girls attending college and appearing on the program, an opportunity to take part, after a fashion, in their activities.

The following, from KSAC's 1927-1928 *Radio Program Catalogue*, is descriptive of the College of the Air Program, which was the general program of the station and was supported by all the divisions and most of the departments of the College:

The first half of the hour is devoted to subjects of interest to everyone. On Monday, for instance, current history is reviewed and a forum in applied sociology is conducted; on Tuesday there are timely topics, lectures, debates, and music; Wednesday, talks on athletic sports; Thursday is general entertainment night and features music, debate, oratory, dramatics, and contests; and Friday is devoted to campus news for alumni and former students.

The last half of the hour was devoted to lectures.

Throughout the year there were miscellaneous broadcasts of athletic events, debates, lectures, and special programs.

It is estimated that three hundred members of the college staff and student body contributed to the year's programs.

Five thousand copies of the 1927-1928 *Radio Program Catalogue* were mailed, 3,500 to persons reported by county agricultural and home demonstration agents, vocational-agricultural teachers, and bankers as having radio sets, who in turn requested the catalogue after being circularized. The program catalogues have always been furnished on a request basis, except for 1,000 copies distributed each year by county agricultural and home demonstration agents.

SEPTEMBER 1, 1928—SEPTEMBER 1, 1929

The following program schedule was adhered to during this and the following year:

Daily, except Saturday, Sunday, and generally observed holidays:

Housewives' Musical Program.....	8:00-8:40 A.M.
Health Period.....	8:40-9:00 A.M.
Housewives' Half-Hour.....	10:00-10:30 A.M.
Special Programs.....	10:30-11:00 A.M.
Market Reports.....	12:30-12:35 P.M.
Entertainment Features.....	12:35-12:45 P.M.
Agricultural News Service.....	12:45-1:10 P.M.

Farm Question Box (unlimited time) Farm Flashes, Farm Forum, and miscellaneous announcements.....	1:10 P.M.
Boys' and Girls 4-H Club Program (on Wednes- days, special program of entertainment fea- tures by college organizations and students)...	6:30-7:00 P.M.
Market Reports (at 5 P.M. during the year fol- lowing).....	7:00-7:10 P.M.
College of the Air.....	7:10-7:45 P.M.
Special talks and entertainment program by col- lege organizations and students.....	7:45-8:30 P.M.
<i>Tuesday and Friday:</i>	
Music Appreciation.....	4:00-4:30 P.M.
<i>Saturday:</i>	
Housewives' Musical Program.....	8:00-9:00 A.M.
Markets and Agricultural News Service (time unlimited).....	10:00 A.M.
Radio Fans' Program (time unlimited).....	12:30 P.M.
<i>Sunday:</i>	
Concerts and Faculty Recitals occurring within the period September 1, 1928—September 1, 1929, only	2:00-4:00 P.M.

On October 30, 1928, the station was shifted to 580 kc where it shared time with Station WSUI.

The Rural School Program this year was supplemented by the Health Period, from 8:40 to 9:00 A.M., for children and adults. Members of the College Department of Physical Education directed the calisthenics during this period. Letters received and requests for calisthenics charts indicated a regular following of 2,000 for this program.

The Music Appreciation Program was continued from 4:30 to 5:00 P.M. on Tuesdays and Fridays instead of every day. The Boys' and Girls' 4-H Club Program was given a Monday, Tuesday, Thursday, and Friday broadcast from 6:30 to 7:00 P.M. instead of three days a week as previously.

There were but minor other changes in the program from the broadcast schedule of the year previous. Miscellaneous broadcasts were continued.

A total of 350 persons connected with the College broadcast from the station during the year.

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At the first of this year Dean H. Umberger appointed an Extension Division Radio Committee to govern the nature of the subject matter to be broadcast and the policies of the station. Included on this committee were: Dean Umberger as chairman, L. C. Williams, Mary Worcester, George Gammell, M. H. Coe, and L. L. Longsdorf.

SEPTEMBER 1, 1929—AUGUST 15, 1930

The same schedule of programs was broadcast this year as the year previous, with the exception that the United States Department of Agriculture's Radio Service was added to the Noon Farm Program. This service continued to be used on this

TABLE 2

Division	Lectures	Contacts
Agriculture.....	372	582,075
Engineering.....	101	224,725
Home Economics.....	234	332,775
Veterinary Medicine.....	32	42,111
General Science.....	475	517,720
Miscellaneous.....	1,494	2,104,000
Total.....	2,708	3,803,406

program, supplemented with a like amount of agricultural and domestic science material applicable to Kansas. Table 2 shows the estimated number of radio lectures and contacts for this year.

On January 8, 1929, the station was permitted to use 1,000 watts power during daytime hours and 500 watts power at night. On November 15, 1929, Station WIBW was placed on the same frequency with Station KSAC, and Station WSUI was removed from this frequency.

SEPTEMBER 1, 1930—AUGUST 1, 1931

Whereas, for the years previous, the schedule of programs had been printed in bulletin form, this year they were printed for the year on separate sheets for each week and were mailed by the month in this form. Over 3,500 names were on the mailing list. The schedules were also sent to all weekly newspapers in

Kansas, as well as to county and home demonstration agents, for distribution.

The following schedule of programs, with the exceptions noted, was broadcast through April 1, 1933:

Daily, except Saturdays, Sundays, and generally observed holidays:

Housewives' Musical Program	8:00-8:40 A.M.
Health Period	8:40-9:00 A.M.
Housewives' Half-Hour	10:00-10:30 A.M.
Noon Farm Program	12:30-1:00 P.M.
Farm Business Half-Hour (Mondays)	1:00-1:30 P.M.
Educational Program (Tuesdays, Wednesdays, Thursdays, and Fridays by the Home-Study Service)	1:00-1:30 P.M.
Music Appreciation (Wednesdays)	4:30-5:00 P.M.
Boys' and Girls' 4-H Club Program (Mondays, Tuesdays, Thursdays, and Fridays)	4:30-5:00 P.M.
College of the Air	5:00-5:30 P.M.

Saturdays:

Housewives' Musical Program	8:00-9:00 A.M.
Radio Fans' Program	12:30-1:00 P.M.

Miscellaneous and special programs were presented as such could be arranged for with the consent of Station WIBW.

With the interest shown by farmers in co-operative marketing, and the desire by members of the College's Department of Agricultural Economics to broadcast their research information, a half-hour each Monday was devoted to the Farm Business Program. The first program was given on September 1, 1930. Three ten-minute timely talks were broadcast on each program.

Beginning in the fall of 1930 a half-hour broadcast of transmission and reception of Continental code for those desiring to secure commercial or amateur operating licenses was started on the Saturday Radio Fans' Program. Over 400 letters were received in the first year from all parts of the United States, Canada, and Puerto Rico in response to this program. As many as 600 have been enrolled at one time for these twelve-lesson semiannual courses, for the successful completion of which certificates were issued. The course was discontinued in the spring of 1932.

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In January, 1930, the Educational Program was initiated, being sponsored by members of the Extension Division's Home-Study Service and broadcast four days each week. Specialists from that department gave fifteen-minute talks on home economics, agriculture, engineering, history, government, education, English, and wild-life conservation.

Owing to lack of finances for leased wire service, the station this year abandoned its market quotation broadcasts. Weather reports were given at the opening and closing of all programs. This proved a real service in cases where people and livestock were in the paths of oncoming storms or floods.

During this year a new transmitter was installed, and the first broadcast was sent out over this new equipment on May 7, 1931.

The number of radio lectures, by programs, given this year was as shown in Table 3.

TABLE 3

Program	Lectures
Health Period.....	180
Housewives' Half-Hour.....	495
Noon Farm Program.....	835
Farm Business Half-Hour.....	145
Educational Program.....	385
Boys' and Girls' 4-H Club.....	100
College of the Air.....	255
Radio Fans' Program.....	140
Total.....	2,535

On May 18, 1931, a new Radio Committee was formed of representatives from all divisions of the College and those persons responsible for special programs. Committeemen were appointed by the deans. The purpose of this committee was to consider the policies to be established with relation to radio programs, to acquaint broadcasters within their divisions with what the radio station was doing as regards education, and to aid in keeping the broadcasters enthusiastic about radio.

The committee included: chairman, H. Umberger, dean of the Division of Extension; W. E. Grimes, Division of Agri-

culture; William Lindquist, Division of General Science; M. F. Ahearn, Division of General Science; H. F. Lienhardt, Division of Veterinary Medicine; L. M. Jorgenson, Division of Engineering; Martha M. Kramer, Division of Home Economics; H. W. Davis, Division of Graduate Study; L. C. Williams, in charge of Extension Agricultural Specialists broadcasts; Amy Kelley, in charge of Extension Home Economics Specialists broadcasts; George Gammell, in charge of Home-Study Service broadcasts; M. H. Coe, in charge of Boys' and Girls' 4-H Club broadcasts; R. D. Compton, radio engineer; L. L. Longsdorf, program director; A. F. Turner, district agricultural agent at large and assistant program director.

SEPTEMBER 1, 1931—SEPTEMBER 1, 1932

Station KSAC broadcast the same schedule of programs this year as during the previous year.

On July 1, 1931, arrangements were made for the Noon Farm Program talks by Extension Division specialists to be supplemented with one talk each Monday, Tuesday, Wednesday, and Thursday by resident staff workers of the College's Division of Agriculture so that they, as well as the Extension specialists, might present their subject matter to the radio audience.

On August 4, 1931, the market report service was reinstated at the beginning and end of the Noon Farm Program, with the exception of the Saturday program.

At the beginning of this broadcast year the lecturers on the College of the Air program were scheduled at the same time and on the same day of each week, the number of talks in a series ranging from two to thirty-two. Radio listeners thus were able to become familiar with the day and hour of programs particularly interesting to them. On September 14, 1931, there was instituted on this program a Kansas State College News Service, broadcast as the concluding feature. It was the intent of this news service to acquaint Kansans with the educational activities of the College and its students.

A state road report was instituted on September 14, 1931, given along with the weather report at the beginning and conclusion of all programs broadcast after 10:00 A.M.

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In previous years Station KSAC did not broadcast during August, but with the installation of its new transmitter on May 7, 1931—assuring good reception under adverse summer atmospheric conditions and with more lectures and programs by the College's subject-matter professors supplementing those of the Extension specialists—the station began a full-year broadcasting schedule.

At the beginning of the second semester of the 1931-32 school year a two-hour radio speaking course was offered—Radio Speaking and Announcing. The facilities of the station and its staff were used as a laboratory of instruction, with direction of the course procedure by a member of the Public Speaking Department. This course grew steadily in importance and listener interest. Several who finished it received positions on the announcing staffs of commercial broadcasting stations. In the fall of 1932 a total of fifty students tried out for admission to the course, and twenty-five of the most promising, whose voices were the best, were permitted to enrol. Four periods each week, of twenty minutes' duration, were devoted to announcing college news, national and international affairs, sports, and the like by these students.

An advanced regular school year course—the Radio Program—with Radio Speaking and Announcing as a prerequisite was initiated at the beginning of the second semester of the 1932-33 school year. Here consideration was given to analysis of program types, with particular attention to educational, dramatic, and advertising programs; experience in the planning of programs and in construction and presentation of original features was given.

On August 12, 1932, the license for Station KSAC was issued in the name of the Kansas State College of Agriculture and Applied Science.

SEPTEMBER 1, 1932—APRIL 1, 1933

The same program schedule as the year previous was followed with these enlargements and exceptions:

A new educational radio service to commercial broadcasting

stations of Kansas and to the commercial stations near Kansas' borders was begun January 18, 1932. This service featured educational radio talks on agriculture and home economics provided by the United States Department of Agriculture Radio Service and the Kansas State College Extension Service. The material furnished by the Federal Radio Service was routed through the College's Extension Division and from there to the commercial stations. The United States Department of Agriculture's seven minutes of speech material was reviewed by specialists of the Kansas Extension Service for its timeliness and practicalness in the state and supplemented with another seven minutes of material before it was sent to the commercial stations. The schedule of agricultural subject-matter releases was as follows: crops and soils, Monday; livestock, Tuesday; fruits and vegetables, Wednesday; poultry and dairy, Thursday; farm business news, Friday; and news, Saturday.

Arrangements were made for the Kansas Extension Service to alternate days with the adjoining states of Missouri and Oklahoma on programs offered. About two months after the establishment of this co-operative arrangement the Missouri Extension Service found it impossible so to continue. Following this the Kansas Extension Service provided the Kansas-Missouri border stations with a daily service. The radio program director of the College's Division of Extension handles all this procedure.

On January 18, 1932, the following commercial stations began broadcasting the programs furnished them: WIBW, Topeka, Kansas; KBFI, Abilene, Kansas; KFEQ, St. Joseph, Missouri; KGGF, Coffeyville, Kansas; KFH, Wichita, Kansas; KGNO, Dodge City, Kansas; WREN, Lawrence, Kansas; WBBZ, Ponca City, Oklahoma.

On September 28, 1932, WREN discontinued using this service.

On October 11, 1932, Station KMOX, St. Louis, Missouri, requested this service. It was sent to the station at once.

The co-operative arrangement between commercial radio stations in Kansas and the bordering states and the Kansas Extension Service proved most valuable as a supplement to the

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College's other facilities for disseminating educational information. Not only did it prove valuable from the standpoint of broadcasting agricultural and home economics subject matter, but it was also helpful as a means of acquainting listeners with coming Extension Service schools, demonstrations, educational tours, state meetings, and the like. It furnished an almost immediate and most acceptable outlet for acquainting Kansas with the program of the Extension Service in the field. The good-will created between the co-operating stations was also most desirable.

The four-day-a-week Educational Program by the Home-Study Service was discontinued on July 1, 1932, following a reduction of personnel in that department.

From June 6 to August 6, 1932, a series of more than forty summer-school lectures was broadcast. This was prepared by the instructors for the regular seminar during summer school and given at 8:00 A.M. the day after each lecture was delivered to the class. This was the first broadcast of summer-school lectures.

A new venture in extension teaching was begun on December 20, 1932, known as the radio filmstrip-extension school. By previous arrangement, county agents scheduled meetings of farmers and homemakers to be held in their communities at the same time that a particular educational talk was to be broadcast from Station KSAC. A filmstrip of still pictures was projected on the screen in the broadcasting station at the same time that the county agents and local leaders over the state operated a duplicate filmstrip of pictures illustrating the particular talk heard over the radio receiver. By this method one extension speaker was able to conduct an illustrated school for an innumerable group of people.

The Young People's Opportunity Hour was inaugurated on May 14, 1931, as a series of weekly one-hour radio programs. The first series was concluded on September 10, 1931. The second series was offered beginning on April 1, 1932, and was continued weekly until June 24, 1932. The third series was begun on February 15, 1933, and was concluded on June 7, 1933.

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These programs were originally planned to offer prospective high-school graduates and their parents a cross-section of the opportunities open at Kansas State College.

In this unveiling of college activities it was customary to introduce prominent students enrolled at the College as speakers. Also, talks were made by the College president, deans, re-

TABLE 4

Program	No. of lectures
Health Period.....	180
Housewives' Half-Hour.....	515
Noon Farm Program.....	1,150
Farm Business Half-Hour.....	157
Home-Study Service.....	413
Boys' and Girls' 4-H Club.....	108
College of the Air.....	255
Radio Fans' Program.....	140
Total.....	2,918

TABLE 5

College Division	No. of lectures
Extension.....	1,878
Agriculture.....	375
Engineering.....	45
Home Economics.....	200
Veterinary Medicine.....	30
General Science.....	390
Miscellaneous.....	1,250
Total.....	4,168

search workers, and other faculty members. Music supplemented these programs.

Table 4 shows the number of radio lectures given by programs and by College divisions, based on the year's scheduled programs begun on September 1, 1932.

On November 9, 1932, the College was granted an experimental visual broadcasting license on the 2,100-2,200 kc frequency with 125 watts power for "unlimited" time on the air.

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APRIL 1, 1933—NOVEMBER 30, 1934

Much the same method of procedure was used in the development of radio programs this year as was used in the previous two years. Emphasis was placed upon more thoroughly canvassing the institution for new broadcasting possibilities with agricultural, home economics, and 4-H Club programs predominating.

Radio was used extensively in broadcasting agricultural adjustment and emergency drought information.

A change in time-sharing agreement with Station WIBW became effective on July 1, 1934. The time allotment for Station KSAC was not changed, but broadcast periods were scheduled to allow for three broadcasts each weekday in preference to four. This arrangement was made to the advantage of both stations.

Increased emphasis was placed upon further development of radio speaking courses for Kansas State College students. This development was in line with the increased tendency for commercial and educational interests to employ graduates who have had radio training.

There was a decided trend on the part of administrative officers to improve and better adapt the programs broadcast over institutionally owned stations and the manuscripts syndicated to co-operating commercial radio stations. This trend necessitated the employment of trained radio writers, specialists in agriculture, home economics, 4-H Club work, and the general sciences.

To develop added interest in the activities of the institution, both on the campus and in the field, and to acquaint high-school students with what institutions of higher learning have to offer, the station continued its series of Young People's Opportunity Hour programs. These programs emphasized the activities of students on the campus and gave a cross-section of the research findings of staff workers.

Increased effort was made to attract a larger listening audience through newspaper announcements of scheduled broadcasts and through the building-up of a listener mailing list. This

list totaled approximately 5,000 names and was made up solely of those making requests for printed programs.

Tables 6, 7, and 8 give summary of radio lectures based on programs scheduled beginning on September 1, 1934.

TABLE 6

Division	No. of lectures
Extension	1,410*
Agriculture	368
Engineering	142
Home Economics	132
Veterinary Medicine	37
General Science	491
Total	2,580

* Includes radio service from the Office of Information, United States Department of Agriculture, as listed in Table 7.

TABLE 7

Subject	No. of lectures
Agriculture	312
Home Economics	270
Total	582

TABLE 8

Program	No. of lectures
Health	180
Housewives' Half-Hour	790
Farm Hour	1,122
Farm Business Half-Hour	156
Radio Speaking Course	540
College of the Air	249
Weekly 4-H Club Hour	104
Agricultural Adjustment Act	512
Total	3,653

The radio committee, composed of representatives from all divisions of the institution, continued to offer invaluable suggestions for improvement of programs and for maintaining interest in broadcasting on the part of the voluntary broadcasting staff. The committee's most notable contribution to

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program development for 1934 was to prepare recommendations for radio development for the coming twenty years. These recommendations were incorporated in a special report to the President of the College for consideration in "The 20-Year Plan."

DECEMBER 1, 1934, TO THE PRESENT

As cited in the annual report of the program director of Station KSAC for 1934-35, the College broadcasting station had as its objective the projection of the College teachings and research findings to the rural and urban citizens of the state. It served as a medium by which series of related lectures and timely scientific information might be given, thus offering an opportunity for the citizen of both adult and school age to continue his or her education although unable to attend an educational institution. It was considered an efficient and effective medium for assisting other established methods of education at the College in the improvement of the standards of living of Kansas citizens.

Subject-matter broadcasts covered practically the entire range of teaching at the Institution. Here may be listed agriculture, home economics, veterinary medicine, engineering, general science, 4-H Club material, and other allied subjects.

Extension workers, and approximately 300 members of the residence staff as well as students, voluntarily provided an average of four hours of broadcasting each weekday on a twelve-month schedule.

The Correlated Federal-State Educational Program to commercial radio stations constituted another major activity of this project. A daily half-hour program, divided equally between agriculture and home economics, was supplied in manuscript form to thirteen co-operating commercial radio stations. In addition, numerous extension workers were scheduled to appear on the farm programs of these commercial stations.

Radio has constantly served its place in publicizing coming events, in broadcasting reviews of released manuscripts, in giv-

ing simultaneous release to all press articles, and in acquainting listeners with the developments in agricultural adjustment.

During the year there was a decided trend toward the use of drama in acquainting radio listeners with the recommendations of the Institution. The comments from radio listeners on the dramatized form of broadcasting educational information seemed to have "more than warranted the extra expenditure of time and money." A typical illustration of this type of dramatization was the Young People's Opportunity Hour which was presented once a week for thirteen weeks, beginning on February 13.

Decided improvement in syndicated materials broadcast from thirteen commercial radio stations was indicated by program directors during the year. This improvement was attributed to the employment of trained writers of educational script who incorporated in their writings the commercial radio stations' style of script writing.

Increased effort was placed upon student participation in the broadcasting of programs prepared by students. Special consideration was given to student programs for the following reasons: (1) to give students an opportunity to obtain the rudiments of radio script writing and radio technique; (2) to increase the listener interest in the radio station by publicizing the fact that local, home-town boys and girls attending Kansas State College would be on the air.

Beginning with the second semester of 1936 and in line with the trend of student participation, a period was set aside for the broadcasting of Home Town News prepared and broadcast by students in radio writing.

There was a belief among educational broadcasters that educational institutions had not done sufficient research work to determine radio listener reactions to programs broadcast. Therefore, from July 16, 1935, to September 1, 1935, a special survey—Kansas Radio Listener Survey—was conducted by the staff of Station KSAC to obtain reactions to programs broadcast from the station and to obtain from radio listeners a cross-section of their program choice.

EDUCATION'S OWN STATIONS

During the period in which agricultural adjustment and drought information were pertinent to the agricultural industry of the country both the College and the co-operating commercial stations were actively engaged in broadcasting adjustment and drought information.

There seemed to be a decided tendency for radio listeners to know the hour specific subjects were broadcast so that they

TABLE 9

Division	No. of Lectures
Extension	1,629*
Agriculture	340
Engineering	127
Home Economics	74
Veterinary Medicine	19
General Science	671
Total	2,860

* Includes radio service from the Office of Information, United States Department of Agriculture, as listed in Table 10.

TABLE 10

Subject	No. of Lectures
Agriculture	312
Home Economics	312
Uncle Sam at Your Service	52
Consumer Facts	52
Total	728

could tune in on the programs in which they were interested. This fact may be indicated by the increased requests for printed radio programs. The request mailing list was increased to 7,500 from the 5,000 of the year previous.

Considerable emphasis was placed upon broadcasting sketches from available publications issued by the Institution and distributed upon request. Thousands of publications on all phases of research work done by the College were distributed by this means alone.

Tables 9, 10, and 11 indicate the work of the station during this period. Additional talks for 1935 totaled 580.

Engineering developments at Station KSAC consisted of the construction of an efficient, compact remote-control amplifier that proved to be better and more economical for out-of-studio broadcasts; and the installation of a conversion switch for altering station power as required by the Federal Communications Commission. Construction permit was granted for the building of a short-wave transmitter for the broadcasting of

TABLE 11

Program	No. of Lectures
Health.....	180
Housewives' Half-Hour.....	672
Farm Hour.....	1,525*
Farm Business Half-Hour.....	156
Radio Speaking Course.....	324
College of the Air.....	284
Weekly 4-H Club Hour.....	156
Agricultural Adjustment Act.....	...
Total.....	3,297

* Includes Agricultural Adjustment Administration talks.

remote control programs within a radius of twenty miles. It was the intention of the staff to utilize this transmitter to feed into the large transmitter from meetings, group discussions, achievement day programs, livestock shows, and the like.

On February 20, 1936, the Federal Communications Commission granted to the Kansas State College of Agriculture and Applied Science a license permitting the construction of a portable mobile short-wave transmitter, W9XHC. This transmitter when completed will be used to relay programs to Station KSAC which otherwise could not be broadcast because of unavailability of telephone line facilities.

The "20-Year Plan" as recommended by the College Radio Committee is here presented as a basis for future development of the station:

EDUCATION'S OWN STATIONS

RECOMMENDATIONS FOR RADIO DEVELOPMENT KANSAS STATE COLLEGE

PURPOSE

The College radio station should have as its purpose the projection of the College teachings and research findings to the rural and urban citizens of the state. It should serve as a medium by which courses or series of related lectures may be given, thereby offering an opportunity for the citizen of both adult and school age to continue his or her education although unable, due to lack of finances or to other reasons, to attend an educational institution. It should be considered an efficient and effective medium for assisting other established methods of education at the College in improving the standards of living of Kansas citizens.

The 20-year plan is based upon a full-time broadcast program which consists of a minimum of 12 hours a day and a maximum of 18 hours a day, 6 days a week (excluding Sunday), with a power of not less than 5,000 watts, or more if necessary to provide for adequate reception throughout the state.

PROGRAM DEVELOPMENT

1. The program director should be the final authority on programs, subject to such general policies as may be laid down by the Administration of the College.

2. As radio personalities tend to give stability to the station programs, it is suggested that an effort should be made to build up radio personalities by having certain subject-matter individuals appear on the station regularly, at least three to six times each week.

For instance, all materials relating to home economics might be presented by some one faculty woman, carefully selected for pleasing radio personality. Materials presented by her might be credited to various instructors in home economics, but the continued appearance of the same person would contribute to the building-up of recognition and, consequently, greater interest on the part of the listener. Probably two people from home economics and three from agriculture would be adequate to handle materials of this nature. These employees should be considered as half-time classroom teachers and half-time radio workers.

It should be understood by all employees on the staff of the Kansas State College that they are expected to appear on radio programs when requested to do so by their administrative superior and by the program director. It is further recommended that each faculty member appear on programs at least once each semester.

3. Some arrangement should be made by which suggestions would be available to those speakers who broadcast regularly concerning the ways in which they may improve their English, voice, speaking manner, microphone technique, and general performance. It has been suggested that, through the co-

operation of the Department of Public Speaking and Radio, there be instituted a volunteer class in which instruction in studio technique be given.

4. In addition to the regular subject-matter programs that have been developed, increased use should be made of talent that is not usually available to commercial stations, talent that peculiarly belongs to educational stations. (For example: Educational interpretations of current events, special geological explanations that might coincide with current happenings, such as the disintegration of Niagara Falls.) Many faculty members have developed hobbies of a scientific and cultural nature regarding Kansas that should be of interest to the general public.

5. Far greater use should be made of the Department of Music. It would be quite possible to arrange for two weekly programs of 30 minutes each by the band, orchestra, and/ or Glee clubs; for four to six weekly programs by individual members of the music faculty; and for two 30-minute programs each week by advanced students of the Department of Music.

6. It is also recommended that the established policy be to have only those associated with the College, either on the staff or closely associated with the Institution, on the programs.

7. Adequate provision should be made to acquaint the public with scheduled programs.

8. Frequent surveys should be conducted to determine the extent to which the Kansas public listens to the station and the relative popularity of the programs presented.

PERSONNEL DEVELOPMENT

The following recommendations are made for the future development of the Radio Station personnel, based upon an increase in the broadcasting time, increase in number of educational broadcasting features, and increase in broadcasting facilities (salaries for these employees would be based upon the prevailing rates at the Institution):

1. *Program staff*: (a) that there be employed one full-time director who is trained in announcing, in the editing of radio talks, and in the writing of continuities; (b) that there be employed one full-time assistant to the program director, this assistant to act in the capacity of assistant director and announcer. He should be trained in announcing, in the editing of radio talks, and in the writing of continuities; (c) that there be employed a full-time director of radio music, who shall have the same relationship to the Department of Music as the other extension specialists have to their respective subject-matter departments. He should be adequately trained in announcing and in the presentation of radio music. His duties would include the supervision and announcement of all music appreciation programs, band and orchestra concerts, Glee clubs, etc.; (d) that there be employed a full-time director of radio dramatics, who shall have the same relationship to the Department of Public Speaking as the other extension specialists have to their respective subject-

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matter departments; (e) that there be employed a full-time College radio news representative, who shall have the same relationship to the Department of Industrial Journalism as the other extension specialists have to their respective subject-matter departments; (f) that in addition to the full-time director, there should be at least 5 additional assistants to the program director, each of whom would be in charge of a subject-matter program. The committee recommends that a limit of two hours a day of actual program should be assigned to each of the assistants.

2. *Technical Staff:* (a) that there be employed a full-time chief operator or radio engineer; (b) that there be employed four full-time assistant radio engineers. (With the increase in power and the installation of new units, it is to be understood that the technical staff must be sufficient to handle the broadcasting adequately, including part-time assistance for the broadcasting of remote control programs and for assisting in laboratory work in the courses in radio speech.)

PHYSICAL PROPERTIES DEVELOPMENT

1. To serve an area as large as the state of Kansas, a station having a power of not less than 5,000 watts will be necessary within the next 10 years. At the present time at least 2,500 watts are needed to serve this same area. The increase in power with respect to time is due to the tendency on the part of broadcasters to build stations of greater power and thus "drown out" the broadcaster with smaller power. The station's power of 1,000 watts is not consistently covering the state. By consistent coverage is meant the ability to send satisfactory signal strength into any part of the state at any time of the day or night.

An increase in power can be effected by the purchase of an amplifier of adequate size for the present transmitting equipment. A 2,000 watt amplifier will cost approximately \$12,000, and a 5,000 watt amplifier will cost approximately \$21,000.

Adequate provision should be made for changes in power, replacement of obsolete equipment, or other improvements made desirable by inventions or changes in broadcast equipment or technique that may occur during the 20-year period, or changes in regulations governing broadcast stations. (It is estimated that a budget of \$2,500 be set aside for station maintenance.)

2. In connection with new transmitting equipment, an antenna system designed to give more efficient coverage of Kansas should be installed. An antenna system of this type would probably be in the form of a vertical antenna, costing between \$10,000 and \$25,000.

3. The facilities should be increased to provide adequate housing for transmitter and studio in the proposed new Extension Building. It is recommended that appropriate surveys be taken before any new transmitting equipment is definitely located so that the most advantageous position may be selected for a broadcast station. If this location should not be adequately adapted as a

location for both the transmitter and studios, the transmitter should be located independently of the studios in the best location as determined by the College and radio engineers.

4. With the building of new studios should come the purchase of supplemental studio equipment, such as microphones, amplifiers, and loud-speakers, capable of operating according to the best standards. Such equipment would cost approximately \$3,000.

5. The studio arrangement should include facilities for the broadcasting of all types of programs originated by the College, and for this purpose it should include one auditorium-type studio capable of seating 500 persons, two medium-sized studios, and at least one small studio designed to be used for programs composed only of speeches.

6. In connection with the studios and studio equipment, it is recommended that a suitable phonograph recording machine be installed at the earliest possible time for the purpose of making phonograph records to be used by the various departments of the College. In this case the studios and studio equipment would serve as the pickup and amplifying equipment for the recording machine. This equipment is especially needed to make it possible to broadcast the natural voice of the speaker when he or she is absent from the studio. A machine of the desired type would cost approximately \$1,000.

7. To secure the maximum efficiency and service from the radio station, aids should be installed to facilitate tuning and adjusting the equipment to the best operating point. Such equipment would consist of an oscilloscope, beat-frequency oscillator, field strength measuring set, and associated equipment, such equipment costing approximately \$750.

8. Small studios should be provided in the principal buildings on the campus, connected to the broadcast station by cables, these cables being extended to all rooms which are frequently used for public meetings. Broadcasting booths should be incorporated in the auditorium and in all rooms used for housing public gatherings. Cost of such installation is problematical, depending upon the number, locations, and distances from the transmitter.

9. It is also recommended that suitable connections be made between the television station and the broadcasting station for future synchronized broadcasting. Cost of such connections would be approximately \$250.¹

¹ Data furnished by Dr. Harry Umberger, dean of the Division of Extension, Kansas State College of Agriculture and Applied Science, and files of the Federal Communications Commission.

UNIVERSITY OF KANSAS

LAWRENCE, KANSAS

ON DECEMBER 18, 1924, the University of Kansas, Department of Electrical Engineering, was licensed by the federal government to operate a radio station on 1,090 kc, using 500 watts power and for "unlimited" time. The call letters KFKU were assigned.

Almost immediately there was a rush by the faculty to broadcast, and an elaborate series of programs was arranged. This included lectures from almost every department in the University along with two courses in educational psychology and elementary Spanish, given for credit in connection with correspondence study assignments.

Within six months twenty-seven different stations had been licensed to operate on the same frequency with Station KFKU, the result being that considerable interference was experienced and the University's broadcasts could be heard satisfactorily with any degree of regularity only within a radius of about forty miles from Lawrence. Consequently the courses for credit were abandoned and the programs limited to short talks of an educational nature, music, and athletic events.

Further, the extreme interest exhibited by the faculty in broadcasting soon wore off, as it became evident that the development of special techniques was necessary. Many faculty members found it difficult to devote the time required for this, and difficulty was experienced in getting sufficient program material to fill the station's time on the air. Some of those who had contributed to the programs felt that their talks did not have an audience. Others found it impossible to organize talks which would appeal to a general audience, and a few members of the faculty refused to popularize their material for radio presentation.

As a result the offerings from Station KFKU were gradually reduced and the programs offered were pitched more nearly on a popular level.

On June 1, 1927, the station was shifted to 1,180 kc, still with 500 watts power. On October 15, 1928, the station was again shifted, this time to 1,220 kc which it also shared with Station WREN. At this time, however, permission was granted to increase the station's power to 1,000 watts. Less than a month later, on November 9, 1928, the power was reduced to 500 watts.

Authorization was given the University on November 12 of that year to make use of the transmitter of Station WREN and to operate with 1,000 watts power when using this transmitter. The transmitter of Station WREN was secured on a rental basis and used for all subsequent programs, the old transmitter of KFKU being kept as auxiliary equipment and for experimental use.

By order of the Federal Radio Commission on February 10, 1931, the University was denied authorization to use 1,000 watts power and reduced to 500 watts. It continued to use, however, the transmitter of Station WREN which, for all other programs, was being operated at 1,000 watts power.

Subsequently, on January 29, 1934, the Commission granted the University permission to again increase the power of Station KFKU to 1,000 watts and on September 17, 1935, the station was authorized to use 5,000 watts until "local sunset" and 1,000 watts at night. This arrangement has been in effect since that date.

After Station WREN joined the network facilities of the National Broadcasting Company, Station KFKU found that its schedule of broadcasts conflicted with increasing frequency with periods desired by the other station for the broadcast of sponsored programs. Until that time the University station had no regular schedule for daily broadcasts, using periods of from one hour to an hour and a half three evenings a week and little time during the day except for the broadcast of addresses at convocations and special events, or of athletic events. The conflict with the network programs of Station WREN and the requirement of a definite time-sharing agreement, on orders of the Federal Radio Commission in 1931, resulted in a change to a daily schedule of hours with exceptions to provide for the

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broadcast of football and basketball games, Sunday Vesper programs, and other special concerts and lectures. During the next few years the time-sharing agreements were gradually changed to eliminate most of these exceptions and to restrict the broadcasting time of Station KFKU to thirty minutes each afternoon and fifteen minutes each evening daily, except Sunday, with an additional fifteen minutes two evenings of the week.

In the meantime many members of the University faculty have developed increasing ability in the presentation of radio talks, more departments have become interested in developing the techniques necessary to successful presentation of their material, and the program offerings have far exceeded the broadcast periods available. In this situation Station KFKU is presenting a carefully selected series of broadcasts each weekday from 2:30 to 3:00 P.M. and from 6:00 to 6:15 or 6:30 P.M., with the evening period coming later during the months of April, May, and June after the network schedule is changed to daylight-saving time. Among these broadcasts are Spanish, French, and German lessons, News Flashes, Problems of the Growing Child, Educating Yourself and Your Child, Books Old and New, Athletic Scrapbook, Kansas Then and Now, Health through the Ages, Study of Shakespeare, Music Appreciation, as well as special broadcasts of unique events, musical programs, and the like.

These programs are presented by members of the faculty and advanced students who have special talents in the line of their broadcasts. Of special importance have been the contributions of musical groups such as the University orchestra, glee clubs, band, string quartet, and the a cappella choir. About 90 per cent of the limited time available is used for broadcasts of a strictly educational nature, many of them directed to the public schools as a supplement to classroom lessons in junior and senior high schools. Schools within the coverage area of Station KFKU are following especially the afternoon "School of the Air" broadcasts and requests for detailed program schedules have increased more than 50 per cent during the past two years.¹

¹ Data furnished by Dr. Harold G. Ingham, director of extension, University of Kansas, and files of the Federal Communications Commission.

KNOX COLLEGE

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GALESBURG, ILLINOIS

KNOX College was licensed by the federal government, on December 12, 1924, to operate a broadcast transmitter on 1,180 kc, with 10 watts power, for "unlimited" time. The call letters WFBZ were assigned.

Broadcasts from this station were planned largely to give publicity to the College, and nothing of a definitely educational nature was presented, though certain speeches which seemed to have general interest were "put on the air."

On April 13, 1925, the power of the station was increased to 20 watts and on December 20, 1926, it was again increased to 50 watts. On June 1, 1927, the station was moved to 1,210 kc where it was ordered to share time with Station WRAM.

The transmitter had only a short effective radius and was constantly interfering with the broadcasts from other stations. Thus its value was not believed to be comparable to the expense necessary for continuing its operation.

Further, broadcasts of public addresses succeeded in producing smaller audiences in the lecture hall with a very uncertain group of listeners scattered throughout the territory covered by the station.

Again, the quality of programs presented from the College transmitter was such as to make competition with programs from larger commercial stations impossible.

Consequently, since the advantages to the College in maintaining the station were extremely doubtful and the cost high, when the license expired no attempt to continue the project was made and the station was deleted by the federal government on August 1, 1928.¹

¹ Data furnished by Dr. Albert Britt, president of Knox College, and files of the Federal Communications Commission.

LAKE FOREST COLLEGE

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LAKE FOREST, ILLINOIS

BROADCASTING at Lake Forest College had its beginning early in 1923 when two young men built a transmitter on the campus and made application for a license to "go on the air." This license was granted on April 17, 1923, permitting the station to operate on 1,130 kc, using 100 watts power, for "unlimited" time. This license expired on July 16 of that year and the station was deleted by the federal government on July 23. The call letters used under this early license were WABA.

On October 10, 1923, a new license was issued to the station permitting operation upon the same frequency and with the same power and time as before. The call letters also remained the same. This license, however, was issued in the name of Lake Forest University. On July 10, 1924, the station license was permitted to expire and the station was deleted by the federal government.

A third license was issued to the station on January 12, 1925, authorizing the use of 1,320 kc, 100 watts power, and "unlimited" time on the air. The call letters remained the same as those of the two previous licenses.

During the slightly more than two years that the station was operated intermittently, experimental work in radio communication predominated, though a few regular entertainment programs were broadcast. No definitely educational broadcasting was attempted.

Though the equipment was small, the expense of maintenance and operation was heavy enough to convince College authorities that it would be unwise to continue the project. Further, because of the quasi-experimental nature of the programs broadcast, the Department of Commerce felt that the station was not serving the public interest as it should.

Consequently, on July 2, 1925, renewal of license was refused by the federal authority and the College did not enter a protest. Thus the station was deleted by the federal government on October 14, 1925.¹

¹ Data furnished by Dr. Herbert McComb Moore, president of Lake Forest College, and files of the Federal Communications Commission.

LANE TECHNICAL HIGH SCHOOL

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CHICAGO, ILLINOIS

THE Lane Technical High School, in February, 1923, established a radio station as a school project, financed wholly by the school as a private venture. No support was given this early station by the Chicago Board of Education or other outside agency.

On June 26, 1925, the school was granted a federal license to operate this station on 1,160 kc, using 100 watts power, for "unlimited" time. The call letters assigned were WLTS. In this license it is stated that the station was owned by the public school and under the supervision of the Board of Education and the city of Chicago.

On June 1, 1927, the station was shifted to 620 kc where it shared time with Station WCFL. On July 27 Station WEMC was also placed on the frequency to share time with the two stations already operating there.

When the station license expired on June 1, 1928, application for renewal was made on the basis that programs broadcast were educational, and further that Station WLTS was the only broadcasting unit in a secondary school in the Middle West. This application was designated for hearing before the Federal Radio Commission on the ground that the transmitter was not being operated in "public interest, convenience, and necessity." When representatives of the school failed to appear, the application was denied by default, on July 25, 1928.

This default was due to the fact that the expense of maintaining legal representation in Washington to defend the interest of the school was more than the institution could afford.

The station was deleted by the federal government on August 1, 1928.

A later application to reinstate the station was made and denied (December 16, 1929) when the school failed to appear and defend its interest before the Commission's hearing. This

failure was, as that before, due to expense involved in employing legal representation in Washington.

Out of this experience Principal Charles E. Lang speaks: "In the light of the present development of radio it was inevitable that such an enterprise was doomed to fail if attempted by any organization not able to command any considerable revenue from some independent source."¹

¹ Quoted from a letter by Mr. Charles E. Lang, principal of the Lane Technical High School, dated February 18, 1936. Data furnished by Mr. Lang and files of the Federal Communications Commission.

LATTER DAY SAINTS UNIVERSITY

SALT LAKE CITY, UTAH

SOME experimental work in radio transmission was done at the Latter Day Saints University during 1919-20 under an amateur license, with call letters 6BAL, and also under a special experimental license.

In 1921 broadcast equipment was purchased and a license obtained under call letters KFOO. During the next five years broadcasting was carried on by the University intermittently. Numerous concerts and lectures were broadcast and two series of educational lectures were "put on the air" in 1923 and 1924. During these years reports of basketball games were broadcast by remote control from the Deseret Gymnasium. In October, 1922, the first broadcast of a concert from the great organ in the Mormon Tabernacle was made over these facilities.

Originally the station operated with 50 watts power. The license issued on March 19, 1924, placed the station on 1,150 kc, with the power at 10 watts, and permitted the use of "unlimited" time on the air. On January 6, 1925, the power was reduced to 5 watts and on April 14, 1925, this was increased to 250 watts. On May 29, 1925, the station was shifted to 1,270 kc.

With this higher power the station was heard throughout the United States, in Hawaii, and in New Zealand.

The station was never operated on a commercial basis, its control remaining always in the hands of authorities of the Latter Day Saints University who desired that it be used exclusively for educational purposes. The transmitter was in charge of Dr. Thomas H. Howells and Mr. Don C. McRae.

The last license held by the University expired in November, 1926, and the station was deleted by the federal government on January 26, 1927.¹

¹ Data furnished by Dr. Thomas H. Howells, Department of Psychology, University of Colorado, who was in charge of Station KFOO during its existence, and files of the Federal Communications Commission.

LINCOLN MEMORIAL UNIVERSITY

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HARROWGATE, TENNESSEE

ON MAY 28, 1936, Lincoln Memorial University was granted a construction permit to erect a broadcasting station at Middlesboro, Kentucky. This permit designated a station operating on the 1,210 kc frequency, using 100 watts power, for "unlimited" time. Call letters assigned were WLMU.

Application for license is under advisement of the Federal Communications Commission.¹

¹ Data gathered from files of the Federal Communications Commission.

LOMBARD COLLEGE

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GALESBURG, ILLINOIS

ON JANUARY 11, 1923, Lombard College was licensed by the federal government to operate a broadcast transmitter on 360 meters (834 kc), using 100 watts power, for “unlimited” time. The call letters assigned were WRAM. On June 13 of that year the station was deleted.

A new license was issued to the College on November 12, 1923, permitting operation of the transmitter on 1,230 kc, with 250 watts power, for “unlimited” time. The call letters assigned under this license were the same as those under the former license.

On February 25, 1924, the power of this station was reduced to 100 watts and on June 1, 1927, it was again reduced to 50 watts and the station placed on 1,210 kc where it was ordered to share time with Station WFBZ.

No application for renewal of license was filed after August 1, 1928. Thus the station was deleted by the federal government on September 1, 1928.

Lombard College has been consolidated with Knox College and its buildings are now used as a junior high school.¹

¹ Data gathered from files of the Federal Communications Commission.

LOUISIANA COLLEGE

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PINEVILLE, LOUISIANA

ON APRIL 13, 1923, Pincus and Murphy, music dealers at Alexandria, Louisiana, were licensed by the federal government to operate a broadcast transmitter on 275 meters, with 100 watts power, for "unlimited" time. The call letters KFFY were assigned.

At about this time the state of Louisiana passed a law requiring privately operated radio stations to pay a license fee of \$500. Because of this fee Pincus and Murphy felt that they could not operate the station as planned and, consequently, gave the transmitter to Louisiana College which was, by law, as an educational institution, exempt from the state tax.

On October 9, 1924, a federal license was issued in the name of the College authorizing operation of the station on 1,090 kc, with 50 watts power, for "unlimited" time.

By the time the station was ready for broadcasting, the equipment, owing to the rapid development then being made in the improvement of transmitting apparatus, was found to be obsolete. Not being able to purchase the necessary new equipment, the College, after operating the station for approximately one month, closed the transmitter and stored the apparatus.

Thus, when the station license expired on April 10, 1925, no application was made for renewal and the station was deleted by the federal government.

Hoping that, at some time in the future, it would be possible to replace the obsolete pieces, the College kept the equipment and, on August 3, 1925, received a new license to operate a radio station on 1,260 kc, with 100 watts power, for "unlimited" time. Call letters assigned were KFWU. In the meantime more of the equipment was becoming obsolete and the transmitter less suitable for use.

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Consequently, when this license expired on November 2, 1925, no application for renewal was made and the station was deleted by the federal government. Later the equipment was sold to a concern at Minden, Louisiana, which made use of such parts as were found serviceable.¹

¹ Data furnished by Dr. Claybrook Cottingham, president of Louisiana College, and files of the Federal Communications Commission.

LOUISIANA STATE UNIVERSITY

BATON ROUGE, LOUISIANA

ON APRIL 20, 1923, the Louisiana State University was granted a federal license to operate a broadcast transmitter on 1,180 kc, with 100 watts power, for "unlimited" time. The call letters KFGE were assigned to this station.

Actual operation of the station was begun in January, 1924. The equipment was built and operated by the Physics Department of the University and, though using only moderate power, was heard satisfactorily in all sections of the United States and at several points in Canada.

On December 31, 1924, the station was shifted to 1,120 kc.

In the summer of 1925 the University moved the plant and equipment to its new campus, about three miles south of Baton Rouge. It took some time to get established in the new quarters, and sufficient funds were not available for the installation of an adequate broadcast station in the new building designated for that purpose.

Further, because of the rapidly changing conditions in radio, it was realized that a power greater than 100 watts would be necessary to cover the area that the older equipment had been servicing. To effect changes adequate to meet this need would have required an expenditure considerably larger than the University could afford.

Consequently the license was permitted to expire on January 15, 1926, though no broadcasting had been attempted under this license since May, 1925. The equipment of the station was used only in the operation of an amateur radiotelegraph and radio-phone station from that date.

While the station was "on the air" as a broadcasting unit, programs were presented for approximately one hour each evening. These featured the various University organizations such as the glee clubs, the University Band, etc., as well as a few addresses by members of the faculty.¹

¹ Data furnished by Dr. D. V. Guthrie, professor of physics, Louisiana State University, and files of the Federal Communications Commission.

LOYOLA UNIVERSITY

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NEW ORLEANS, LOUISIANA

RADIO on the campus of Loyola University began in 1907 when Rev. Anthony Kunkel, S.J., professor of physics, erected a receiving aerial on the University grounds and succeeded in picking up messages in code from great distances. Soon he added to this a crude spark transmitter and began sending code messages throughout the country. As radio developed, this spark transmitter was replaced by the spark gap, and later by the quenched gap, and then by the arc transmitter.

At the outbreak of the World War the apparatus was at the disposal of the United States government. As a result, under the direction of Rev. Ed. Cassidy, S.J., there was established at the University a radio school for the training of young men in radio communication.

At the close of the war the school was abandoned, owing to the fact that several such organizations were operating in New Orleans for the exclusive purpose of training in the field of radio communication. However, the University turned its attention to the erection of a thoroughly up-to-date broadcasting station modeled after Station KDKA which was then coming into prominence in the field of broadcasting.

On March 30, 1922, by special telegraphed authority of the United States Department of Commerce, the new station was inaugurated and the first musical program ever broadcast in the city of New Orleans was "put on the air."

The following day, March 31, 1922, the University was granted a federal license to operate a broadcast transmitter on 360 meters (834 kc), using 100 watts power, from 7:00 to 10:00 P.M. daily. This license was revised on June 15, 1922, to give the station "unlimited" time on the air. The call letters WWL were assigned.

On July 7, 1923, the station was shifted to 1,070 kc. One year later, on July 14, 1924, the power was decreased to 50 watts.

On January 6, 1925, the station was moved again, this time to 1,090 kc.

As the science of radio communication developed, Station WWL kept pace, adding to its equipment new inventions as soon as they were put on the market. This was the first station in New Orleans to use a piezocrystal oscillator, a four-channel mixing panel, the condenser microphone, and mercury type rectifying tubes, and the first to incorporate in its transmitter design the practice of low-level, high-percentage modulation in conjunction with the master-oscillator power amplifier type of transmitter.

On March 28, 1925, the station was authorized to increase its power to 100 watts.

During the period of broadcasting chaos, following the breakdown of the Radio Act of 1912, when stations were jumping from one frequency to another at will and seeking to gain more favorable places on the dial for themselves, Station WWL remained on its assigned frequency. With the passage of the Radio Act of 1927 the University made application for an increase of power to 5,000 watts and for a more favorable frequency assignment.

On November 16, 1927, effective December 1, 1927, the new Federal Radio Commission authorized Station WWL to operate its transmitter on 1,220 kc, using 500 watts power. On July 3, 1928, a new 500-watt transmitter was put "on the air" from the station's new studios in Bobet Hall.

Efforts were continued, and the aid of various organizations enlisted, to secure a 5,000-watts power and a better frequency. On October 31, 1928, the station was shifted to 850 kc where it shared time with Station KWKH. On May 25, 1929, the station was licensed to use 5,000 watts and on Easter Sunday the new transmitter, operating with this power, was "put on the air." This transmitter incorporated the first master-oscillator power amplifier to be used in New Orleans.

Recognizing the strategic position of Station WWL in the south, University authorities began to lay plans for further modernization of the transmitter and greater power so as to serve better the listening area. The outcome was that on Octo-

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ber 2, 1932, Loyola's new 10,000-watt RCA transmitter, modern and up-to-date in every respect, went "on the air." This transmitter is located at Kenner, Louisiana, about ten miles west of New Orleans.

The facilities of Station WWL, though owned by Loyola University, are operated on a quasi-commercial basis. According to Rev. O. L. Abell, S.J., director of the station:

Station WWL has never posed as an educational station as opposed to a commercial station. On the contrary, we have always emphasized the fact, in all our applications and hearings before the Federal Radio Commission as well as its successor the Federal Communications Commission, that WWL was a commercial station conducted by an educational institution. We have tried to give to our radio listeners a well-balanced program service, in which entertainment and cultural features have, of course, predominated, with occasional strictly so-called educational talks and lectures.¹

The station is available, without charge, to various departments of the city of New Orleans and of the federal government. It is also used to broadcast University events and features of interest to the Catholic population of the south. Its broadcasts have been heard at points as far distant as Canada, Mexico, Central America, Cuba, and New Zealand.

On several occasions the station has been involved in hearings before the federal licensing authority owing to other stations' desiring its frequency or to other considerations. In each instance Station WWL has been sustained and its work as a public service institution has been recognized. Illustrative of this is the following: "The evidence shows conclusively that this Station WWL was and is serving an important section of the country in a most creditable and high-class manner."²

Though no special courses have been broadcast, the station has, in the past, broadcast special lectures dealing with special courses. It also carried, over a period of six months, an hour known as the "Philosophical Forum." Each Sunday morning throughout the year it broadcasts services from the campus church.³

¹ Quoted from a letter by Rev. Abell, dated February 14, 1936.

² Quoted from *Document No. 5004*, submitted by the Federal Radio Commission to the Court of Appeals of the District of Columbia.

³ Data furnished by Rev. O. L. Abell, S.J., director of Station WWL, and files of the Federal Communications Commission.

LUTHER COLLEGE

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DECORAH, IOWA

ON DECEMBER 18, 1926, the Norwegian Luther College was licensed by the federal government to operate a broadcast transmitter on 695.6 kc, with power of 50 watts, for "unlimited" time. The call letters KGDZ were assigned.

On January 24, 1927, the license was issued in the name of Luther College and the call letters changed to KWLC.

On April 21, 1927, the station was shifted to 700 kc and the power increased to 500 watts. Less than a month later, on May 3, 1927, the power was reduced to 50 watts. In another month (June 1, 1927) the station was placed on 1,210 kc, where it was ordered to share time with Station KGCA.

The station was again shifted, on October 30, 1928, to 1,270 kc, where it was permitted to operate during daytime hours only and ordered to share time with Station KGCA as before.

On January 3, 1929, the power was increased to 100 watts.

On December 2, 1932, the College sought to transfer its license to the *Telegraph-Herald* of Dubuque, Iowa, but the Federal Radio Commission ruled that such transfer would not be in "public interest, convenience, or necessity," and therefore denied the application.

The College now operates the station, presenting a varied schedule of programs consisting of music, devotional periods, Bible study, book reviews, lectures by members of the faculty and guests, dramatic presentations, news, and other educational features designed to meet the needs of schools and adults within the range of the station. Of these last are: Science, News Letter, Literary Hour, Economics and History Hour, Norwegian Culture Hour, Primary Education Program, Natural History Hour, and a Speech Class.

No attempt is made by the College to give systematic courses in academic subjects; rather does it seek to present programs that have cultural value and at the same time appeal to a large group of listeners.

From the time the station began broadcasting, the daily chapel exercises and programs of a devotional nature have proved the most popular. Studies of the listening audience reveal that there are more listeners to the chapel periods than to any other single feature broadcast from the station.¹

¹ Data obtained from Dr. Oscar L. Olson, of Luther College, files of the Federal Communications Commission, and program schedules issued by the College.

UNIVERSITY OF MAINE

ORONO, MAINE

AFTER some experimental work in radio communication the University of Maine was licensed by the federal government on February 9, 1925, to operate a broadcast transmitter on 1,190 kc, with 10 watts power, for "unlimited" time. The call letters WGBX were assigned. On May 20 of that year the power was increased to 100 watts.

On August 19, 1926, the station was shifted to 1,280 kc and its power increased to 500 watts. However, on April 21, 1927, the power was reduced to 250 watts.

For approximately one year, evening programs of entertainment and educational value were broadcast on a fairly regular schedule.

Because Maine is comparatively large in area and is sparsely populated, the coverage made possible by the power permitted and on the frequency assigned was not at all adequate to serve the area desired. Further, the per capita cost of such broadcasting was found to be extremely high. Likewise, program material was difficult to obtain with any degree of regularity from a faculty already overworked. It was very soon realized that "effective broadcasting requires a staff which can devote most of its time to that work."¹

Since its income was "very restricted," the University felt that the educational benefits from this venture were not proportionate to the expense involved and that what money was available should be allocated where expenditure would be more effective.

Thus these factors, together with the University's inability to obtain a more favorable frequency from the Federal Radio Commission, led to the abandonment of the license on May 17, 1927, and deletion of the station on that date.

¹ Quoted from a letter by W. J. Creamer, professor of electrical communication at the University of Maine, dated January 27, 1936.

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The electrical equipment of the station was turned over to the University's Department of Electrical Engineering and is now used for laboratory instruction.

While there are those at the University who are intensely interested in both the technical and the social aspects of broadcasting, it is generally felt that under the circumstances "discontinuance of the station by the administration was a wise decision."²

At present the University is granted a minimum of a fifteen-minute period for five days a week and a thirty-minute period on Sundays by Station WLBZ for educational broadcasts. According to Professor Creamer: "This certainly does not give the people of the State any sort of radio service from their University; but, until money and staff are made available, it is probably the best that can be done."³

² *Ibid.*

³ Data furnished by Professor Creamer and files of the Federal Communications Commission.

MARIETTA COLLEGE

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MARIETTA, OHIO

INTEREST in radio at Marietta College dates from the time when a son of one of the faculty members at the College, who was “dabbling” in wireless, was given permission to use a room in the Science Building for his transmitter and receiving set. As the work of this young man developed and general interest in radio increased, members of the faculty saw the possibilities of using radio as a means of education and prevailed upon the College to take over the equipment.

Thus, on April 29, 1922, the College was licensed to operate a broadcast transmitter on 360 meters (834 kc), using 100 watts power, for “unlimited” time. Call letters WBAW were assigned.

Definite plans for radio education were developed. These included the conducting of college courses by a combination of correspondence and broadcasting. Syllabuses were to be supplied the students and reference readings and illustrative material furnished by mail. It was believed that the broadcast lectures would establish a closer contact between students and instructors than is usually possible in correspondence teaching.

Formal approval of this plan was asked and obtained from the state Department of Education, and considerable thought was given to details of the plan. Correspondence with teachers in neighboring villages revealed considerable interest in the courses proposed.

However, because of the limitations of the station’s transmitting equipment, and because those who were in charge of the operation of the station had other duties in the College which did not permit them to devote the time to this project that was necessary for its success, the plan was never put into full operation.

Dr. A. C. Watson, closely connected with the station at the time, points out that

this was not merely an idea, but an idea to which a considerable amount of time and energy were devoted. . . . It is easy to see now that we should have secured an audience by less serious, less academic material, before we got down to the classroom type of lecture. Also, we should have made contact with a larger circle of potential students by mail, before we began the more serious type of discussion. I suspect that the *real* difficulty which stopped us was that terrible feeling of futility in talking seriously over the air before we had a real basis for believing that anyone was listening in.¹

On November 29, 1922, the station's power was increased to 300 watts and on March 24, 1923, it was again increased, this time to 750 watts. On May 29, 1923, the station was shifted to 1,220 kc and its power placed at 100 watts. Later this was increased to 250 watts.

It was very quickly evident to those most interested in radio at Marietta College that more elaborate equipment was necessary to give reliable service and that funds for this were not available. Further, the teaching load of the faculty was such that no one could spare the time to plan and direct a regular schedule of broadcasts.

Consequently, when the station's license expired on November 13, 1923, no application was made for renewal and the project was abandoned. The station was deleted by the federal government on January 21, 1924.²

¹ Quoted from a letter by Dr. A. C. Watson, dated January 22, 1936.

² Data furnished by Dr. Edward S. Parsons, president of Marietta College; Dr. A. C. Watson; and files of the Federal Communications Commission.

MARQUETTE UNIVERSITY

MILWAUKEE, WISCONSIN

RADIO at Marquette University had its inception in the physics laboratory of Professor John B. Kremer during the year 1921 as an experiment in wireless communication.

On June 30, 1922, the University was licensed to operate a broadcast transmitter on 360 meters (834 kc), with 50 watts power, for "unlimited" time. The call letters WHAD were assigned. The first official program under this license went on the air on September 27, 1922.

On October 10, 1922, the power was increased to 200 watts and on December 30 of that year it was reduced to 100 watts.

During the early days of the station's existence a limited schedule of weekly programs by students of the College of Music and other departments of the University was broadcast. Also, daily weather and market reports were given by the station at the noon hour.

On June 20, 1923, the station was shifted to 1,070 kc and on December 10, 1924, it was again shifted, this time to 1,090 kc where it was authorized to increase its power to 500 watts.

Early in 1925 the station entered into an agreement with the *Milwaukee Journal* such that the station became a commercial enterprise with most of the programs coming from the studios in the Journal Building and Marquette University handling all educational periods. On March 10, 1925, the station license was issued in the name of Marquette University and *Milwaukee Journal*.

During this joint-control period an elaborate remote control net was established, covering the entire city and having microphones placed in theaters, restaurants, dance halls, the University stadium, the Gesu Church, and many other points. This enabled the station to present a greatly enlarged and varied program.

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On June 1, 1927, the station was placed on 1,020 kc and ordered to share time with Station WTMJ.

The relation with the *Milwaukee Journal* "resulted in a conflict of purpose" so that, on August 15, 1927, the University took over full operation of the station as an educational project solely.

On September 15, 1927, the station was shifted to 1,110 kc where it shared time with Station WSOE. On October 15, 1928, the station was moved to 900 kc where it was restricted to day-time operation and ordered to share time with Station WLBL. A few days later (October 30, 1928) the station was placed on 1,120 kc, ordered to reduce its power to 250 watts, and forced to share time with Station WISN.

The University objected to these restrictions of its broadcasting time and began a series of law suits to secure a more favorable assignment.

The first of these hearings was on the application by Station WHAD for transfer to 900 kc and a limited amount of nighttime operation with 750 watts power. The Federal Radio Commission held that General Order No. 40 did not allow 900 kc to Zone 4 for nighttime operation and denied the application on October 22, 1928.

Approximately one year later (December 3, 1929) Station WHAD again submitted an application for 900 kc, sharing time with Station WLBL, Stevens Point, Wisconsin. Hearing on this application was held on May 13, 1930. The Federal Radio Commission held that since Stations WLBL and WHA had entered a joint application for a high-power assignment on that frequency, Station WHAD's application should be denied. The case was appealed to the United States District Court of Appeals and the Commission was sustained on February 2, 1931.

Likewise, Marquette University entered an objection to the granting of the high-power license to Stations WLBL and WHA, but this was overruled.

Failing in its application for a different frequency, Station WHAD set about finding a more satisfactory time-sharing agreement with Station WISN. The former station desired to

use the week as the basis of the division of time whereas the latter insisted on using the single day. Using the week, Station WHAD could obtain a more liberal and flexible division for its sport programs and educational service. Station WISN opposed the new proposal in a hearing before the Federal Radio Commission on November 12, 1931. As a result of this hearing the Commission appointed certain definite hours for the operation of each of the two stations and issued licenses, effective February 19, 1932, specifying these hours.

From its inception Station WHAD specialized in educational programs. During the early days of the station approximately 90 per cent of the programs broadcast were strictly educational. Included also were religious talks and services, public health talks, conservation talks, weather reports, and broadcasts of athletic events. Some of the subjects covered in talks given by members of the faculty during these years were business news, literary criticism, everyday psychology, household science, and musical history and appreciation.

In June, 1932, the station began accepting advertising as a means of assisting the University with its financial burden. These commercial programs consisted of approximately 10 per cent of the total time on the air and were devoted 6 per cent to entertainment and 4 per cent to education. The other 90 per cent of time on the air was devoted to sustaining programs divided: 34 per cent entertainment, 54 per cent education, and 2 per cent religious.

On May 5, 1934, the University asked the Federal Radio Commission for permission to assign its license to the American Radio News Corporation which was seeking to build a Wisconsin chain of stations with Station WHAD as the Milwaukee outlet. Marquette University was to have educational periods equal to its assigned time. This request grew out of an assignment of license made on October 16, 1933, when the University transferred its station license to WHAD, Incorporated. Station WISN protested this assignment but was overruled by the Commission on January 3, 1934.

WHAD, Incorporated, was a corporation in which Marquette

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University held all the stock; thus the transfer of license was nothing more than the legal routine of placing the operation and control of the station in the hands of the corporation organized and controlled by the University for that purpose. The Commission granted this finally, after protest had been denied, on January 5, 1934.

The American Radio News Corporation, a Hearst subsidiary for the operation of radio stations, owned Station WISN and entered all protests for Station WISN against Station WHAD.

The request of the University for permission to assign its license to the American Radio News Corporation was granted by the Commission to consummate sale of the station to this corporation. Consequently, on May 29, 1934, Station WHAD was deleted and Station WISN given "unlimited" time on the 1,120 kc frequency.¹

¹ Data furnished by William R. Duffey, director of Station WHAD, and files of the Federal Communications Commission.

MERCER UNIVERSITY

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MACON, GEORGIA

ON JUNE 8, 1921, the commencement exercises at Mercer University were broadcast from the campus through a 10-watt experimental transmitter located in a tent to the rear of the Administration Building. In October of that year a 50-watt transmitter was installed in the Chapel tower, using a six-wire antenna from the flagpole and rectified plate voltage. During October, November, and December, 1921, experimental tests in speech output were made.

These experimental tests were completed by the spring of 1922 and the use of phonographic modulation of output power begun.

On June 7, 1922, the commencement exercises were broadcast over this experimental equipment.

The success of these early experiments was such as to encourage the University to establish a broadcasting station on the campus. Consequently, during August, 1922, a 70-foot tower was erected on top of the Chapel tower to carry an enlarged antenna, and, on October 30, 1922, the station was granted a broadcast license, permitting operation on 360 meters (834 kc), with 750 watts power, for "unlimited" time. The call letters WMAZ were assigned.

Programs broadcast consisted of talks by members of the faculty, concerts by the College Glee Club, entertainment features by local talent, daily Chapel exercises, and the playing of phonograph records.

On January 27, 1923, the power was reduced to 50 watts and on May 7, 1923, the station was shifted to 268 meters. When this license expired the University made no application for renewal and the station was deleted by the federal government.

Approximately a year later (May 22, 1924) the University was granted a new license permitting operation of the transmitter on 1,150 kc, using 100 watts power for "unlimited" time.

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The call letters WMAZ were assigned. On June 24, 1925, the power was increased to 500 watts.

On June 1, 1927, the station was placed on 1,110 kc where it shared broadcast time with Station WGST. On November 7, 1928, the station was again shifted, this time to 890 kc, and authorized to use 500 watts power until "local sunset" and 250 watts power at night. On this frequency time was shared with Station WGST.

During the period of operation of Station WMAZ the University successfully conducted a campaign for increased support. A survey of University activities made in connection with this campaign indicated that the funds obtained should be spent for features of the campus program other than radio, it being felt by many that the operation of a radio station was not essential to the proper functioning of the institution as a college of liberal arts.

Added to this was the fact that progress in the field of radio science made it necessary for the University to spend a considerable amount to modernize the station if the venture was to be continued.

In view of these considerations the University decided to abandon the project. Consequently, on March 15, 1929, the station was closed and the equipment turned over to the Board of Trustees of the Macon Junior Chamber of Commerce, Macon, Georgia, and the license assigned to this body. Provision was made in the transfer by which the University was to have preferential right to weekly broadcasts at its pleasure.

Later the Junior Chamber of Commerce leased the station to a commercial broadcasting company, but without prejudice to the University's right to broadcast.

At present broadcasts are presented by the University over Station WMAZ whenever such is thought desirable. Further, Station WSB, located in Atlanta, Georgia, is used for a program of weekly broadcasts presented each Friday during the year.¹

¹ Data furnished by Miss Lucy Barrett, secretary to the president of Mercer University; Dr. J. C. Shelburne, registrar of the University; and files of the Federal Communications Commission.

MICHIGAN COLLEGE OF MINING AND TECHNOLOGY

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HOUGHTON, MICHIGAN

ON DECEMBER 1, 1923, the Michigan College of Mines, now known as the Michigan College of Mining and Technology, was licensed to operate a broadcast transmitter on 1,230 kc, with 250 watts power, for "unlimited" time. The call letters assigned were WWAQ. When the station license expired on June 28, 1924, no effort at renewal was made and deletion by the federal government followed on August 7 of that year.

On October 9, 1924, a new license was issued to the College in which frequency, power, time, and call letters were the same as those in the previous license. When, on July 9, 1925, the station license expired—a license which had shifted the station to 1,140 kc—renewal was not requested and deletion followed on July 25.

A third license was issued to the College on October 9, 1925, permitting operation of its broadcast transmitter on 1,140 kc, with 250 watts power, for "unlimited" time. The call letters assigned were the same as those of previous licenses, WWAQ. The station was operated under this license until January 8, 1926. At this time the license expired and was not renewed. As a result the station was finally deleted on May 29, 1926.

During the entire period of operation of the station it was found that reception by the sections which the College authorities wished to reach was impossible. Further, numerous complaints were made locally that whenever the College station was on the air other stations could not be heard in the immediate area. Added to these difficulties was the fact that students showed a lack of interest in radio broadcasting, thereby making satisfactory program talent difficult to enlist. Because of lack of sufficient funds it was impossible for the College to comply with government regulations as to equipment and necessary replacements.

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In the light of all these considerations it was finally thought best to abandon the project.

At present the College operates an amateur station, under license call letters W9YX, for instructional purposes and an experimental transmitter, with call letters W9XAW, in connection with its research program of prospecting by radio waves.¹

¹ Data furnished by Dr. Grover C. Dillman, president of the Michigan College of Mining and Technology; Professor G. W. Swenson, head of the Department of Electrical Engineering; and files of the Federal Communications Commission.

MICHIGAN STATE COLLEGE

EAST LANSING, MICHIGAN

MICHIGAN State College was granted a federal license to operate a broadcast transmitter on August 18, 1922, on 360 meters (834 kc), with 250 watts power, for "unlimited" time. The call letters WKAR were assigned.

The first transmitter was a development of experiments carried on by members of the staff of the Electrical Engineering Department and interested students. This equipment was operated, using 100 watts power, for two years with a regular schedule of educational programs. On March 30, 1923, the authorized power was placed at 100 watts. On June 22 of that year the station was shifted to 1,070 kc and on September 27 the power was increased to 250 watts.

Early in 1924 the *Detroit News*, having installed a new transmitter at its Station WWJ, gave the College its old 500-watt Western Electric transmitter. This was, evidently, the first transmitter built by Western Electric for broadcasting purposes, for it was Type 1-A and the serial number was 100. To cover operation of this transmitter, the license issued January 12, 1924, authorized the use of 500 watts power.

On January 27, 1925, the station was shifted to 1,050 kc. Two power increases followed during the year: on April 27 to 750 watts and on July 29 to 1,000 watts.

During 1925, under the sponsorship of the Agricultural Extension Division, Station WKAR opened a Farm Radio School which presented five courses for the farmers of the state. These courses included Home Economics, Animal Husbandry, Poultry and Veterinary Medicine, Horticulture and Gardening, Dairy Husbandry, and Farm Crops. Enrolments were secured, examinations given, and certificates issued to all who completed the courses satisfactorily. During this period the station presented a farm program at noon each day and, also, a night program of

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one and one-half hours. It also broadcast accounts of sports events at the College.

In the application for license filed on April 15, 1927, it is stated that the service which the station renders is that of public instruction through lectures and talks given by the faculty of the College, important and timely information of value to the farmers of Michigan on crop and market conditions, insect pest campaigns, etc. It is also stated that

experience at the College during the past four years has shown that the demand of the farmers of the state for special information . . . has been met by radio broadcasting more quickly and satisfactorily than through the other agencies employed by the College. Also the programs of the station are of material assistance to the other facilities for extension work used by the College which are in the order of importance: county agents, boys' and girls' clubs, house-to-house demonstration on home economics, railway demonstration tours, and publications.¹

At this time the station's main studios were in the Home Economics Building and auxiliary studios were located in the new Armory, the Gymnasium, and the Band Room on the College campus. Also telephone lines were maintained for picking up programs off the campus.

Support of the station was obtained from state and federal funds appropriated for co-operative extension work by the state of Michigan for maintenance of the College, of which the station was a unit.

On June 1, 1927, the station was placed on 1,300 kc where it was ordered to share time with Station WREO. A few days later it was shifted to 1,050 kc and granted "unlimited" time for broadcasting. At this time the station was authorized to use 1,000 watts power to "local sunset" and 500 watts power at night. On December 1 of that year it was again shifted, this time to 1,080 kc where it shared time with Station WGHP.

With the reallocation of broadcasting stations by the Federal Radio Commission, Station WKAR, on October 31, 1928, was placed on 1,040 kc and authorized to broadcast only during daytime hours, using 500 watts power. This new assignment ne-

¹ Taken from license application of Station WKAR (April 15, 1927) in files of the Federal Communications Commission.

cessitated a rearrangement of programs and resulted in a course of farm lectures scheduled at 7:30 A.M. daily. In addition to the noon service program an afternoon period was offered.

On April 11, 1929, the station was permitted to increase its power to 1,000 watts.

In 1931, although improvements had been made on the transmitter from time to time, it became necessary to replace this equipment and a complete new composite transmitter of 1,000 watts was installed. This equipment, built by WKAR engineers, was crystal controlled and, at that time, modern in every way. The new equipment immediately enlarged the field of service of the station and permitted a large percentage of the rural people of the state to receive the daily programs.

On January 30, 1932, the hours of broadcasting for Station WKAR were specified by the license.

During 1932, in an effort to reach the high schools of Michigan, a course was offered in agriculture for the Smith-Hughes high schools. While this was successful—more than 700 students were regular listeners—the course was rebuilt for the season of 1932–33 to provide supplementary material in the field of biology which could be used by all high schools. This biology course has been continued and is now presented jointly by the Departments of Botany, Zoölogy, Bacteriology, Entomology, and Physiology. More than 1,200 outlines of the course are distributed to high schools annually.

During this period, owing to the economic situation and the curtailment of funds for radio, programs were restricted to a half-hour at noon daily and an hour in the afternoon through January to May. However, in the fall of 1934, the College determined to rebuild the service of the station and to utilize fully this medium of promoting its public relations.

Beginning in October, 1934, a new schedule of broadcasts was begun which was designed to provide educational material and entertainment for the general public, although continuing to stress the farm service. Robert J. Coleman was appointed director of the station and began building the programs immediately. The afternoon period was expanded to two hours and an average

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of thirteen hours per week was used for the broadcasts. At the same time the broadcasting of athletic events and other such special occasions as Farmers' Week was resumed.

During this same year it became necessary to make some technical changes in the equipment, and a new composite transmitter was put into operation in September, 1935. During the summer a new vertical antenna system was installed and, again, the high efficiency of this equipment further enlarged the field of the station's service. Preparatory to operating this new equipment, the station was licensed, on January 14, 1935, to operate on 850 kc, the position which it has held on the dial since that date.

The technical equipment of Station WKAR is rated high in efficiency and enables the College to render a consistent service to the state. Placing the transmitter on 850 kc has proved decidedly beneficial and has permitted many listeners in the area formerly blanketed by interference to hear its programs clearly.

A College of the Air was instituted in 1935 with the offering of several courses of study for adults. Some of these courses were broadcast direct from the classroom, while others were presented from the station's studios. The rapid increase in enrolment during the first year indicated, in the opinion of those in charge of the project, that there was a distinct place for such courses via radio.

The plan for the College of the Air is to offer such courses, without credit, under the leadership of members of the faculty of Michigan State College. Special study material is furnished to all those regularly enrolled and no charge is made for the work.

During the spring term of 1936 nine courses were offered as follows:

1. *Survey of English Literature*: Broadcast direct from the classroom on Monday, Wednesday, and Friday from 1:10 to 2:00 P.M. This course consisted of a study of English literature from the Elizabethan period to the present. Mr. E. P. Lawrence was the instructor.
2. *Criminology*: Broadcast direct from the classroom on Monday, Wednesday, and Friday from 10:10 to 11:00 A.M. This course was a study

- of the causes, treatment, and prevention of crime. The instructor was Professor C. R. Hoffer of the Sociology Department.
3. *Ethics of Christianity*: Broadcast direct from the classroom on Tuesday and Thursday from 10:10 to 11:00 A.M. This course was an exposition of morality with emphasis upon personal conduct in the home and in society. Rev. C. M. Winters was the instructor.
 4. *Intermediate Spanish*: Broadcast from the studio on Wednesday from 2:30 to 3:00 P.M. This course was a study of the Spanish language and literature in conversation and translation. Associate Professor J. O. Swain was the instructor.
 5. *Elementary Spanish*: Broadcast from the studio on Tuesday from 11:00 to 11:30 A.M. This course began the study of the Spanish language and literature and was planned for those who joined the radio classes late. Mr. Swain was the instructor.
 6. *Flower Growing*: Broadcast from the studio on Tuesday from 1:00 to 1:30 P.M. This course dealt with the use of annuals and perennials for the home garden. Mr. P. R. Krone, of the Horticulture Department, was the instructor.
 7. *Vegetable Gardening*: Broadcast from the studio on Thursday from 1:00 to 1:30 P.M. This was an introductory course in the production of vegetables with special attention given to varieties. Mr. H. L. Seaton, of the Horticulture Department, was the instructor.
 8. *Business Writing*: Broadcast from the studio on Tuesday from 3:15 to 3:45 P.M. This course dealt with the general principles of business correspondence, composition of effective business letters, and other forms of business writing. Mr. L. H. Geil, of the Department of Journalism and Publications, was the instructor.
 9. *Growing Up in the Family*: Broadcast from the studio on the first Monday in the month from 3:15 to 3:45 P.M. This course dealt with the growing child and his relations in the family. Mrs. Lydia Ann Lynde, extension specialist in child development, conducted the course.

The broadcast schedule has been further expanded to include the hours from 6:00 to 7:30 A.M. and from 10:00 A.M. to 5:15 P.M. daily except Sunday—a total of forty-five hours per week. This is the largest schedule ever attempted by Station WKAR, and the increased number of listeners indicates, it is held, that the public is pleased with this enlarged service.

Station WKAR is now co-operating with the state government in Lansing to provide a service of education as regards affairs of government business. Included on the program for 1936 were: the Governor's Hour, on which the governor of the

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state appeared regularly, and periods conducted by representatives from the Department of State, the Department of Public Instruction, the State Highway Department, the State Department of Agriculture, the State Police, and the State Historical Commission.

The station is governed in all matters of policy by a Radio Committee appointed by the president of the College and on which sits the director of agricultural extension of the College as chairman.

In general, according to College authorities, the policy of the station has been that of maintaining high standards in educational programs, free from all politics, religion, and advertising. With this policy the station continues its service to the citizens of the state.²

² Data furnished by Robert J. Coleman, director of Station WKAR, and files of the Federal Communications Commission.

UNIVERSITY OF MICHIGAN

ANN ARBOR, MICHIGAN

DURING 1923 some members of the faculty and student body of the College of Engineering at the University of Michigan built a radio transmitter. On January 14, 1924, a federal license was issued authorizing operation of this equipment on 1,070 kc, with 200 watts power, for "unlimited" time. The call letters assigned were WCBC.

On November 4, 1924, the station was shifted to 1,310 kc.

The equipment of this station was experimental and inefficient. Consequently a request was made to the University for \$20,000 with which to build a broadcasting station and for a yearly appropriation of \$3,000 for maintenance. Believing that the University's broadcasting program could be carried out with much less expense through co-operation with commercial stations, the administrative authorities refused the request.

As a result, when the station's license expired on June 16, 1925, no application for renewal was filed and deletion followed on October 24, 1925.

Following this action Professor Waldo Abbot was appointed director of broadcasting and instructed to arrange for programs over the facilities of Detroit commercial stations. During 1925 ten programs of one-hour duration were broadcast through Station WJR, then owned by the Jewett Radio Company, from the campus of the University. The studio in which these programs originated was located on the top floor of old University Hall and consisted of a classroom in which a tent was constructed of painters' dropcloth in order to decrease the reverberation period.

Broadcasting continued from this crude studio for three years, until a modern studio was constructed in Morris Hall on the campus. This studio consisted of an announcer's booth, a small room for ensemble groups, and a large room from which

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the University's hundred-piece band could broadcast, as well as suitable offices, control rooms, and mailing rooms.

Since 1925 broadcasting from the campus of the University has been continued through Station WJR, with the exception of one year when the facilities of Station WWJ were used.

During 1931-33 a total of 164 programs of one-half hour each were broadcast; during 1933-34 the total reached 130 programs; in 1934-35, 177 programs; in 1935-36, 246 programs. All these programs originated in Morris Hall and were carried over a special telephone loop to the Detroit control board of Station WJR. The broadcasting equipment used in the campus studio is the property of Station WJR.

Sunday programs have been addressed to the Michigan Congress of Parents and Teachers since 1930. Dr. Joseph E. Maddy has used the radio for direct teaching of wind and stringed instruments as well as for elementary singing. Daily afternoon programs are designed to supplement the work conducted in state preparatory schools and to appeal equally to adult listeners. Members of the faculties of the thirteen schools and colleges of the University contribute their services, while students, enrolled in the courses in broadcasting speech, act as announcers and take parts in dramatic skits. An annual bulletin announcing the programs for the season is published and all talks for which there is a demand are mimeographed and distributed free.

In addition to the educational programs which were broadcast over Station WJR, some students of the University Reserve Officers' Training Corps, in the fall of 1927, in co-operation with the Electrical Engineering Department, built and began broadcasts over a continuous-wave radiotelegraph station. This equipment was granted an experimental license under call letters W8AXZ.

This station was used chiefly for code practice for members of the Signal Corps and communication with the Hobbs expedition to Greenland. The transmitter was made possible by a grant of \$100 from the United States Army and a gift of a 250-watt vacuum tube used as the main power amplifier, the latter

coming from the General Electric Company. The Electrical Engineering Department donated the room and the high-voltage motor-generator used for power.

With this equipment communication was maintained directly with the Hobbs expedition. Amateurs on all continents except Asia were contacted. Further, contact was maintained with South Africa, messages being exchanged with a branch of the University's observatory located there.

An application for a license for a commercial station to be located in Ann Arbor has been filed with the Federal Communications Commission. Fielding H. Yost, director of inter-collegiate athletics, is president of this proposed company, and Waldo Abbot, director of broadcasting for the University, is vice-president. If this license is granted, the use of its facilities will afford the University an extended outlet for its educational programs.¹

¹ Data furnished by Dr. Frank Egleston Robbins, assistant to the president of the University of Michigan; Professor Waldo Abbot, director of broadcasting at the University; Mr. Robert R. Swain, associated with some early work in broadcasting at the University; and files of the Federal Communications Commission.

MIDLAND COLLEGE

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FREMONT, NEBRASKA

A YOUNG man, a resident of Fremont, Nebraska, had some radio equipment which he offered to give to Midland College. This was accepted and, on September 22, 1922, the College was licensed by the federal government to broadcast on 360 meters (834 kc), with 100 watts power, for "unlimited" time. The call letters WOAE were assigned.

A student at the College, well trained and able to operate the equipment, was placed in charge of the station. With the co-operation of faculty members and others, he was able to present a number of addresses by professors at the College and musical programs by members of the Music Department. These were well received by the community served by the College.

On December 28, 1922, the station power was reduced to 20 watts. On June 26, 1924, the station was shifted to 1,070 kc and the power reduced to 15 watts.

When the operator of the station graduated, difficulty was experienced in securing the services of one capable of handling the station adequately. Further, the College soon realized that it was not financially able to equip and maintain the station as was necessary for adequate broadcasting.

Consequently, when the station license expired on December 16, 1924, no application for renewal was made and deletion followed on January 6, 1925.¹

¹ Data furnished by Dr. D. W. Crouse, professor of physics at Midland College, and files of the Federal Communications Commission.

MILTON COLLEGE

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MILTON, WISCONSIN

DURING 1923 one of the senior students at Milton College, Mr. A. G. Sayre, who had been a radio operator during the World War, was operating an amateur station with a friend and a neighbor. He conceived the idea of broadcasting a basketball tournament for high schools sponsored by the College and obtained a temporary license in the name of the College for this purpose. This license covered the two days of March 20 and 21, 1923, and permitted use of the call letters WSAM.

The attempt was a complete failure so that no further plans for broadcasting were made.

However, the College has presented occasional short programs over commercial stations, particularly Station WCLO located at Janesville, Wisconsin.¹

¹ Data furnished by William D. Burdick, professor of chemistry at Milton College, and files of the Federal Communications Commission.

MILWAUKEE SCHOOL OF ENGINEERING

MILWAUKEE, WISCONSIN

ON JULY 22, 1922, a federal broadcasting license was issued to the School of Engineering of Milwaukee and the *Wisconsin News*, authorizing operation of a radio transmitter on 360 meters (834 kc), with 500 watts power, for "unlimited" time. Call letters assigned were WIAO. On January 9, 1923, the power was reduced to 100 watts.

On July 23, 1923, the power was increased to 200 watts in a license issued to the School of Engineering of Milwaukee. However, on October 9 of that year the station power was reduced to 100 watts.

On May 31, 1924, the station was shifted to 1,220 kc. On September 9 of that year the call letters were changed to WSOE. Two power increases followed: July 15, 1925, to 500 watts, and April 21, 1927, to 1,000 watts.

On June 1, 1927, the station was shifted to 1,110 kc and the power reduced to 500 watts. On September 15 of that year the station was authorized to share time on its frequency with Station WHAD and on October 15 the power was reduced to 250 watts.

On November 15, 1927, the School leased Station WSOE to the Evening Wisconsin Company, publishers of the *Wisconsin News*, a William Randolph Hearst paper, for a minimum period of three years. According to the lease agreement the paper was to operate the station and furnish all financial support while its ownership and technical supervision was to remain in the hands of the School. In the license application made on January 11, 1928, in the name of the School it was stated that this lease existed. Also, in a license application made on January 12, 1928, in the name of the Evening Wisconsin Company statement that the lease existed was made.

The subsequent licenses were issued in the name of the newspaper company. That of October 31, 1928, placed the station

on 1,120 kc where it was ordered to share time with Station WHAD. This license, further, permitted change of the call letters to WISN.

In the license application made on September 20, 1929, it was stated that the station had been leased by the newspaper for a period of eleven years and that the station was owned by the School but operated by the newspaper, most of the station equipment being owned by the newspaper. Statements to this effect appeared in subsequent license applications until July 29, 1930, at which time the newspaper made application for permit to instal a new 1,000-watt transmitter. Permit to make this installation was granted by the Federal Radio Commission on September 12, 1930, the transmitter to be installed and ready for operation on December 26, 1930.

A license to cover operation of this new equipment was issued on December 16, 1930. In the application for this license it was stated that the new transmitter was to be used as the station transmitter and the old transmitter, leased from the School of Engineering of Milwaukee, as auxiliary in case of difficulty with the new equipment.

In the application for license dated December 30, 1930, it was stated that the newspaper was owner of the station. In the license application dated July 27, 1931, it was stated that the "Evening Wisconsin Company owns the new WISN transmitter and studio, has five-year lease on old WISN transmitter which is used as auxiliary; old transmitter owned by School of Engineering."

On August 6, 1932, the Evening Wisconsin Company requested permission to make a voluntary assignment of the license of Station WISN to the American Radio News Corporation, an organization established by Mr. Hearst to operate his radio interests. In a sales agreement drawn up between the Evening Wisconsin Company and the American Radio News Corporation to effect sale of the Station WISN to the latter, dated August 11, 1932, it was stated that the Evening Wisconsin Company owned the station. On August 16 the license was

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transferred to the corporation and the sale of the station was consummated.

On January 29, 1935, the name of the American Radio News Corporation was changed to Hearst Radio, Incorporated, and licenses covering Station WISN have been issued in that name since.¹

¹ Data obtained from files of the Federal Communications Commission.

UNIVERSITY OF MINNESOTA

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MINNEAPOLIS, MINNESOTA

THE University of Minnesota first engaged in broadcasting in the fall of 1920, when it inaugurated a radiotelegraph service, broadcasting twice daily and presenting market information of interest to agriculturalists. The University began its radiotelephone broadcasting service in the spring of 1921, offering, in addition to regular daily market and weather reports, weekly concerts.

This early work was done over a small transmitter operated by the Engineering School of the University as an experimental laboratory for students in the School and under an experimental license assigning as call letters 9XI.

On January 13, 1922, the University was granted a federal license authorizing operation of a radio transmitter on 360 meters (834 kc), with 100 watts power, and sharing time with Station WHDI. Call letters assigned were WLB.

In 1922 a commercial radiotelephone broadcasting station was established in the Twin Cities. This station enjoyed the support of a number of business firms in both Minneapolis and St. Paul, being owned by the Washburn Crosby Company of Minneapolis and operating under the call letters WCCO. The University was asked to co-operate with this station by presenting its programs from the commercial studios. "In the interest of better broadcasting," regular operation of Station WLB was discontinued and members of the University's teaching staff co-operated to the fullest extent in the preparation and presentation of programs through the larger commercial facilities. During this period, however, sufficient broadcasting was done through the University's transmitter to warrant continuance of its license.

Though seeking to co-operate with Station WCCO to the fullest, it was very soon evident that such an arrangement could not be continued satisfactorily and that the full needs of the

University could not be met by the use of a commercial station. In the first place, the Washburn Crosby Company was forced, through pressure for commercial time on the air, to shift the University's programs to hours which were wholly undesirable for the work which the institution sought to do. In the second place, the Washburn Crosby Company imposed a censorship upon University programs which caused considerable bitterness on the part of the University.

On one occasion an agricultural expert broadcasting for the University told farmers how to mix a certain type of feed for their cattle. This feed happened to be one that was mixed and sold commercially by the Washburn Crosby Company. The Company made serious objection to this broadcast on the ground that the University was "killing" the sales of this product. On another occasion the Company censored a University program which proposed to give to the farmers certain information which was not in accord with the publicity and propaganda sent out to the farmers by the Company.

Consequently the University resumed regular operation of its transmitter. However, program support of Station WCCO and other commercial stations in the area was continued until the fall of 1927. This support extended as far as the actual production of a "University Hour" over commercial stations, this hour being produced on the University campus and transmitted by wire to the commercial station involved. In the fall of 1927 limitations and restrictions existing in the use of a commercial station outlet proved to be such a handicap in the presentation of educational material that the policy of transmitting authorized University programs over commercial stations was definitely abandoned. Since that time all official University of Minnesota material has been broadcast through the transmitter located on the campus or, later, located north of St. Paul.

Early in 1927 Station WCCO improved its equipment for broadcasting with higher power and loaned the University its old 500-watt transmitter. This was licensed, on April 23, 1927, to operate on 1,080 kc, with 500 watts power, for "unlimited" time. On June 1, 1927, the station was placed on 1,220 kc and ordered to share time with Station WHDI.

On October 15, 1928, the station was again shifted, this time to 1,250 kc where it shared time with Stations WCAL, KFMX, and WRHM. At this time it was permitted to change its call letters to WLB-WGMS.

This arrangement grew out of an effort on the part of four educational institutions—St. Olaf College, Carleton College, Dunwoody Institute, and the University of Minnesota—to operate their transmitters on a common wave-length. Final arrangement placed three of these institutions on the same frequency with Station WRHM, a commercial station operated by a Minneapolis hospital.

Considerable difficulty was experienced in making time-sharing arrangements with Station WRHM. Further, this station sought full time on the frequency under the name of the Minnesota All Night Broadcasting Company, pleading that it was on the air for all the time in each twenty-four hours not used by the other three stations. When representatives from the University of Minnesota appeared in Washington to defend their time on the frequency, Station WRHM dropped its appeal, stating that it did not want full time on the 1,250 kc frequency, but on another frequency.

On May 12, 1930, the University was licensed to operate its new transmitter located on the institution's golf course outside the city limits, using 1,000 watts power on 1,250 kc and sharing broadcast time with Stations WRHM, WCAL, and KFMX. The new equipment consisted of a 1,000-watt Western Electric 6-B transmitter with direct temperature crystal control and an auxiliary crystal maintained in readiness at all times for emergency use. This transmitter was capable of 100 per cent modulation. The radiating system consisted of a semivertical cage suspended between two 125-foot steel towers. A ground system made up of 1,200 square feet of copper mesh laid in a grid network directly under the antenna was used. Under normal conditions the greater part of this network was covered by a pool of water, thus offering excellent ground facilities. All of the necessary monitoring devices were in use as well as one of the latest types of instruments for measurement of percentage of modula-

EDUCATION'S OWN STATIONS

tion. A frequency standard was constructed later, enabling a frequency check of a high degree of efficiency and accuracy.

The studio equipment was largely of Western Electric manufacture, there being three complete systems. Studios were maintained in the Electrical Engineering Building, the Music Building, and in the Cyrus Northrop Memorial Auditorium. Extensive underground cable facilities made possible broadcasts from practically every building on the University campus.

On November 25, 1932, the hours of operation of the station were specified in the license. This arrangement was made following a hearing before the Federal Radio Commission.

On May 15, 1933, the station was permitted to delete the call letters WGMS and use only WLB.

Since 1933 a number of technical improvements have been found necessary in order to keep pace with the advances made in the art of broadcasting. In 1935 a more complete and flexible studio switching system was designed and built by the station engineers. An RCA line amplifier and loud-speaker monitoring system were installed at the control room and an RCA loud-speaker monitoring system installed at the transmitter. The condenser and carbon microphones were replaced with Brush crystal microphones. Remote pickup equipment, using the new type microphone, was also obtained. These changes resulted in smoother operation and increased fidelity of transmission.

During the summer of 1936 further progress was made. The high-voltage motor generator set at the transmitter was replaced by a Western Electric mercury vapor rectifier, resulting in lower distortion. Changes were made in the transmitter proper to bring it up to present standards. The new general radio transmission monitoring assembly was obtained, making possible a continuous and accurate check of the transmitter performance. Speech input equipment was installed at the transmitter to substitute for regular programs in the event of line failure. Additional remote pickup equipment was also obtained.

Other even more radical changes are pending, such as will give the station added efficiency and clearness of broadcasting.¹

¹ Data furnished by Dr. H. B. Gislason, program director of Station WLB; Mr. Robert W. Orth, assistant program director and announcer; and files of the Federal Communications Commission.

UNIVERSITY OF MISSISSIPPI

UNIVERSITY, MISSISSIPPI

INTEREST in radio at the University of Mississippi dates back to 1912 when, with the use of a crude, home-built instrument, signals were received from the government radio station NAA located at Arlington, Virginia.

The Department of Physics was quick to realize the importance of this achievement and, under the leadership of Dr. W. L. Kennon, head of the Department, student interest was aroused.

During the World War instruction in radio theory and operating was given to a number of prospective soldiers, several of whom saw active service in Europe.

Immediately after the government ban on the operation of radio apparatus was lifted, in 1919, the Department of Physics acquired the equipment and necessary license for the operation of a rotary-spark type of transmitter, using the call letters 5YE. In 1920 this station participated in several tests with Station NSF, the naval air station at Anacostia, District of Columbia. These tests consisted of the transmission of speech and music from Station NSF, with the immediate verification in code by Station 5YE of the type and quality of reception. These tests, on the part of Station NSF, were made by Mr. L. C. Young and Mr. A. Hoyt Taylor; on the part of the University, two students, Mr. Roswell C. Basinger and Mr. Hardy R. McGowan, together with Dr. Kennon, made the reports of reception at Station 5YE. These tests created considerable excitement in the University community because of the novelty of receiving speech and music via radio.

In 1923 the transmitting equipment was changed from spark to vacuum tube. A composite transmitter was employed which permitted the use of 20 watts for radiotelegraphy, or 10 watts radiophone. With this equipment reception of signals from Station 5YE was obtained consistently over a distance of 1,000 miles.

EDUCATION'S OWN STATIONS

After some experimenting in the field of amateur radiotelephony it was thought desirable to enter the field of broadcasting. Accordingly the license of Station 5YE was allowed to expire and plans were perfected for the establishment of a broadcast station. The transmitter of Station 5YE was remodeled, sensitive microphones for picking up programs were secured, and an amplifying system was installed. On February 28, 1924, the University was granted a license to operate this equipment on 1,240 kc, with 20 watts power, for "unlimited" time. The call letters WCBH were assigned.

Mr. S. C. Gladden was the first operator of this station. A room in the building housing the Department of Physics was fitted up as a studio. The University orchestra and Glee Club, together with musicians from the neighboring town of Oxford, Mississippi, furnished program material.

On June 10, 1924, the power was reduced to 10 watts and on September 18, 1925, was increased to 50 watts. In 1926 the power was again increased to 100 watts.

During this later period station operators included Mr. A. B. Lewis, Mr. J. D. Hardy, and Mr. J. D. Wallace. Also, further modifications of the transmitter were made, including the installation of a crystal-controlled oscillator to insure transmission on the proper frequency. With these improvements the station attained to a high degree of excellence. Programs were received by listeners in the states of New Jersey, New Hampshire, Vermont, Massachusetts, Michigan, Oklahoma, Texas, and in the Canadian cities of Toronto and Montreal, besides a large number of others closer by.

In 1926 the EKKO stamp fad reached its height. Several of the broadcasting stations had stamps bearing the call letters of the station and appropriate designs. These were forwarded to listeners who had written the station upon reception of a program. A verified reception stamp of this type was employed by Station WCBH until it ceased to operate in 1927.

As the station grew, the full time of five or six persons was required during each period of broadcast. With programs being presented regularly three times a week, and with several broad-

casts of athletic events at other times, the pressure of work necessary to conduct these activities properly was too great for the Department staff, responsible for other teaching and administrative duties.

Consequently, when the station license expired on July 31, 1927, no attempt at renewal was made and deletion followed on September 12, 1927.¹

¹ Data furnished by Mr. Sanford C. Gladden, assistant professor of physics at the University of Mississippi, and files of the Federal Communications Commission.

UNIVERSITY OF MISSOURI

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COLUMBIA, MISSOURI

IN THE winter of 1920-21 a number of officers of the field artillery unit of the Reserve Officers' Training Corps, then located at the University of Missouri, became interested in radio, installed a set of instruments in the headquarters building on the campus, and began experimenting with wireless transmission and training men in military radio communication.

The equipment consisted of materials furnished by the Government, supplemented with some homemade instruments designed and constructed by students of the Engineering Department of the University. In 1922 this equipment was expanded through outside contributions.

Records show that two experimental licenses were issued in the name of the University. The first was an experimental, class 3 license with call letters 9XBQ and the second was a general amateur license with call letters 9BNX.

On April 13, 1922, the University was granted a broadcast license authorizing operation of a radio transmitter on 360 meters (834 kc), with 55 watts power, in accordance with non-interference schedule of local stations. The call letters WAAN were assigned. The license granted on July 12, 1922, was issued in the name of the University of Missouri, United States Signal Corps. On February 8, 1923, the power was placed at 50 watts and the license issued to the University of Missouri.

On June 4, 1923, the station was placed on 1,180 kc.

Since the station was a development of the military department of the University, presumably it was used primarily for military instruction. The experimental stations were used for experimental and amateur purposes and could not broadcast news, music, lectures, sermons, or any form of entertainment. Station WAAN was licensed for broadcasting entertainment and similar matters as well as weather reports. Programs of this nature were apparently broadcast over its facilities.

The license covering Station 9XBQ expired on April 12, 1925, and that covering Station 9BNX on October 29, 1927. Previously, on March 21, 1925, the license covering Station WAAN had expired. With the expiration of these licenses broadcasting came to an end at the University of Missouri.

The University has co-operated at times with Stations KFRU and WOS in supplying material and talent for broadcasts over their facilities.¹

¹ Data furnished by Mr. John F. Williams, director of publications at the University of Missouri; Miss Estelle Hickok, secretary to the president of the University; Mr. Leslie Cowan, secretary of the University; and files of the Federal Communications Commission.

MISSOURI WESLEYAN COLLEGE

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CAMERON, MISSOURI

ON JUNE 14, 1922, a federal license was issued to Missouri Wesleyan College and the Cameron Radio Company, authorizing operation of a broadcast transmitter on 360 meters, (834 kc), with 100 watts power, during specified hours. The call letters WFAQ were assigned.

On September 28, 1922, the station was permitted to use "unlimited" time on the frequency. On December 30 of that year the power was reduced to 10 watts.

On July 31, 1923, the license was issued to the Missouri Wesleyan College alone, the name of the Cameron Radio Company being dropped.

During this time the broadcasting attempted by the College was not successful and the cost was found to be greater than the value of the project. Consequently, when the license expired on May 17, 1924, no application for renewal was made and the station was deleted on June 13, 1924.

Since then Missouri Wesleyan College has been merged with Baker University at Baldwin, Kansas.¹

¹ Data secured from files of the Federal Communications Commission.

MOBERLY HIGH SCHOOL

MOBERLY, MISSOURI

ON FEBRUARY 29, 1924, a broadcast license was issued to the Moberly High School Radio Club (W. T. Crawford), authorizing the operation of a transmitter on 1,220 kc, with 5 watts power, for "unlimited" time. The call letters KFOJ were assigned.

When, on June 10, 1925, the station license expired—a license which permitted the use of 10 watts power—no application for renewal was made and the station was deleted on July 2, 1925.

On October 12, 1925, a new license covering the same equipment was issued to the Moberly High School, M. F. Beach, superintendent, authorizing operation of the transmitter on 1,240 kc, with 10 watts power, and the sharing of time with the First Baptist Church of the city. Call letters KFOJ were assigned as formerly.

This license remained in effect until January 11, 1926, when, upon expiration, sufficient funds not being available to operate the equipment, no attempt at renewal was made and the station was deleted on January 28, 1926.¹

¹ Data secured from Mr. M. F. Beach, superintendent of the Moberly Board of Education, and files of the Federal Communications Commission.

UNIVERSITY OF MONTANA

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MISSOULA, MONTANA

ON FEBRUARY 17, 1925, the broadcast station at the University of Montana was officially opened, though the federal license authorizing broadcasting was not issued until February 26. This license provided for use of 1,230 kc, 500 watts power, and "unlimited" time on the air. The call letters KUOM were assigned.

The transmitter had been constructed by students of the University under the direction of Professor G. D. Shallenberger, of the Physics Department, at a cost of approximately \$1,800.

On May 25, 1925, the power of the station was reduced to 250 watts, though on August 19, 1926, it was increased to 500 watts.

During 1925 programs were broadcast three times each week from the transmitter. These consisted largely of music and lectures, with special religious features on Sundays. The program schedule during 1926 was similar to that of the previous year save that there was added play-by-play reports of athletic contests. Also, during the summers of 1926 and 1927 weather reports and forest-fire information were broadcast for the benefit of forest workers.

On April 22, 1927, the station was shifted to 800 kc and on November 1 of that year it was again shifted, this time to 650 kc.

On October 30, 1928, the station was shifted to 570 kc and ordered to share time with Station KXA. This order was rescinded later and, on January 18, 1929, the station was granted "unlimited" time on the frequency so long as no interference with Station KXA was experienced.

Dr. E. M. Little, assistant professor of physics, was director of the station from 1927 until October, 1929. Programs from the University station were listened to by a great many throughout the Northwest, though the coverage of the transmitter was somewhat irregular owing to the mountainous topog-

raphy of the region. With the growth of commercial broadcasting the University authorities felt that Station KUOM's programs were not "up to standard" technically and that the restricted budget of the institution did not allow for sufficient outlay to make possible a broadcasting setup that would adequately serve the state's needs. Consequently, when the license expired on October 31, 1929, no application for renewal was made and the project was abandoned "reluctantly."¹

¹ Data furnished by Dr. G. D. Shallenberger, Department of Physics at the University of Montana, and files of the Federal Communications Commission.

MOODY BIBLE INSTITUTE OF CHICAGO

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CHICAGO, ILLINOIS

ON JULY 27, 1926, the Moody Bible Institute of Chicago was granted a federal license to operate a broadcast transmitter on 1,040 kc, with 500 watts power, for "unlimited" time.¹ The call letters WMBI were assigned.

On June 1, 1927, the station was shifted to 1,140 kc where it was ordered to share time with Station WJAZ. On January 20, 1928, it was authorized to increase its power to 5,000 watts and on November 9, 1928, it was shifted to 1,080 kc where time was shared with Station WCBD.

During the fall of 1928 the Federal Radio Commission took cognizance of the fact that two members of the Board of Trustees of the Institute were Canadian citizens and called the Institute's attention to the fact that the Radio Act of 1927 prohibited aliens from serving on boards of directors or as officers of organizations holding broadcast licenses.² Immediately the Moody Bible Institute Radio Station, Incorporated, was organized, and on November 12, 1928, the station license was transferred to this body, acting as lessee of the transmitter from the Institute. No alien sat on the Board of Directors of this leasing corporation, the board being chosen especially to eliminate such in accordance with instructions from the Commission. However, aliens remained on the Board of Trustees of the Institute until June 15, 1932.

According to the contract under which the Moody Bible Institute Radio Station, Incorporated, was established, this organization broadcast only those programs sanctioned by the Institute and the latter financed the station completely. Never-

¹ A carbon copy of this first license on file in the offices of the Federal Communications Commission indicates that the assignment was for "unlimited" time. However, material in the files of the Moody Bible Institute of Chicago indicates that at this time the station was instructed to share time with Station WSBC in Chicago.

² Sec. 12*d*, 44 Stat. L., 1162. Act of February 23, 1927.

theless, "the trustees of the Moody Bible Institute did not have control of the operation of WMBI at that time. The policies of the station rested entirely in the Board of Trustees of the Radio Corporation."³

This arrangement was accepted by the Commission as meeting the requirements of the Federal Radio Act of 1927 and a license was granted to the Corporation on November 26, 1928, authorizing operation on 1,080 kc, with 5,000 watts power, and time shared with Station WCBD. Operation of the station on this basis has been continued to the present.⁴

³ Quoted from a letter by H. C. Crowell, director of the Moody Bible Institute Radio Station, dated October 23, 1936.

⁴ Data furnished by Mr. H. C. Crowell, director of the Moody Bible Institute Radio Station, and files of the Federal Communications Commission.

MORNINGSIDE COLLEGE

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SIOUX CITY, IOWA

ON DECEMBER 13, 1923, Morningside College was licensed to operate a broadcast transmitter on 1,150 kc, with 10 watts power, for "unlimited" time. The call letters **KFMR** were assigned.

The equipment for this station was assembled by Walter Ducommun, a student at the College and the first operator of the station, from standard RCA materials. Rectifying tubes were used for power supply.

In the spring of 1924 the station license was allowed to expire and deletion followed on May 12, 1924.

In the fall of 1924 additional funds were obtained and the station was revived under a new license issued soon after the old license had been deleted (May 27, 1924). On March 16, 1925, the station was authorized to increase its power to 100 watts. To care for operation on this increased power a 1,100-volt motor generator was installed for power supply. The Heising modulation circuit was used. A two-button Kellogg carbon microphone with a preamplifier circuit was installed.

A regular schedule of programs, including the Chapel exercises, was broadcast daily. In addition, special musical and educational features, as well as athletic contests, were presented. Reports of reception of these programs indicated that the station was reaching to a distance of approximately 100 miles, a range which was considered ample for the purposes of the College. Under very favorable conditions a much wider coverage was obtained.

On June 1, 1927, the station was placed on 680 kc and on August 18 of that year was ordered to share this frequency with Station KFJY. On November 1 the station was again shifted—this time to 1,290 kc which it divided with Station KFJY as heretofore.

The rapid development of commercial radio and of mechani-

cal and electrical equipment, the increasing use of chain programs, and the employment of high-priced talent by "commercials" all made the College feel that any competition with these commercial stations would be impossible. It was further felt that the College could obtain a more effective coverage by judicious use of the local commercial stations.

Consequently the station license was allowed to expire on August 1, 1928, and broadcasting over the College-owned transmitter was abandoned. The station was deleted by the federal government on this date.

Since giving up its station the College has been using the facilities of local commercial stations, and its experience has been that practically the same coverage is obtained with many additions, at a cost no greater than that of the upkeep of the station on the campus.¹

¹ Data furnished by Mr. Ira J. Gwinn, personnel director at Morningside College, and files of the Federal Communications Commission.

NEBRASKA STATE TEACHERS COLLEGE

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WAYNE, NEBRASKA

ON AUGUST 24, 1926, Dr. S. A. Lutgen, of the Wayne Hospital, was granted a federal license to operate a broadcast transmitter on 666.3 kc, with 500 watts power, for "unlimited" time. The call letters KGCH were assigned. On November 17, 1926, the station was shifted to 690 kc.

During this time the Nebraska State Teachers College purchased a half-interest in the station, under the name of the Wayne State Teachers College, and furnished program material.

On April 23, 1927, the station was shifted to 1,240 kc and its power reduced to 250 watts. On June 1 of that year another shift was made, this time to 1,020 kc. Again, on October 3, a change was ordered, requiring the station to share time with Station KGDW on 1,020 kc.

On April 26, 1928, the station was sold and license transferred to the Farmers and Merchants Cooperative Radio Corporation of America and consolidated with another station. Station KGCH was deleted by the federal government on August 25, 1928.

For some time following this the College broadcast by remote control over the station with which Station KGCH was consolidated, located at Norfolk, Nebraska. In the spring of 1936 this work ceased so that at present the College has no contact for future broadcasts.¹

¹ Data furnished by Dr. J. T. Anderson, president of the Nebraska State Teachers College, and files of the Federal Communications Commission.

UNIVERSITY OF NEBRASKA

LINCOLN, NEBRASKA

RADIO experimentation at the University of Nebraska began soon after the first Marconi announcements of 1897, and as early as 1916 the University sent out regularly, by means of a spark transmitter, weather, road, and market reports.

During the school year of 1919-20 Professor O. J. Ferguson offered the first radio course to be given in the University.

During the spring and summer of 1921 a combination radio-phone and continuous-wave telegraph station was built by two graduates of the Electrical Engineering Department of the University, Mr. H. O. Peterson and Mr. Allan Weaver. For a three-week period, beginning July 13, 1921, concerts of phonograph records were broadcast daily at 12:00 M. and 7:30 P.M. The call letters under which the station operated were 9YY and Mr. Peterson, a licensed operator, was in charge. On Sunday, July 24, 1921, from 6:00 to 7:00 P.M. a musical program, supplied by the American Legion band playing at a local park, was broadcast over the station. The Lincoln Telephone and Telegraph Company supplied a telephone circuit between the bandstand in the park and the Electrical Engineering Building, where the transmitter was located. The music was picked up at the bandstand by three microphones.

These experimental broadcasts evoked letters from Nebraska, South Dakota, Iowa, Minnesota, Missouri, and Kansas stating that the programs had been heard. These letters indicated that the maximum daylight range of the station was 340 miles.

The unmodulated output of the transmitter as a radiophone station was approximately 100 watts. The license for the station allowed use of a wave-length of either 200 or 375 meters. A wave-length of 375 meters was found more satisfactory and consequently was used.

As a continuous-wave radiotelegraph station 9YY had an output of 200 watts.

EDUCATION'S OWN STATIONS

During the fall of 1921 the reports of the Nebraska University football games were broadcast from a 1,000-watt radiotelegraph spark set which the University had built and which was being operated on the 375-meter frequency. Mr. H. J. Heim, later to be graduated from the Electrical Engineering Department with the class of 1922, was in charge of the operation of this transmitter.

Beginning on November 14, 1921, market reports and weather forecasts were broadcast at 9:45 A.M. daily over this 1,000-watt transmitter.

On December 22, 1921, or thereabouts, use of the 1,000-watt radiotelegraph spark set was discontinued and Mr. Heim began using the equipment of Station 9YY as a radiophone transmitter to broadcast market reports and weather forecasts. In addition to these daily reports, weekly musical programs were added to the schedule of broadcasts. This schedule was continued until September, 1922.

Until this date only student and graduate assistants had operated any of the University's radio stations for broadcasting. However, in September, 1922, Mr. Frank J. Moles was employed to teach in the Electrical Engineering Department of the University and to operate the University radio station. He operated Station 9YY that fall and continued with the program schedule started by Mr. Heim.

During December, 1922, and January, 1923, a new radio station was constructed. Considerable radio equipment that had been used at the Nebraska state capital was purchased by the Electrical Engineering Department and made part of the new University station.

Preparatory to this development the University had been granted a broadcast license on June 16, 1922, permitting operation of a station on the 360-meter (834-kc) frequency, with 100 watts power, for "unlimited" time. The call letters WFAV were assigned. On July 17, 1924, the station was shifted to the 1,090-kc frequency and the power increased to 250 watts. This was further increased to 500 watts on October 8, 1924.

Regular programs were started over this equipment on Feb-

ruary 5, 1923. These consisted of weather forecasts, road reports, news reports, government health bulletins, and time signals, all given on a daily schedule. Weekly broadcasts included talks by University faculty members and musical features supplied by the School of Fine Arts. On February 15, 1923, the first University Charter Day program was broadcast.

Mr. Moles was in charge of Station WFAV until June, 1924. During the summer of 1923, while Mr. Moles was away on his vacation, two students, Mr. W. P. Meyer and Mr. H. J. Schrader, operated the station. During the summer of 1924 Mr. E. L. Plotts was in charge of operations.

In September, 1924, Mr. R. A. Cushman became an instructor in the Electrical Engineering Department. He immediately took charge of the radio course in the University and the operation of Station WFAV. Further, he continued the broadcast schedule of weather forecasts, road reports, news items, and government health bulletins. In addition, faculty members of the College of Agriculture gave daily talks over the station during the school year 1924-25.

On December 24, 1924, Professor Maurice H. Weseen, under the sponsorship of the Extension Division of the University, began a radio course in "Business English and Letter-Writing," broadcasting lectures each Thursday at 7:00 P.M. This course was designed to offer aid to business men, teachers of English, and all others seeking to better their ability in letter-writing. Two hours' university credit were offered to all who completed the course satisfactorily, and the cost for enrolment, including texts and other supplies, was placed at \$12.50 per student.

The course consisted of twenty lectures in which English was considered as a useful tool in everyday life. Each lesson contains a review of some essential elements. There is an interesting study of words, including correct spelling, pronunciation, and use. There are helpful exercises in the construction of correct and effective sentences. Daily difficulties with grammar are cleared up. Punctuation is considered as a practical art. Every topic is illustrated by means of live examples drawn from daily speech and writing. The discussion is plain and straightforward. Enrolled students may send in questions for discussion.¹

¹ Quoted from an announcement of the course published by the University of Nebraska, November 12, 1924.

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During the summer of 1925 arrangements were made with Station KFAB, which was privately owned, by which the University might use its transmitter for broadcasting instructional programs, Station WFAV being maintained as a supplementary transmitter. An up-to-date studio was built in the Administration Building on the campus and equipped with the latest devices. Telephone lines were run to Station KFAB's transmitter. On September 15, 1925, the first program was broadcast over this new equipment, this work being under the direction of Professor A. A. Reed, director of University extension.

The broadcast schedule called for the following hours each Monday, Tuesday, Wednesday, and Friday: 9:30-9:55 A.M., 10:30-11:00 A.M., 1:15-1:30 P.M., 3:00-3:30 P.M., and 8:05-8:30 P.M. The program schedule included a continuation of the credit course in business English offered during the previous year.

Station WFAV was continued until March 2, 1927, being used to broadcast a musical program each Friday midnight. When the station license expired on this date it was thought advisable for the University to broadcast exclusively over Station KFAB. Consequently Station WFAV was discontinued and no application for renewal of license made. This station was deleted by the federal government on April 30, 1927.

Since 1927 the University has continued to use Station KFAB, broadcasting courses in religion, Spanish, musical drama and allied fields, French, German, education, and business English. These courses have been well received as attested by the number of texts and other supplies ordered by listeners.²

² Data furnished by Professor Ferris W. Norris, associate professor of electrical engineering in charge of communications courses at the University of Nebraska; Dr. A. A. Reed, director of the University Extension Division; and files of the Federal Communications Commission.

NEBRASKA WESLEYAN UNIVERSITY

LINCOLN, NEBRASKA

NEBRASKA Wesleyan University began broadcasting daily weather and news bulletins over a 1,000-watt spark set, using call letters 9YD, financed by direct appropriations from the University budget, in 1914. This work was continued until 1917 when the station was shut down by order of the President of the United States as a World War measure.

In 1919 this spark equipment was again put into service and operated until 1920 when a De Forest OT20, 20-watt phone transmitter was installed for experiments with speech, music, and other broadcasts. In 1921 a regular market service was begun by the station at the request of the Nebraska State Bureau of Markets.

In April, 1922, the United States Department of Commerce, Radio Division, ruled that the service of the station was that of broadcasting rather than experimenting and ordered it to apply for a broadcast license. Such license was issued on May 6, 1922, authorizing operation on 360 meters (834 kc), with 20 watts power, for "unlimited" time. The call letters WCAJ were assigned.

On August 24, 1922, the licensed power was increased to 100 watts, though this power was never actually used; while on November 29 of that year it was placed at 20 watts, the power being employed by the equipment.

The first remote-control broadcast from the station was made in April, 1923, when an address by a telephone official from Chicago was put "on the air."

On May 29, 1923, the station was authorized to increase its power to 500 watts. This was followed, during April, 1923, by the purchase and installation of a 500-watt rebuilt De Forest radiophone transmitter. In July of 1924 the station was shifted to 1,060 kc and, on October 10, was again shifted, this time to 1,070 kc. Two further shifts were made during the following

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year: January 19, 1925, to 1,090 kc and April 16, 1925, to 1,180 kc.

With the breakdown of radio regulation in the summer of 1926, when the courts ruled that the United States Department of Commerce had no authority to assign specific frequency or power to a station, Station WCAJ remained on its assigned frequency even though sixteen other stations had "jumped" on this frequency and were attempting to operate there. As secretary of the Association of College and University Broadcasting Stations, Professor J. C. Jensen, then director of the station, urged all other colleges to continue broadcasting on their assigned frequencies "as a matter of good citizenship."

When the Federal Radio Commission was finally established and took charge of radio regulation in the United States, in March, 1927, Station WCAJ was operating full time on its assigned frequency of 1,180 kc with licensed power of 500 watts. On June 1 of that year the station was ordered to shift to 860 kc. This resulted in serious interference with Station KVOO, a 1,000-watt station then located at Bristow, Oklahoma. Though several attempts were made to reach some agreement with this station as to a division of time which would eliminate the trouble, no satisfactory adjustment was possible and the Federal Radio Commission refused to take a hand in the matter.

On July 7, 1927, the station was shifted to 790 kc where it was ordered to share time with Station KMMJ. This arrangement resulted in bad nighttime heterodyne with Station WGY operating on this same frequency at Schenectady, New York. To eliminate this difficulty the Commission, on November 16, 1927, ordered Station WCAJ to change its hours of operation to "daylight only" over its protest. This change necessitated the cancellation of two evening study courses for adults which were only two-thirds completed at the time.

During 1927-28 new and thoroughly modern equipment was installed and, in the following year, the station was put under crystal control.

On October 29, 1928, the station was placed on 590 kc and

ordered to share time with Station WOW, the latter being granted six-sevenths of the total time.

At about this time the Board of Trustees of the University approved plans for the erection of a broadcasting building, new antenna towers, and improvements in the transmission equipment. Action on these projects was temporarily delayed.

On February 28, 1930, Station WOW filed an application with the Federal Radio Commission asking for full time on the 590-kc frequency. This was set for hearing before the Commission on September 10-12, 1930.

Before the decision of the Commission was rendered Station WCAJ filed application for permission to change its equipment so as to comply with General Order No. 97. This order demanded that stations be so constructed as to produce modulation of approximately 100 per cent. The circuits in general use at the time would produce only about 40 per cent modulation. With the average power supply, the added power in the modulator circuit could not be obtained from the generators with which the transmitters were provided. It thus became necessary to decrease power on the carrier wave in order to have more power for modulation until larger generators could be obtained. The application filed by the University, therefore, asked for permission to decrease the power of the station to 250 watts temporarily.

Attached to this application was a note stating that the University was preparing to ask the Commission for authority to increase its power to 1,000 watts and that bids on the necessary equipment had been solicited from manufacturers.

Since many stations were unable to comply immediately with the requirements of General Order No. 97, the effective date of the order was extended by the Commission. As a result Station WCAJ continued to operate with its old circuit of 500 watts carrier power until its new equipment was completed in September, 1931.

However, though the station sought to recall its application for reduced power after the extension of the effective date of General Order No. 97, it was unsuccessful, and, on December 5,

1930, the Commission placed the station on 250 watts power, though this power was never used.

This was followed on December 19 by an application for a construction permit to erect a 500-watt transmitter with 100 per cent modulation and with circuit designed so that it could give 1,000 watts power with a few simple changes.

On May 22, 1931, the Commission rendered its decision on the application by Station WOW for full time on the 590 frequency and denied said application by a four-to-one vote, reversing the report of its examiner which was favorable to Station WOW. On June 10, 1931, Station WOW appealed from the decision of the Commission to the Court of Appeals of the District of Columbia, and, on February 29, 1932, this appeal was denied.

On July 31, 1931, the Federal Radio Commission "after much delay and correspondence" granted Station WCAJ a construction permit for new equipment capable of 1,000 watts power, but to operate on 250 watts only. By special action, on September 2, 1931, the power limit was raised to 500 watts. This equipment was installed immediately and application made on October 27, 1931, for authority to increase the power to 1,000 watts. This application was refused by the Commission on November 2, 1931, on the grounds that to grant it would increase Nebraska's quota above that allowed.

On February 2, 1932, under a new rule "6g" of the Commission, Station WCAJ again filed application for 1,000 watts power. This was denied on February 26, 1932, on the grounds that General Order No. 102 was not complied with. This order made it necessary for any station, located in an area where the quota was full, desiring an increase in power to attack some other station within the area and attempt to take away its facilities. Station WCAJ responded that it did not desire to take anything that another station had.

On May 3, 1933, Station WOW again filed an application with the Commission for full time on 590 kc, specifying the facilities of Station WCAJ. This was followed, on June 3, 1933, by another application from Station WCAJ for 1,000 watts

power specifying 0.06 units from the facilities of WOW. This application was denied by the Commission and a hearing set regarding renewal of the station license.

On June 8, 1933, Professor J. C. Jensen, director of Station WCAJ, wrote a letter to Judge Eugene O. Sykes of the Federal Radio Commission, in which he stated:

May I also suggest that the Commission made a technical blunder when WOW and WCAJ were ordered to share the same bed in 1928. This combination was neither sought nor desired by either party. WOW has always insisted on taking its six-sevenths of the bed in the middle, and now for the second time threatens to kill its smaller bedfellow. Rather than stand by while this murder is being contemplated, can not the Commission make some needed changes in its room arrangement?¹

Since previous legal battles had cost the University a great deal in time and money, and since it did not care to spend more for "endless litigation," the station was sold to Station WOW on July 5, 1933. Immediately the Federal Radio Commission, though it had repeatedly denied Station WCAJ 1,000 watts power on the grounds that such would overquota the state, granted Station WOW full time on its frequency with 1,000 watts power, thus automatically increasing the quota of Nebraska and of the fourth zone by 0.06 units, without a hearing.

Discussing the affair, Professor Jensen said:

WOW attacked WCAJ on the ground that it was not rendering efficient service. WCAJ was criticized by its supporters because it could not be heard as clearly as WOW, the latter having twice the power on the same frequency. The Federal Radio Commission refused to give relief to WCAJ, although admitting that the equipment was capable of supplying the necessary power. When WCAJ was sold to WOW, the Federal Radio Commission reversed itself and granted to WOW the increased facilities which it had formerly denied to WCAJ.

To put the situation in a nutshell. WCAJ failed to get the full support from its constituents which was necessary for more efficient operation largely because it was shifted so frequently by Federal authorities and put on such unsatisfactory frequencies that many friends of the station felt the cause to be hopeless. Colleges and universities work on budgets set up a year in advance and are not always in a position to expend considerable sums of money on thirty days notice because of new Federal orders. Commercial stations

¹ Quoted by special authority of the Federal Communications Commission from a letter in its files.

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can make quick adjustments and then point with pride to their immediate compliance with orders as a reason for giving them the facilities of their less fortunate colleagues in financial matters.²

On August 1, 1933, Station WCAJ was ordered deleted.

During the last year of its history, which ended on July 31, 1933, the following programs were carried regularly by Station WCAJ: Nebraska State Teachers' Association, Nebraska Congress of Parents and Teachers, Union College, the attorney-general of Nebraska on law enforcement, the Lancaster County Medical Society, the Lincoln Ministerial Association, the Lincoln City YMCA, the Woman's Christian Temperance Union, and the First Methodist Church. In addition to these regular features there were occasional programs by the American Legion of Nebraska, the League of Women Voters, city school assemblies, and musical and educational features presented by Nebraska Wesleyan students and faculty including oratorios, glee club concerts, and organ recitals.³

² Quoted from a letter by Professor J. C. Jensen, of the Physics Department at Nebraska Wesleyan University, dated October 23, 1936.

³ Data furnished by Professor J. C. Jensen, professor of physics at the Nebraska Wesleyan University, and files of the Federal Communications Commission.

UNIVERSITY OF NEVADA

RENO, NEVADA

FROM September, 1920, to September, 1924, a United States government code station was operated from the campus of the University of Nevada in connection with the air mail. The University had no connection with this station other than permitting its location on the campus.

One of the employees of this federal station wished to attempt some experimental radio work and was given permission to apply for a broadcast license in the name of the University. This license was granted on May 1, 1922, permitting operation on 360 meters (834 kc), with 500 watts power, for "unlimited" time. The call letters KOJ were assigned. On June 7, 1922, this license was canceled and the station deleted.

In the fall of 1924 the government station was moved to the new airfield three miles south of Reno.

In September, 1929, Professor Irving Sandorf, a member of the faculty of the School of Electrical Engineering at the University, was licensed to operate an experimental station on the campus. Numerous experiments were carried out with this equipment, though no educational broadcasts were attempted. At present some experimental work is being done at the University, as Professor Sandorf is keeping his license "alive" in order that he may have due authority to set up an adequate experimental station "if and when funds are available."

A privately owned station at Reno, KOH, has granted the University use of its facilities on numerous occasions for the broadcasting of special lectures, athletic events, and programs arranged by various student groups on the campus. A regularly scheduled series of weekly radio talks by members of the University staff was continued over these facilities for eleven weeks, from February 26 to May 7, 1935, and a similar series of twelve weekly talks from October 4 to December 17, 1935. Approximately the same schedule was maintained in 1936.

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In addition to this regular weekly series by members of the staff, Station KOH co-operates in publicity for various University activities. Programs by representatives of these organizations are broadcast whenever opportune. Such periods of broadcast are given free to the University by the station.¹

¹ Data furnished by Dr. Walter E. Clark, president of the University of Nevada, and files of the Federal Communications Commission.

NEW COLUMBUS COLLEGE

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SIOUX FALLS, SOUTH DAKOTA

ON DECEMBER 17, 1923, the New Columbus College was licensed to operate a radio station on 1,160 kc, with 50 watts power, for "unlimited" time. The call letters WFAT were assigned. When, on June 13, 1924, the license expired no attempt was made at renewal and the station was deleted by the federal government. The building is now being used by the Columbus Orphanage.¹

¹ Data furnished by files of the Federal Communications Commission.

NEW MEXICO STATE COLLEGE OF AGRICULTURE AND MECHANIC ARTS

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STATE COLLEGE, NEW MEXICO

DURING the World War Dr. R. W. Goddard, a member of the faculty of the New Mexico State College of Agriculture and Mechanic Arts, conducted experimental work in radio communication while training men in the Signal Corps of the United States Army. At the close of the war, when the government lifted its ban on amateur and commercial radio operation, an amateur's license was granted to Dr. Goddard under call letters 5CX.

Under this license Dr. Goddard constructed equipment and operated an amateur station on the campus of the College. Very soon this license was replaced by a special experimental license with call letters 5XD. Under this license the work of Dr. Goddard was expanded and new equipment added to the station.

A regular schedule of experimental broadcasting was followed by this station using a wave-length of 485 meters. Programs, broadcast in code and consisting of time signals, weather reports, and news items, were put "on the air" daily at noon and at 10:00 P.M.

Early in 1920 a 50-watt telephone transmitter was installed and the broadcast schedule expanded further to include music and educational talks. Only night reception was possible at a distance of approximately fifty miles from the station.

On April 5, 1922, the station was granted a broadcast license to operate on 360 meters (834 kc), with 750 watts power, broadcasting weather reports. The call letters KOB were assigned. On July 24 of that year a power increase to 1,000 watts was authorized and the station placed on "unlimited" time.

In December, 1922, a 500-watt transmitter was installed and the aerial rebuilt to secure greater radiation. The output of the

transmitter was increased by increasing the number of oscillation and modulation tubes. On January 8, 1923, this new equipment was licensed to operate on 360 meters (834 kc), with 500 watts power, for "unlimited" time. Because of lack of power this equipment was not put into use until early in 1924.

On March 31, 1925, the station was shifted to 860 kc and the power increased to 750 watts. A further increase in power to 1,000 watts was granted on September 25, 1925.

In the fall of this year a portable superheterodyne receiver was secured and fitted out with measuring instruments for testing purposes.

On January 22, 1927, the power was further increased to 5,000 watts and on June 1, 1927, the station was shifted to 760 kc where it was ordered to share time with Stations KWSC and KTW. There were eight other stations in the United States using this frequency. One of these was Station KWKH at Shreveport, Louisiana, which caused serious interference, thereby decreasing the effectiveness of Station KOB.

A new studio was built at this time and, in December, the power-generating equipment was placed in a new building. Provision was also made for microphone connections in the College auditorium, the music building, and the gymnasium. A wiring connection was also made available at the College athletic field for use in broadcasting all kinds of athletic contests. A special radio orchestra was organized at this time and the program schedule was expanded so as to make as full use as possible of college organizations, such as the band and mixed quartet. However, to keep the time on the air full, a number of recordings were used.

On September 28, 1927, the station was authorized to use 7,500 watts power until "local sunset" and 5,000 watts power at night.

A special feature inaugurated in 1927 consisted of the broadcasting of road reports furnished by a special highway patrol. Chambers of commerce and hotels used receiving sets to get these reports and make them available for tourists.

A typical program during this period consisted of weather,

market, and road reports at noon together with orchestra music, farm flashes, and household chats in the evening.

As the broadcasting facilities were improved the technical staff of the station was increased from one to six—four announcers and two operators. This, with the added increase of expense for equipment to keep pace with new developments in broadcasting, made more acute the financial problem. In the early stages of the station's history there was no regular budget from state funds. As the financial burden became heavier such funds were made available in small sums and some federal money was received, but "there was never enough money to purchase the equipment actually needed."

The station was constantly troubled by interference from other stations operating on the same frequency. Finally, on October 30, 1928, Station KOB was shifted to 1,180 kc where it shared time with Station KEX. At this time a power increase to 10,000 watts was authorized. The time agreement with Station KEX gave Station KOB all the daytime hours and one-third of the nighttime hours.

During the fall of 1929, when the New Mexico Broadcasting Association was organized to advertise the state, Station KOB presented a series of programs featuring the attractions of various sections of the state, using material prepared by the chambers of commerce or similar organizations in these sections.

On January 11, 1930, a power increase to 20,000 watts was authorized. This resulted in serious interference with Station WOAI at San Antonio, Texas, and the manager of Station KOB sought a change to 1,170 kc, but was unsuccessful. A 7,500-volt generator was installed in March, 1930, and trial test of this new equipment made in August of that year.

During 1930 it became evident that, to continue operation of the station, added income from commercial programs was necessary. Consequently a contract was signed in November, 1930, with the *El Paso* (Texas) *Post* under which a studio was equipped in El Paso and connected with the studio and transmitter on the college campus by private wire. It was expected that advertising could be sold in El Paso and that better pro-

grams could be arranged through the use of El Paso talent. To improve reception a new aerial was erected later in the year.

The dedication program from the new studio was broadcast on January 31, 1931, and a schedule established which provided for programs from El Paso from 7:00 to 10:00 A.M. and from 5:00 to 9:00 P.M. The remainder of the time was used to broadcast from the campus studio.

During the period from January 31 to December 7 a wide variety of musical and dramatic programs was put "on the air." Some educational and informational talks were included in these programs. A Women's Hour and a Children's Hour program were inaugurated at the college studio in February, 1931. A series of programs by the Seventh Cavalry Band at Fort Bliss was broadcast from the El Paso studio during the summer of that year.

Each year Station KOB permitted the use of its facilities in connection with the Atwater Kent radio audition. In April and May, 1931, various college organizations arranged programs which were put "on the air" weekly. These were designed to advertise the College and to arouse the interest of prospective students.

During the fall of 1931 lessons in Spanish were broadcast from the campus studio.

Throughout the entire period that regular programs were broadcast from Station KOB, the New Mexico Extension Service, with headquarters at the College, made full use of the radio facilities, broadcasting a great deal of educational and informational material. Its regular programs included Farm Flashes, Housekeeper's Chats, talks by State Extension workers, and 4-H Club Music Appreciation programs.

From a business standpoint the operation of the studio at El Paso did not prove successful as advertising could not be sold to any great extent. Thus it was finally decided by the College authorities that the solution of their problem, since the state was unable to supply funds for operation of Station KOB, was either to sell or to lease the equipment. Consequently, in the fall of 1931, application was made to the Federal Radio Commission

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for permission to transfer the station to Albuquerque, New Mexico.

On December 7, 1931, the El Paso studio was closed and a ten-hour daily schedule was established from the campus studio. At this time a station in Phoenix, Arizona, applied for the facilities of Station KOB and it was necessary for the station to fight for its existence.

In April, 1932, the Commission approved Station KOB's application to move to Albuquerque.

Meantime, on September 12, 1931, a contract was made with Mr. T. M. Pepperday, of the Journal Publishing Company of Albuquerque, for lease of the station. The terms of the contract were:

a) The New Mexico College of Agriculture and Mechanic Arts leased to the Journal Publishing Company the KOB broadcasting station, together with the transmitter, appliances, and equipment for a full period of ten years beginning November 1, 1931, and terminating October 31, 1941.

b) The lease was made contingent upon the College obtaining permission from the Federal Radio Commission to move said broadcasting station from State College, New Mexico, to Albuquerque, New Mexico.

c) The Journal Publishing Company deposited \$5,000.00 earnest money in the First National Bank of Albuquerque, which \$5,000.00 was to be paid to New Mexico State College as the last year's rental as soon as the necessary permission to move the station was obtained.

d) The Journal Publishing Company was to move the said station to Albuquerque, New Mexico, at its own expense and was to purchase a certain tract of land near Albuquerque as the site of such station, put the necessary improvements thereon and to deed the land and improvements to the State College in consideration of the payment of \$400.00 by the College.

e) The rental to be paid by the Journal Publishing Company was \$1,250.00 each three months to be paid in advance and to begin at the date when the Journal Publishing Company commenced dismantling the station preparatory to moving it to Albuquerque.

f) The Journal Publishing Company was to keep a complete set of books on the operating expense of the station, said books to be open to inspection by the State College at all times and was to divide all net profits in excess of \$5,000.00 per year equally with State College. State College was to have the right to broadcast over said station three hours per week.

g) The Journal Publishing Company agreed to keep the license and equipment in good condition, to obey all orders of the Radio Commission, and to

defend the radio license against any attacks made on it; at the end of the ten-year period to turn back all of said station and equipment to the State College.

h) The Journal Publishing Company agreed to post a \$25,000.00 surety bond to insure its performance of the terms of the contract.

i) State College could terminate the contract only upon a breach by the Journal Publishing Company and the Journal Publishing Company had no option whatever to terminate the agreement.¹

Since some difficulty was experienced in obtaining the necessary permission of the Federal Radio Commission to move Station KOB to Albuquerque, nothing was done under this contract.

Consequently a supplementary contract was drawn amending the original agreement as follows:

a) That the \$5,000.00 already placed in escrow by the Journal Publishing Company should be paid immediately to the State College. That the State College should take \$4,000.00 of this sum, together with an additional \$5,000.00 to be put up by the Journal Publishing Company, and out of this fund of \$9,000.00 new radio equipment was to be bought for KOB and if the full \$9,000.00 was not expended then to prorate the expenditure, four-ninths to be borne by the College and five-ninths by the Journal Publishing Company. It appeared that the purchase of some additional equipment was necessary in order to obtain permission to remove Station KOB to Albuquerque.

b) The Journal Publishing Company was to have the right to rescind the supplemental agreement as to expending said amount of money at any time before the radio equipment was purchased.

c) All the other provisions of the original contract of September 14, 1931, were to remain in effect.²

This supplemental contract was signed by both parties on December 12, 1931. Immediately the engineers of the Journal Publishing Company took charge of the station, though the Commission did not grant permission for removal of the station to Albuquerque until April 24, 1932, and no application had been made to transfer the station license to the lessee.

The station was dismantled and plans made to move it to Albuquerque. The actual moving was done by men and trucks

¹ Quoted from *Report of Joint Senate and House Committee upon Investigation of Radio Station KOB* (12th Leg., state of New Mexico; submitted by Senator Fred Wilson, chairman), pp. 2-3.

² *Ibid.*, pp. 3-4.

furnished by the New Mexico Highway Department under agreement by which the Journal Publishing Company was to pay the Department for this service. A bill for \$426.53 was rendered to the Journal Publishing Company by the State Highway Department for this service, but was never paid.³

During the period of February 18 to October 15, 1932, the College, from its own funds, purchased equipment for the station to the amount of \$8,962.89. This purchase was made at the request of Mr. Pepperday so that the educational discount might be obtained. Though repeated promises of payment were made, nothing was ever done to reimburse the College.⁴

Further, the Journal Publishing Company did not put up the \$5,000 agreed upon for purchase of equipment.

During July, 1932, the College agreed to wait for its rental payment on the station until the transmitter had been installed at Albuquerque and broadcasting began. It was expected that the station would be in operation and payment would start sometime in September, 1932. However, "no rentals whatever were ever paid by the Journal Publishing Company to the State College."⁵

In November, 1932, the College was notified that an attack had been made upon the KOB license before the Federal Radio Commission and that a date had been set for hearing. When notified of this

the Journal Publishing Company refused to stand the expense of defending said station in the attack made upon it notwithstanding the provision in its original contract of September 14, 1931, by which the Journal Publishing Company agreed to defend the KOB license at its own expense.⁶

Although Mr. M. C. Mecham, attorney for Mr. Pepperday, represented the station at the hearing, his fee of \$1,000 was paid, under protest, by the Board of Regents of the College upon advice from Governor Arthur Seligman of New Mexico.

On October 5, 1932, the new station, located at Albuquerque, went on the air with a special dedicatory program. So that the College might make full use of its time grant on the station, a

³ *Ibid.*, p. 4.

⁴ *Ibid.*, p. 5.

⁵ *Ibid.*, p. 5.

⁶ *Ibid.*, p. 5.

committee of three from the institution was appointed to have complete charge of all college broadcasts.

On November 16, 1932, the amount due the College from the Journal Publishing Company, under the lease agreement, was \$6,436.54. A statement of this bill was rendered the company and a copy sent to the governor with request that immediate payment be made. "Nothing was paid on the indebtedness."⁷

A year later, on November 24, 1933, the College was notified through Mr. Pepperday and Mr. Mecham that the Journal Publishing Company wished to exercise its privilege under the lease agreement and return the station to the College. Since

the Board of Regents had no means of operating the station at that time if it was turned back to them . . . [it] made a temporary agreement with Mr. Pepperday and the Journal Publishing Company whereby the Journal Publishing Company was to continue operation of the station during the month of December, 1933, and the State College was to bear one-half of the operating loss of the station for that month.⁸

Nothing further was done and the Journal Publishing Company continued to operate the station until December, 1933. In the meantime Mr. Pepperday made several suggestions to the governor of the state by which the numerous state institutions and state departments should buy broadcasting time over the station to help defray the expense of operation.

On July 31, 1934, the Board of Regents of the College agreed to the signing of an agreement with Mr. Pepperday by which all indebtedness of Mr. Pepperday to the College was to be extinguished as well as all indebtedness that the College might owe to the Publishing Company. Further, it agreed to permit the Journal Publishing Company to operate the station at its own expense with the reservation of three hours of broadcasting time each week to be used for College broadcasts. The Journal Publishing Company was to pay no rental but divide all net profits equally with the College. This agreement was signed by the Journal Publishing Company.

In December, 1934, Mr. Pepperday sent to the Board of Regents of the College another agreement similar to the one he

⁷ *Ibid.*, p. 6.

⁸ *Ibid.*, pp. 6-7.

EDUCATION'S OWN STATIONS

had recently signed, asking for their signature. This was not signed by the Board of Regents.

After making a complete investigation of the transactions between Mr. Pepperday and the State College, the Joint Senate and House Committee appointed for this purpose concluded:

It is apparent that although a contract was originally entered into whereby the State College was to receive \$50,000.00 in rentals at a rate of \$5,000.00 per year for a lease of the station, it has, in fact, received no rentals whatever, but has instead expended several thousand dollars of its own funds to purchase new equipment for the station since the time that the original contract was entered into. It also appears to the committee that under the various supplemental agreements that were made by the parties the Journal Publishing Company is now operating Station KOB under an agreement whereby it pays no rentals for the station unless there is a net profit earned by the station, and that there is no provision whatever for determining what expenses can be included by the Journal Publishing Company in determining whether or not a net profit has been made by the station. It also appears to the committee that although under this last agreement the Journal Publishing Company agreed to furnish monthly statements of the operating expense of Station KOB that in fact no statement of operating expense of the station has been furnished to the State College. Further than this, there has never been furnished to the Board of Regents any statement whatever by the Journal Publishing Company of the operating expenses of KOB and that no audit or examination of the books of KOB has ever been made by the Regents of the New Mexico College of Agriculture and Mechanic Arts.

It also appears to this committee that at the time the purported contract of September 18, 1934, was entered into, the Journal Publishing Company, by its own admission was then indebted to the State College in the sum of \$8,757.38 and that said indebtedness was probably for a considerably larger sum; that no part of said indebtedness has ever been paid. It also appears that the said Journal Publishing Company is indebted to the State Highway Department of the State of New Mexico in the sum of \$426.53 and that no part of this amount has been paid.

It is, therefore, recommended by this committee that the whole matter of the contracts of the Journal Publishing Company with respect to radio broadcasting station KOB be referred to the Attorney-General of the State of New Mexico with instructions to the Attorney-General to investigate said transactions and to proceed, if possible, to collect the amounts due the New Mexico College of Agriculture and Mechanic Arts and due to the State Highway Department from the Journal Publishing Company and to rescind all purported supplemental agreements between the Journal Publishing Company and the said College, if possible, so that all original contracts of September 14,

1931, can be put into full force and effect. If said original contract can not be put into full force and effect, then it is recommended that the Board of Regents of said College proceed at once to negotiate for sale of the said radio broadcasting station for the best amount obtainable and to discontinue all connection of State College with the operation of said KOB station as soon as possible.⁹

Following this investigation the application for station license was set for hearing before the Federal Communications Commission and, on December 28, 1935, the hearing was continued indefinitely. Meantime temporary licenses were granted the station.

On May 7, 1936, the Journal Publishing Company surrendered its lease and soon thereafter the station was sold to the Albuquerque Broadcasting Company and the license officially transferred to that organization.¹⁰

⁹ *Ibid.*, pp. 8-10.

¹⁰ Data furnished by Dr. G. L. Guthrie, assistant to the president of the New Mexico State College of Agriculture and Mechanic Arts, from a thesis written by Dr. R. W. Goddard, formerly of the College; the Department of Justice of the State of New Mexico; Dr. H. M. Gardner, acting president of the College; and files of the Federal Communications Commission.

UNIVERSITY OF NEW MEXICO

ALBUQUERQUE, NEW MEXICO

IN THE year 1921 Professor Charles E. Carey, of the University of New Mexico, installed a telegraph station on the campus of the University, using a damped-wave transmitter with a navy type high-frequency alternator, for experimental and training purposes.

Early in 1922 a 100-watt continuous-wave transmitter was installed, the station being, to a considerable extent, constructed by Mr. Wiley N. Price, a student working with Professor Carey. Speech was transmitted over this equipment under an experimental license but no broadcasting license was obtained at this time.

Much of the money used in the purchase of this equipment was donated by Mrs. J. Korber. For this reason the station was named "the Korber Wireless Station."

On October 30, 1923, the station was granted a broadcast license authorizing operation on 1,180 kc, with 100 watts power, for "unlimited" time. At this time the call letters KFLR were assigned. Professor P. S. Donnell, of the University faculty, was placed in charge of the station.

The broadcast schedule consisted of a one- to two-hour program each Friday evening during the school year until January 29, 1924, when the station was deleted, the license having expired and no application for renewal made.

On July 29, 1924, a new license was issued to the station permitting operation on the same frequency and with the same power as formerly. On May 6, 1925, the power was increased to 200 watts, though on September 9 it was reduced to 100 watts.

Toward the close of the school year of 1925 the station was closed because of lack of funds, there having been practically no money supplied for operating the equipment.

Soon thereafter Mr. and Mrs. Korber donated \$3,000 to the University for a radio station and this amount was matched by

an appropriation from the regents of the University. With this sum two buildings were erected, one to house the studios and the other to care for the transmitter. The antenna was moved to the new location, the old station having been in the Science Hall, and the towers raised eighteen feet in height. Also, a new cage type antenna was constructed.

Negotiations were then begun with the Western Electric Company for a new 1,000-watt transmitter and consideration was given to erecting a homemade station of this capacity, purchasing the parts needed. All this was done upon a verbal understanding with some of the business men and organizations of Albuquerque that a station was desired by them in order to place that city before the country, and that such a station would be financed, as regards operating expenses, by them. On the basis of this understanding the University kept its station license alive.

However, the understanding was never carried into actual operation and, since no funds were available for purchasing the equipment needed or for maintaining the station, Dr. J. F. Zimmerman, who became president of the University in 1927, recommended that the station be definitely closed and the license surrendered. This was done and, as a result, the station was deleted by the federal government on July 18, 1927. Of this action Dr. Zimmerman says:

The growth of the University student body required that all possible funds be used to supply the necessary instructional program, and it was felt that it was impossible to maintain this station as it should be maintained, if any appreciable services were to be derived from it.¹

¹ Quoted from a letter by Dr. Zimmerman dated March 2, 1936. Data furnished by Dr. Zimmerman and files of the Federal Communications Commission.

NORTH CAROLINA STATE COLLEGE OF
AGRICULTURE AND ENGINEER-
ING OF THE UNIVERSITY
OF NORTH CAROLINA

•
RALEIGH, NORTH CAROLINA

ON AUGUST 31, 1922, the North Carolina State College was licensed to operate a broadcast transmitter on 360 meters (834 kc), with 2,000 watts power, for "unlimited" time. The call letters WLAC were assigned. Installation of the equipment was under the direction of Major George C. Cox, then assistant professor of electrical engineering at the College and formerly of the Signal Corps of the United States Army.

As there was no appropriation available to care for the expenses of the station, only intermittent broadcasts of a more or less experimental nature were possible.

Consequently no application for renewal of the license was made and the station was deleted on October 29, 1923.¹

¹ Data furnished by William Hand Browne, Jr., professor of electrical engineering at the North Carolina State College of Agriculture and Engineering of the University of North Carolina, and files of the Federal Communications Commission.

NORTH CENTRAL HIGH SCHOOL

SPOKANE, WASHINGTON

EARLY in 1921 a group of boys under the direction of Mr. A. L. Smith, a member of the faculty of the North Central High School, built an amateur radiophone station which was later converted into a broadcasting station in the school building and applied for a federal license to operate. This license was granted on May 22, 1923,¹ and authorized use of 1,190 kc, 50 watts power, and "unlimited" time. The call letters KFIO were assigned.

On January 19, 1925, the station was shifted to 1,130 kc and a few months later permission was granted to increase the power to 100 watts.

When, on September 2, 1925, the station license expired, application for renewal was not made and the station was deleted by the federal government on November 28, 1925.

A new license was granted to the School on August 19, 1926, authorizing the same frequency, power, time, and call letters of the last license which the School held. On September 18 of that year the station was shifted to 1,100 kc and on June 1, 1927, it was moved to 1,220 kc where it was ordered to share time with Station KFPY. On February 20, 1928, KGY became another sharing station on this frequency.

On January 15, 1929, the station was shifted to 1,230 kc and limited to daytime broadcasting.

Little planned educational broadcasting was ever presented over this station. However, it was used in an irregular way to broadcast educational talks and to draw the public's attention to many of the educational features and programs of entertainment originating in the School.

The expense of maintaining the station was a constant burden to the School and became heavier as the art of broadcasting

¹ Records at the School seem to indicate that this license was granted in 1922, though those of the Federal Communications Commission place the date as 1923.

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developed. No advertising was permitted on the station, thus making the use of this means of revenue impossible. Further, the School Board "did not care to or was not able to finance" the project. Thus, during the entire history of its operation, approximately \$1,500 was spent on the station.

Consequently, after almost seven years of operating, the station was too much of a financial burden on the School and was sold to the Spokane Broadcasting Corporation and the license assigned to this organization on August 23, 1929.²

² Data furnished by Professor F. G. Kennedy, principal of the North Central High School, and files of the Federal Communications Commission.

NORTH DAKOTA AGRICULTURAL COLLEGE

FARGO, NORTH DAKOTA

DURING the summer and fall of 1922 members of the Engineering Department of the North Dakota Agricultural College built a 50-watt broadcast transmitter as an experiment in the department and for practice in building such equipment.

On December 14, 1922, the station was granted a federal broadcast license to operate on 360 meters (834 kc), permitting use of 250 watts power, for "unlimited" time. The call letters WPAK were assigned. A regular schedule of broadcasts, consisting of programs three times each week, was started soon thereafter—March 2, 1923. On March 10, 1923, the power permitted the station was placed at 100 watts and on October 11 it was reduced to 50 watts.

The station was shifted on the frequency band two times during the following year: on June 21 to 1,060 kc and on December 15 to 1,090 kc.

Equipment of the station was poor and inefficient, and the power was such as to make effective coverage of its service area impossible. Further, the College did not have finances sufficient to expand the station or to secure talent for presenting programs equal to those of commercial stations in the same area. Consequently it was decided by the College authorities that the expense of maintaining the station was not commensurate with the service rendered. Thus, when the license expired on November 24, 1926, no application for renewal was made and the station was deleted by the federal government on May 9, 1927.

Since commercial stations in Fargo were developing listening audiences and were reaching fairly well throughout the state, the College decided to buy time from Station WDAY. Under this plan a half-hour program was presented three times a week until the fall of 1929. Later this was increased to four times a week and in the fall of 1930 was changed to five times a week.

On January 4, 1932, agreement was made with the United

States Department of Agriculture by which the College edited its Farm Flashes and added to them information pertinent to the North Dakota area. This joint program was then sent to all the radio stations in the state and a member of the staff read it over Station WDAY. A five-minute wire market report was broadcast at this same period.

At the same time the College was preparing a program entitled "Educational," which was sent to all stations in the state. Other educational features have been broadcast by the College as occasion warranted.

At present the College makes use of a fifteen-minute period each day over Station WDAY, at a time, however, which is not satisfactory for reaching farmers and other agriculturalists—the time being 3:30 P.M. It also uses ten minutes daily over a station at Bismarck, North Dakota, at 12:45 P.M., an arrangement which has proved very satisfactory.

Recently the College installed recording apparatus and is now sending out electrically transcribed programs to stations desiring them. This venture is "proving very satisfactory."

The experience of the College, according to Mr. W. C. Palmer, of the institution, has been that "on the whole it was more satisfactory to cooperate with Station WDAY" than to undertake operation and maintenance of its own station.¹

¹ Data furnished by Dr. J. H. Shepperd, president of the North Dakota Agricultural College; Mr. W. C. Palmer, extension editor; and files of the Federal Communications Commission.

UNIVERSITY OF NORTH DAKOTA

GRAND FORKS, NORTH DAKOTA

ON AUGUST 13, 1923, the University of North Dakota was licensed to operate a broadcast transmitter on 1,310 kc, with 100 watts power, for "unlimited" time. The call letters KFJM were assigned. On November 6 of that year the station was shifted to 1,070 kc.

On January 15, 1925, the station was moved to 1,080 kc and, on June 1, 1927, it was placed on 900 kc.

On October 26, 1928, the station was ordered to share time with Stations KFDY and KFYZ on 550 kc. Less than two months later (December 17) Station KFJM was returned to "unlimited" time and placed on 1,370 kc.

During the summer and fall of 1936 the University installed a new 1,000-watt transmitter in a small brick building built to house this equipment, equipped on the campus a new modern studio, and erected a vertical type aerial. On October 20, 1936, operation of this new equipment began on an assigned frequency of 1,410 kc, using 1,000 watts power during daytime hours and 500 watts at night. With this increased power the University initiated plans for expanding its educational radio programs.¹

¹ Data furnished by Dr. D. R. Jenkins, professor of electrical engineering at the University of North Dakota, and files of the Federal Communications Commission.

NORTHEAST MISSOURI STATE TEACHERS COLLEGE

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KIRKSVILLE, MISSOURI

SOMETIME before November 26, 1926, the State Teachers College, located at Kirksville, Missouri, took over a radio transmitter from the Kirksville Chamber of Commerce.

On December 7, 1926, this station was licensed for operation on 1,330 kc, with 15 watts power, for "unlimited" time. The call letters in use at that time were **KFKZ**.

A schedule of two hours per week of broadcasting was maintained, the programs consisting largely of music and addresses by members of the College faculty and student body. The station, however, did not function "to any great extent either as a laboratory for the school or as an educational agency for the school's constituency."¹

In the license issued on April 11, 1927, the name of the College was changed to Northeast Missouri State Teachers College.

On October 29, 1928, the station was shifted to 1,200 kc.

With only 15 watts power the station had a range of approximately fifty miles, a distance not sufficient to reach over the entire area which the College felt should be covered if adequate radio service was to be rendered. Accordingly application for 100 watts power was made in order to better serve the district.

This application was rejected. Consequently, when the license expired on July 31, 1929, no application for renewal was made and the station was deleted by the federal government on May 12, 1930.²

¹ Quoted from a letter by Dr. John Harty, associate professor of physics at Northeast Missouri State Teachers College, dated March 10, 1933.

² Data furnished by Dr. Harty and files of the Federal Communications Commission.

NORTHERN STATE TEACHERS COLLEGE

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MARQUETTE, MICHIGAN

AN EXPERIMENTAL wireless station was initiated at the Northern State Normal School, later the Northern State Teachers College, on January 25, 1922, operating on 360 meters (834 kc). This equipment was employed to broadcast scores of athletic games and to receive radiophone concerts, especially those broadcast by the Westinghouse Electric Company at Pittsburgh and Chicago. At times, the correct time, weather reports, and news bulletins from Washington were received over the apparatus. Whenever any important meeting or tournament was being conducted on the school campus, reports and results were wirelessly over these facilities.

Harry Bottrell, a former United States Navy wireless operator, was in charge of the station.

For March 10 and 11, 1922, a temporary broadcast permit was granted the station by the federal government for special purposes. The call letters WBI were used under this permit.¹

¹ Data furnished by Dr. Webster H. Pearce, president of the Northern State Teachers College, and files of the Federal Communications Commission.

OGLETHORPE UNIVERSITY

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OGLETHORPE UNIVERSITY, GEORGIA

THROUGH the generosity of Dr. and Mrs. J. T. Lupton and their son, Carter, Oglethorpe University was enabled to purchase the transmitter of the Kent's Furniture and Music Store and, with some additions to and improvements of the equipment, to instal it on the campus at Oglethorpe.

In the application for transfer of the license to the University and for license to operate the transmitter, it was stated:

Oglethorpe University proposes to establish a Department of Education by radio. We propose to conduct a complete system of college education by lectures over radio, supported by correspondence, conferences, and examinations, these courses to be conducted in a standard, regular and systematic manner and to be the full equivalent of courses in the classrooms of the University.

Oglethorpe is now conducting many extension courses in downtown Atlanta and desires to still further develop and improve the principle of education by radio.

Among the courses which we expect to teach in this way are English, History, modern and ancient Languages, Sociology, Ethics, all commercial subjects and lecture courses in the Sciences, and in addition thereto, popular courses in the appreciation of music, literature and art. In fact, we propose to found and operate a complete Extension University of the Air.

The Radio Department will be of equal standing, dignity and order with the under-graduate and graduate Departments of the University, and we propose to demonstrate the fact that a full college education can be given by radio, supplemented by the ordinary facilities of our campus equipment.

The Department will be under the direct supervision of the President of the University. It already has hundreds of extension students ready to use its facilities. The faculty is ready and competent to do the work, and the necessary funds are available. Our location in the suburbs of Atlanta gives us a practical field of operation.¹

The Commission gave its permission for transfer of the license to Oglethorpe University effective February 27, 1931, and issued a broadcast license to the University on April 21 of that year. This license permitted operation of the transmitter on 1,310 kc, with 20 watts power, time to be shared equally with

¹ See files of the Federal Communications Commission.

another station "to be assigned later." The call letters WRBI were assigned.

Immediately the station was moved from Tifton, Georgia, where it had been located while owned by the Kent's Furniture and Music Store, and installed on the University campus at Oglethorpe University, Georgia.

On May 23, 1931, the station was shifted to 810 kc and permitted to increase its power to 100 watts. However, it was restricted to daytime broadcasting at this time.

The first program broadcast over the station from its new location on the University campus consisted of the annual commencement address closing the 1930-31 school year.

On June 26, 1931, the station was again shifted, this time to 1,370 kc where it was permitted to use "unlimited" time. Permission was also given at this time to change the call letters to WJTL.

Following its plan, as outlined in the application for its first license, the University, on June 5, 1931, inaugurated a complete program of college education by lectures over the radio, supported by correspondence, conferences, and examinations. These courses were conducted in a standard, permanent, and systematic manner and were the full equivalent of similar courses offered in the classrooms of the University. Broadcasts of such courses were scheduled during the mornings, afternoons, and evenings for six days a week and constituted the greater part of a standard college education. Only those courses requiring laboratory work were omitted.

Lecture periods were of fifty minutes each and lessons were, in many cases, taught direct from the classrooms.

All radio students were required to register in the same way as regular students and to pay a tuition charge of \$15 per year-hour. This permitted them to take the course one hour per day for three days of the week during the radio term of three months. A student was permitted to register for as many year-hours as it was believed he could carry profitably.

Those enrolled in the radio classes were considered on the same basis as regular students of the University. Notification as to texts and general requirements and all instructions as to con-

duct of the course or courses were mailed to them. A student who was a candidate for a degree was required to do the work in a regular and systematic manner, to attend the radio lectures regularly, to make notes thereon, to submit such to the instructor in charge for examination and criticism, to study the texts and correspondence sheets furnished by the University, to meet the instructor at convenient intervals for conferences and guidance, either personally or by telephone, to stand the customary examinations at the close of the course, and in every way to conduct his work on a level equal to that done by students meeting regularly in the classrooms. Each student was required to send in to the instructor his notes immediately at the close of each lecture. To these notes he was urged to attach any questions which he desired to have answered. These questions were taken up at the next lecture period by the instructor and discussed. Questions might also be telephoned to the instructor.

Careful tests were made to determine the relative quality of the work done by radio students as compared with that done by those regularly on the campus. It was found that the former was the full equivalent of that done in other divisions where equal course credit was given. Thus the radio division was considered "of equal standing, dignity, and order with the undergraduate and graduate departments of the University."²

Courses offered during the session of 1931-32 consisted of the following subjects: Beginners' Course in German, Mental Hygiene, History and Appreciation of Music, History of English Literature, Thesis Writing, History and Literature of Georgia, American Literature, Short Story, Literature and Life, Psychology for the Writer, Newspaper and Magazine Writing, Beginners' Conversational Spanish, Beginners' Conversational French, History and Interpretation of the Bible, Comparative Religions, Contemporaneous Civilization, Philosophy, Study of Society, Economic Problems, Business Problems, and Human Body, Its Use and Abuse.³

A number of scholarships were made available to students

² Quoted from a bulletin issued by the University announcing work of the Radio Division of Oglethorpe University, session of 1931-32, p. 3.

³ For description of these courses see *ibid.*, pp. 4-12.

with ability to serve as announcers and these individuals composed the majority of the announcing staff. Assisting these were the regular licensed operator, a staff of engineers, and professional announcers.

By 1933 two points of broadcast had been established, one at the location of the transmitter in Lupton Hall and the other at the Yaarab Mosque in Atlanta.

During the summer session of 1933 the following courses were offered via radio: Spanish, English Idioms and Good Usage, Mental Hygiene, English Literature, Sociology, United States Government, Music Appreciation, and History and Interpretation of the Bible.

Another feature of the University's radio service was the School of Broadcasting "especially designed to prepare students for the technical, the commercial, the production and the managerial departments of radio work."⁴

Four courses were offered in this School. First, a one-year course, preparing the student to obtain a government license of the commercial second class or of the unlimited broadcast class, and consisting of

	Credit Hours
Radio Theory.....	3
Radio Laboratory.....	3
Code Practice.....	5
English Composition, Spoken and Written..	3
Typing.....	3
Total.....	17

Second, a two-year course, preparing the student for the position of program director and at the same time enabling him to obtain a junior-college diploma, and consisting of

	Credit Hours
English Composition, Spoken and Written..	3
English Literature.....	6
Two years' work in each of two languages...	12
Physics.....	4
Studio Management, A and B.....	6
History and Appreciation of Music.....	3
Total.....	34

⁴ Bulletin announcing School of Radio Broadcasting, issued by Oglethorpe University, p. 2.

EDUCATION'S OWN STATIONS

Third, a course preparing the student for the position of studio manager, and consisting of

	Credit Hours
Accounting.....	4
Two business courses or, for students special- izing in technical work, Mathematics and Advanced Physics.....	6
Drama.....	2
Advanced Writing.....	3
Total.....	15

To any of the three courses outlined above a student was permitted to add an extra year and, upon the completion of this work, was granted the degree of Bachelor of Arts in Radio Broadcasting. This year consisted of

	Credit Hours
Psychology.....	3
Chemistry.....	4
Cosmic History.....	1
Radio Theory and Laboratory (Physics)....	6
Studio Management C.....	3
Total.....	17

The courses leading to this degree are standard college credit work to which is added special work designed to fit the student for his particular vocation.⁵

In announcing this program the University states:

It is believed that this is the first school of Aerial Journalism established in the history of the world.

Oglethorpe University is the first college in America to plan systematic college work leading to proficiency in Radio Management and Program Directing. Students who heretofore have had to attend technical schools of Radio can now get this work in connection with such college studies as they may wish to take, in addition, for a liberal education. Those who are especially ambitious may get a college degree while specializing in radio practice and qualifying for a calling or profession.⁶

This program was conducted until 1935 when the station was sold to the Atlanta Broadcasting Company and the license transferred to this organization on November 26, 1935. Under

⁵ For description of the content of each course see *ibid.*, pp. 4-9.

⁶ *Ibid.*, p. 2.

this sale agreement the University was permitted, for a period of three years from January 25, 1935, to broadcast educational programs from the station during the hours from 2:00 to 5:00 P.M. daily, except Sunday.

Following sale of the station the call letters were changed to WATL.

Though ownership of the station has passed completely out of the hands of the University, a continuous program of broadcasting is maintained by the institution and lectures from the campus and the School of Radio Broadcasting are continued as before.⁷

⁷ Data furnished by Dr. Thornwell Jacobs, president of Oglethorpe University, and files of the Federal Communications Commission.

OHIO MECHANICS INSTITUTE

•

CINCINNATI, OHIO

DURING 1919, or thereabouts, the Ohio Mechanics Institute inaugurated a wireless station with the intention of holding a place "on the air" until such time as the general trend of broadcasting should be conclusively demonstrated. It was the plan of the Institute, should this trend be in the direction of education, to move from this to the establishment of a strong educational station.

On May 13, 1922, the Institute was granted a broadcast license permitting operation of its station on 360 meters (834 kc), with 350 watts power, for "unlimited" time. The call letters WAAD were assigned. On August 3, 1923, the power was reduced to 25 watts and on January 12, 1925, the station was shifted to 1,160 kc.

Three other shifts of frequency assignment were made during the history of the station: on June 1, 1927, to 1,120 kc; on December 1, 1927, to 1,300 kc; and on October 29, 1928, to 1,420 kc. On this last frequency the station shared time with Station WSRO.

During the period from 1919 to 1929 no considerable amount of educational work was attempted through the station. In order to hold its license the Institute broadcast one hour a week, these programs being of an educational nature. The general character of the material broadcast was similar to that found in the more popular portions of *Science*, the journal of the American Association for the Advancement of Science.

When it became evident that radio was developing most rapidly along commercial lines the Institute decided that it was not part of its task to attempt the operation of a station. Of this Dr. John T. Faig, president of departments of the Institute, says:

We learned that radio broadcasting in this country was developing along commercial lines. A tendency to develop in that way was unmistakable. It

took some years to demonstrate this tendency. As soon as it was demonstrated, the Institute lost interest in its broadcasting station.¹

In another place Dr. Faig says:

Had radio broadcasting developed along educational lines rather than advertising lines, we would have felt it within the province of an educational institution to maintain a radio station. The development of radio broadcasting along advertising lines was rapid, and necessitated great expenditure for improved apparatus. This was entirely beyond the resources of the Ohio Mechanics Institute, and there seemed no point in maintaining a station when it was evident that its educational features would not be of great importance.²

Consequently the Institute's application for renewal of its broadcast license was designed for hearing before the Federal Radio Commission on May 7, 1929. Since the applicant did not desire to be heard, the Commission denied the application and ordered the station deleted on June 15, 1929.³

¹ Quoted from a letter by Dr. Faig dated March 4, 1933.

² Quoted from a letter by Dr. Faig dated March 24, 1936.

³ Data furnished by Dr. John T. Faig and files of the Federal Communications Commission.

OHIO STATE UNIVERSITY

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COLUMBUS, OHIO

ONE of the outstanding pieces of work now being done in education via radio is that of Ohio State University. Its research is setting standards for the profession, while its program experimentation is opening up new fields and determining techniques for a more efficient use of the radio as a teaching device.

Work already done by the University has convinced those in authority that "educational broadcast experimentation is past the fumbling stage." With past experiences showing the direction to be taken for effective work, the University has now turned its attention to the details of program organization and presentation which, it is believed, will make educational programs just as interesting and attractive as those of a more commercial hue.

From the beginning those in charge of broadcasting at Ohio State University have taken the broad view of "education by radio." They have not been content with lectures and mere presentation of facts, but, believing that the cultivation of interest in good music and drama is definitely educational, the staff has included these features regularly in its programs.

Fourteen years of regular broadcasting have given to the University a broad foundation of experience upon which it has built and continues to build effectively. This experience has included:

1. A Radio Junior College, bringing higher education within the reach of those who cannot attend the University
2. Agricultural programs, meeting the educational and entertainment needs of Ohio's farm families
3. Regular presentations of drama and music
4. "School of the Air" broadcast for students in elementary and secondary schools
5. Development of a "Radio Workshop" to aid in "dressing up" educational programs
6. Experimentation with various techniques for the presentation of information through lectures, discussion groups, debates, and the like
7. Broadcasting of athletic events

In all of these, as well as in the other phases of its program, the University has had a twofold educational purpose: first, the obvious aim of presenting educational programs for its listeners and, second, the educational value to participants in its programs, giving them the opportunity to develop effective radio techniques through experimentation and experience.

The interest in radio communication at Ohio State University dates back to 1909 when the Department of Electrical Engineering offered a course in radio and wireless telegraphy. In this same year a wireless station was established, first as a receiving unit only. By the end of the year transmitting equipment was added. Considerable experimentation on the part of students and faculty members of the Department of Electrical Engineering followed and improvements in the equipment of the station were made from time to time.

During the floods of 1913 the University station was the only means of communication between Columbus and the outside world. Messages were sent to the University of Michigan and relayed by land line from there.

During the World War a radio unit of the United States Army School of Military Aeronautics was established at the University under the supervision of the Department of Electrical Engineering.

The first regular broadcasting from the University campus began sometime during 1921 under an experimental license, with a power of 100 watts and on 425 meters.

On June 3, 1922, a broadcast license was granted the University by the Radio Division of the Department of Commerce, permitting operation of its transmitter on 360 meters (834 kc), with 650 watts power, for "unlimited" time. The call letters WEO were assigned.

Agricultural market reports and weather information, from a leased wire of the United States Department of Agriculture, were the first regular programs broadcast.

On March 13, 1923, the power was reduced to 250 watts and broadcasting restricted to late afternoon and early evening. However, on June 18 of that same year, the power was increased

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to 500 watts and the station granted "unlimited" time for broadcasting. Following this change, development of the station has been continuous.

In October, 1923, the station qualified as a "Class B" station, which placed it on a preferred list of broadcasting stations from the point of view of equipment and service rendered. On September 26, 1924, the station was shifted to 1,020 kc.

After the first year of regular broadcasting, a faculty Broadcasting Station Committee was appointed by the president of the University to direct activities of the station. This committee was composed of representatives from the Alumni Association, News Bureau, College of Agriculture, and several faculty members selected at large. Its influence in creating further and more intensive interest in broadcasting at the University resulted in the reorganization and building of a new station during 1925. The committee also sensed the possibility of extending the University's service throughout Ohio and began planning in this direction.

During the summer of 1925 the transmitting equipment was moved from the electrical engineering building, where it had been located, to a separate structure erected between two radio towers which were provided at the same time. This new arrangement and more favorable surroundings permitted of improved service to listeners, though the power remained at 500 watts.

On July 19, 1926, the station was authorized to increase its power to 750 watts. A year later, on June 1, 1927, the frequency was changed to 1,060 kc and the station ordered to share time with Station WAIU.

On November 10, 1928, the station was placed on 550 kc where it shared time with Station WKRC. By this arrangement the University was given approximately one-third of the total time on this frequency.

On June 15, 1929, the station was shifted to 570 kc and ordered to share time with Station WKBN.

One of the important points in the relationship of Station WEO with the Federal Radio Commission came as a result of

an order of the Commission requiring all stations dividing time to establish and agree upon a definite schedule of broadcasting time. The University and Station WKBN were unable to reach such agreement and the Commission called representatives of both stations for a hearing in Washington, D.C., during December, 1931. The report of the examiner who presided at this hearing was decidedly unfavorable to the University as only undesirable hours were recommended for Station WEAO. The attorney-general of the state of Ohio issued a vigorous protest with the result that the University was granted a schedule of hours quite satisfactory for its purposes. This incident had much to do with the impetus given to educational broadcasting at the University early in 1932, resulting in the installing of a new transmitter and the encouragement of numerous program activities. It was felt that the Commission recognized the importance of the service rendered the public by the University station.

Soon after the erection of the new transmitter, in 1925, the broadcasting station was separated from the Electrical Engineering Department and a new department created—the Broadcasting Station Department. This was the result of a desire to serve all units of the University on an equitable basis and to separate the teaching from the public-service activities. This new department was placed under the College of Engineering where it has remained.

During the summer of 1928 two broadcasting studios, a control room, and offices were built in the north end of the Communication Laboratory to accommodate the broadcasting station. These studios provided satisfactory accommodations for the comprehensive program of broadcasting that was being developed to present adequately the entire University. Improved equipment was provided in these studios for more satisfactory transmission of programs. During May, 1931, a complete new speech input equipment was installed, providing the best available quality of transmission. When the Federal Radio Commission made a request for more strict frequency maintenance, a complete modern Western Electric 1,000-watt radio

transmitter was provided and placed in operation in the station building.

On March 24, 1933, the Federal Radio Commission granted Station WEAO an increase in power to 1,000 watts for daytime operation, though at night the power was kept at 750 watts. This greatly improved reception of the station throughout the state. Field-strength measurements, made in co-operation with the Ohio State University Engineering Experiment Station, showed that a signal of one millivolt per meter existed at a distance of sixty-eight miles and that a signal of one-half millivolt per meter existed at one hundred miles. In other words, the station could be heard clearly to a distance of sixty-eight miles under ordinary conditions and up to one hundred miles under favorable conditions.

Development of personnel and policies relating thereto has been such as to exert wide influence upon the development of the station itself. During the earlier years Professor R. A. Brown, of the Department of Electrical Engineering, directed the activities of the station under Professor F. C. Caldwell, then head of the department. During the first year of regular operation students were employed on a part-time basis to carry out all phases of the station's work. During the summer of 1923 a full-time radio operator was employed. Shortly thereafter a program director was added to the station staff and assigned to management of program activities and announcing. Use was also made of students in carrying on the program activities and technical operation. Following the reorganization in 1925 Professor C. A. Wright, of the Department of Electrical Engineering, became director of the station and other individuals were employed. When Professor Wright left the University in 1927 Mr. R. C. Higgy became director of the station.

An early policy of employing full-time people to conduct the activities of the broadcasting station was established. This has resulted in intensive development of the station's programs and technical equipment. Students have been employed as operators and announcers to a very limited extent.

In 1933 six full-time people were employed, devoting their

entire time and energy to broadcasting: a director, a program arranger, an announcer, two operators, and a stenographer. Part-time employees included a dramatic assistant and critic, an announcer, an operator, and a publicity writer. Now eight people devote full time to the work of the station.

Effective September 1, 1933, the Federal Radio Commission granted a request of the University station to change its call letters to WOSU, which letters are still being used.

During the first year of operation the programs were under the direction of students and consisted of various types of experimental broadcasts. Student groups and Columbus musicians were invited to broadcast, while a few lectures were presented.

A full-time program manager, Mrs. F. G. Charles, was employed in July, 1923, and the programs were expanded to include three daily periods on the air and two evening programs. The daily periods consisted for the most part of agricultural market news and weather forecasts, with an occasional lecture by a member of the University faculty. The evening programs, during 1923 and 1924, included many lectures and musical features presented by student groups and Columbus musicians. Agricultural information was broadcast extensively, the College of Agriculture recognizing early in the station's history that radio was a most effective means of reaching the farmer.

Program records now available show clearly that an effort was made to broadcast materials desired by the public. Analyses of the large volume of listener mail then received were made in an effort to determine the nature of their desires. Listener surveys have been made each year to determine what those within the area covered by the station desire and need most, and programs have been built around the results so obtained.

During 1925 the first investigation of the reception of the station among listeners was made by Mr. Charles F. Class in a thesis presented for the Master's degree in the Department of Rural Economics of the College of Agriculture. The title of this work was *Some Social, Educational, and Economic Aspects of Radio in Relation to Rural Life*. This was the result of several months' study to determine which programs were most listened

to, and an endeavor to determine the type of programs desired by the public.

Since this original investigation similar surveys have been made each year. With the establishment of the Radio Division of the Bureau of Educational Research, in 1931, additional research has been made along this line.

In June of 1930 an Institute for Education by Radio was established and the first meeting held at the University. Here, for the first time, leaders in educational broadcasting assembled for a ten-day discussion of mutual problems. Representatives of commercial and educational stations, state and national governments, as well as delegates from England, Canada, Mexico, and Ireland, attended.

Proceedings of the Institute were published under the title, *Education on the Air*. These Institutes have become annual events at the University, and each year the publication *Education on the Air* has been "starred" as one of the fifteen best books of the year in the field of education.

The research program and the annual Institutes have been made possible through grants from the Payne Fund, of which Mrs. C. C. Bolton, of Cleveland, Ohio, is president.

Those most prominent in directing radio program research work at the University have been the late F. Hillis Lumley and I. Keith Tyler. These men not only have carried on intensive studies in the nature of surveys and work with adult and student groups, but have also conducted an exchange of information with other educational broadcasting stations. Each station and research agency sends information on its work to the University to be passed along to all the others.

The WOSU program offering was gradually expanded until 1925 when, with the reorganization and enlargement of the station, a schedule of fifteen hours of broadcasting was established. This was further expanded to twenty hours per week during 1926 and a continual growth is to be noted until 1933 when the weekly schedule included an average of thirty-eight hours of program broadcasting. During 1927-28 a total of 976 program hours were broadcast; in 1928-29, 1,008 hours; in

1929-30, 1,014 hours; in 1930-31, 1,360 hours; and in 1931-32, 1,685 hours. By 1932-33 the total was 1,854 hours.

An extensive schedule of lectures by members of the faculty had been developed by 1926 when forty-six series of lectures were broadcast by forty departments of instruction of the University. Each series consisted of six fifteen-minute talks. In addition, many single lectures were broadcast.

An evening program known as Farm Night, broadcast under the direct supervision of the College of Agriculture and the Ohio Agricultural Extension Service, was begun in the fall of 1926 when all agricultural talks and information (excepting market news) were scheduled during a single evening's program. Conservative estimates in 1932 included 92,000 farm listeners regularly during this program in 46,000 farm homes, or one out of each four in the state. An experiment attempted in 1932 coordinating extension meetings with radio talks proved successful. Pictures were projected before the audiences and synchronized with the radio talks at five county meetings. Station WOSU has co-operated with the United States Department of Agriculture since 1927 in broadcasting information prepared for radio by that agency. During the fall of 1926 a half-hour program was broadcast three days per week by the School of Home Economics. This feature has been continued as a regular offering of the station.

Throughout the history of the station special events occurring on the University campus and in Columbus have been broadcast. These have included Farm Week lectures, various short courses, athletic events, lectures by noted speakers, graduation exercises, sessions of both houses of the Ohio legislature, inaugurations of the governors of Ohio, special messages by the governors, and the like.

In January, 1929, the State Department of Education inaugurated a series of school programs known as the Ohio School of the Air. Many of these programs have been presented by members of the faculty of the University and produced in the WOSU studios, frequently being transmitted in addition by other Ohio stations. Many departments of the state govern-

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ment have also broadcast through the University station. During 1933 ten different state departments were represented on the station's programs.

In 1930 the broadcasting of French and Spanish lessons was undertaken. Later Italian was added. The lessons were given by faculty members who had resided in those countries, making it possible for students to hear the language as spoken by the native tongue.

Paradoxically, it was the "depression" which gave education via radio its big stimulus at Ohio State University. On the one hand, the station suffered from depleted funds while, on the other hand, it experienced a multitude of new demands for service. Out of this situation grew the Radio Junior College, first presented on the air in January, 1934. This project has been one of the most unusual and effective radio educational developments in the station's history.

Created as an emergency project, it has been partially financed by government aid, three successive agencies furnishing money for assistance in printing and distribution costs: the Civil Works Administration, the Federal Emergency Relief Administration, and the Works Progress Administration. The University provides the radio station, instructors from the regular faculty, and working facilities while the federal agencies provide clerical and field workers drawn from the ranks of the unemployed.

In the three years of its existence enrolment figures for the courses of college level offered by radio have more than trebled. A total of 9,326 listeners have availed themselves of instruction. Each quarter some fifteen hundred students are enrolled, taking an average of 1.9 courses each. Sixty-five per cent of the students have been found to live in urban areas and the remainder in rural districts.

Fifty-nine courses, six directly from the classroom, have been offered, the general subjects including political science, French, Spanish, English, history, psychology, sociology, fundamentals of business, art appreciation, philosophy, home economics, edu-

cation, home engineering, poultry husbandry, classical language, public speaking, music appreciation, and geography.

Some courses bring the same speaker to the microphone each period in the quarter while others present a number of speakers on related phases of the subject. Some depend on lectures entirely while others use the method of conversation and interview. University instructors have, for the most part, contributed their time to the Radio Junior College. In some cases

TABLE 1
ENROLMENTS IN COURSES OFFERED DURING NINE QUARTERS
BY THE WOSU RADIO JUNIOR COLLEGE—CLASSIFIED
BY SUBJECTS

Subject	1 Winter, 1934	2 Spring, 1934	3 Fall, 1934	4 Winter, 1935	5 Spring, 1935	6 Sum- mer, 1935*	7 Fall, 1935*	8 Winter, 1936	9 Grand Total Enrol- ment
1. Political Science	372								372
2. French	305		359	486	260				1,410
3. English	395	536	259	570	369	361	242		2,732
4. Spanish	92	466					324	278	1,160
5. History	571								571
6. Psychology	625	317	527						1,469
7. Sociology			368				227	555	1,150
8. Fundamentals of Business			159						159
9. Art Appreciation			498	360					858
10. Philosophy				399					399
11. Home Economics				493	419	1,118	232	582	2,844
12. Education				260	211		155	442	1,068
13. Home Engineering				190	195				385
14. Poultry Husbandry					687			810	1,497
15. Classical language					196				196
16. Public Speaking					397				397
17. Music Appreciation						251			251
18. Geography of Commerce						246			246
Total	1,164	2,198	1,960	3,285	2,734	1,976	1,180	2,667	17,164

* Enrolments solicited by air and mail only.

teachers have been relieved of other work in their departments. In some twenty-five counties interest in the College has been sufficiently great to justify the employment by the emergency school administration of local teachers to aid the students with their work.

Outlines, syllabuses, supplementary notes and booklets, and, in some cases, complete texts are furnished free of charge to those enrolling for the courses. By filling out a registration card listeners are entitled to all material, the registration card being used for analysis at the station. Such an analysis is assembled in Table 1.

In addition to the Radio Junior College other programs from the station have been expanded to include the new techniques being developed in educational broadcasting. These programs have been making new use of the round-table form of presentation, of both program and incidental music and of student talent. These student programs have utilized both performing and creative talent.

Now, with a more definite idea of the sort of thing which can and should be broadcast successfully, the University has started to "consolidate" its position in the radio education field.

One step in that direction has come with the employment of Dr. Byron B. Williams as program supervisor. With experience in journalism and educational work, Dr. Williams devotes his attention largely to the stimulation of new programs and to co-ordination of the educational broadcasts.

Another has come with the arrival of Mr. Meredith Page, former program director of Station WOR. He divides his time equally between the radio station, the Bureau of Educational Research, and the State Department of Education. Mr. Page has established a radio "workshop" with a twofold purpose: to study methods of "dressing up" the programs so that educational broadcasting no longer needs to be considered dull and to give students interested in radio an opportunity for practical experience.

Some fifty students now spend a considerable part of their spare time at the radio station in this sort of work. No credit has been offered up to this year, but six credit courses in radio have been inaugurated this quarter (winter, 1936) and others are planned.

Among the regular broadcasts from the classroom have been those of Professor Harold Burtt in psychology; Professor F. E. Lumley, Professor Viva Boothe, and Professor Lloyd A. Cook in social problems and sociology; Professor Harlan Hatcher in English; Professor Royal D. Hughes in music; and Professor Roderick Peattie in geography. The instructors are agreed that such broadcasts are valuable and well received.

Professor Burtt found the radio broadcasts to be of special

interest to shut-ins who welcome the contact with the outside world, those just out of high school who are unable to get positions or to attend college, and housewives whose children are away at school or are grown up.

Fan mail received by Professor Burt has been full of human interest. Radio students are quite frank. Some sent photographs; others sent questions which were answered in the broadcasts.

Professor Burt found his broadcasts to be most satisfactory when he sat comfortably before the microphone, completely relaxed and assuming a "chatting" tone of voice. As much of the classroom atmosphere as possible has been carried through the air—even to student coughs and sneezes.

Professor Cook has broadcast his class in social problems, with seventy students in the classroom and more than five hundred others registered for the study via radio. Taxi drivers, housewives, farmers, college graduates—all are included in his audience, as is shown by the daily stream of mail. Professor Cook has sought to have his listeners interpret the broadcasts in terms of their home communities. At Put-in-Bay a group of listeners meet regularly after the broadcasts to discuss their community. In a Columbus young people's society one member is assigned to hear the broadcast each day, and his report forms the basis of discussion at the society's next weekly meeting.

The radio teacher has to "watch his step," Professor Cook has found. In one broadcast he mentioned the physically handicapped as a community problem and the next mail brought letters from crippled people protesting that they did not care to be considered community problems.

On another occasion he interviewed before the microphone a woman who had been through the Russian Revolution. The broadcast brought out only the hardships suffered by innocent victims in any revolution. But the next day he received letters from both pro-Soviet and anti-Soviet listeners, each group charging that the broadcast was partial to the other side.

Professor Cook has found the parents of a number of his students in the classroom listening in, and he sees in the broad-

casts an important means of closing the gap between generations.

Professor William L. Graves undertook a series of broadcasts reluctantly. His work differed from that of Professor Burt and Professor Cook in that he did not have a student class to consider. He was talking, as he thought, entirely "into a void." Admitting the skepticism with which he undertook the series, he says: "When I began to hear from interested listeners, I decided that the attempts toward assisting people in an intelligent knowledge of an enjoyment of poetry, fiction, and biography were very well worth while."¹

Mail indicated that city people were well represented in the radio audience, but the material seemed especially welcome in the small towns and villages and in country homes. Says Professor Graves: "I was struck by what seemed the very sincere appreciation of what I was trying to do. As is usual in radio work, there was special appreciation from intelligent elderly and shut-in people. Young members of families frequently wrote in behalf of older ones to whom the talks had been enjoyable."²

Then there is the case of Professor Robert B. Stoltz, teacher of dairy technology. A few years ago he undertook a talk one night on dairy technology and the opportunities it offers for young men. As the talk ended he thought of the effort as wasted. Months later a boy enrolled in the course because his parents on a farm in southern Ohio happened to hear the talk. That young man now is rated as an expert in cheese-making, employed co-operatively by the Ohio Swiss Cheese Association and the University.

Radio speakers at the University are generally agreed that informality and variety are necessary in educational broadcasts. They believe that lectures should be kept at a minimum, with question-and-answer periods, interviews, and classroom discussions as means of varying the programs.

¹ Quoted from a study prepared for this work by Mr. R. C. Higgy, director of Station WOSU.

² *Ibid.*

Drama also has an important place in the station's schedule. The WOSU Players have been broadcasting regularly from the University station for nine years. During this time they have presented more than three hundred different plays either written especially for or adapted to radio. Through this medium numerous students have had training and experience in radio dramatics and other students have had training in the writing of script especially for radio purposes. Friel Heimlich is the present director.

For five years Station WOSU has conducted an annual dramatic competition for Ohio colleges, plays being broadcast from the Ohio State station. Winners in these contests have included Baldwin-Wallace, Western Reserve, and the University of Akron.

The Ohio Theatre of the Air has come into existence through the activities of Mr. Heimlich. This activity is open to all Ohio colleges. Especially active in the early stages have been Kent State, Ohio Wesleyan, Marietta, and Denison. The purpose of the organization, according to the charter, is "to encourage the preparation, production, distribution, and the exchange of information regarding play-scripts adapted for radio use, by Ohio Universities, Colleges, and Secondary Schools."

The association will serve the double purpose of developing dramatic talent for radio and of furnishing opportunities for development of new ideas in radio drama. Ohio State's station will be available to the participating groups and it is hoped that co-operation will be forthcoming from commercial stations located near the schools in extending time for the presentation of plays coming out of the radio workshops.

Music has had a regular place in Station WOSU's programs since the beginning of the station. Mrs. Charles, program director and music supervisor for fifteen years, is a musician herself and her contact with musical groups has brought to the campus microphone various individuals and organizations from central Ohio, in addition to the programs featuring students. Mrs. Charles has made many important contributions to the development of radio education at the University. She was a pioneer

in proving that women have a place in the executive end of radio.

For five years Station WOSU has had its own line to the studio of Frew Mohr, Columbus teacher of the organ, and his programs are regular offerings of the station.

Morning Melodies has been one of the most popular features on Station WOSU for several years. A considerable library of recordings has been built up for use on these programs, helping to familiarize Ohioans with the work of the masters.

Station WOSU has the only W.P.A. radio orchestra in the United States, twenty unemployed musicians having been organized for that purpose by Mr. Edwin Stainbrook, director. Also, the station has had an ensemble from the ranks of students being helped through the University under the F.E.R.A. and N.Y.A. programs' part-time employment.

The University's Department of Music has regular periods in which students and faculty members are presented. Whenever funds are available it is planned that the Music Department will have on its staff some member who can give most of his time to the arrangement and direction of radio musical offerings.

Among the first presentations from the University station were programs devoted to agriculture. Now there is the daily Farm Night program each Monday evening.

Recently the Office of Agricultural Publications has added to its staff Mr. G. E. Ferris, who has charge of the agricultural programs. Mr. Ferris has had previous radio experience in Kansas. He arranges not only the Farm Flashes and Farm Night programs, but also a radio course in poultry husbandry. Home economics broadcasts also are regular features at Station WOSU.

The station has each year brought intimate accounts of athletic contests to its listeners. Mr. C. W. Pettegrew, of the station staff, interprets such contests in addition to his other duties as announcer and news writer.

That the farm features have real appeal has been definitely established. More than three thousand families have asked to be placed on the mailing list for information concerning agricultural broadcasts. Questions concerning the poultry husbandry

course pour in at such a rate that an overworked staff sometimes runs two weeks behind in getting them answered.

Of unusual interest are the spraying instructions broadcast to horticulturalists each spring. Effective spraying depends upon proper weather conditions. Keeping in close touch with the weather bureau, Station WOSU goes on the air with daily instructions during the spraying period. This action has meant many thousands of dollars to Ohio orchardmen.

By virtue of its position as a part of the state-supported system of education in Ohio, the University has recognized its duty to aid the elementary and secondary schools in making good use of radio. One such aid has been the publication of the *Ohio Radio Announcer*, started in 1935 by the Radio Division of the Bureau of Educational Research. Each week the programs to be offered the following week by the chains and by nineteen Ohio stations are analyzed. Those appearing to have educational value are listed in the publication, with suggestions as to the class for which they will be useful. The *Ohio Radio Announcer* is sent free upon request, and in three months' time the mailing list passed the three thousand mark.

Another publication of the Bureau is the *News Letter*, a medium through which teachers in all parts of the United States exchange information and experiences on the use of radio in the schools.

Other means by which the University has been assisting the schools of the state through the medium of radio include:

A course each summer for teachers on the use of radio in the classroom.

Broadcasting by faculty members of suggestions for groups preparing to compete in state contests, such as those in music and debating.

Conducting of an annual Ohio high-school radio festival, schools of the state being invited to come in for periods of thirty to forty-five minutes during which time musical and dramatic numbers are given by the students. The festival has a twofold purpose: to encourage radio talent and to familiarize students with the operation of a radio station. Mount Vernon high school won in the first festival, held during December, 1935.

Co-operating with the State Department of Education in the Ohio School of the Air. The School of the Air broadcasts for the most part go out over Station WLW, but 80 per cent of them originate in the studios of Station WOSU.

More interested in the cause of radio education than in the mere promotion of its own station, Ohio State University has been co-operating in various ways with other stations. Six Ohio stations regularly pick up programs originating from Station WOSU, one using more than twelve hours a week. Two others take programs occasionally. Among the stations carrying University broadcasts regularly or occasionally are: WALR, Zanesville; WCOL, Columbus; WAIU, Columbus; WHK, Cleveland; WHBC, Canton; WJW, Akron; and WLW and WCPO, Cincinnati.

The Farm Flash broadcasts originating at Ohio State are carried regularly by fourteen stations, one of them in West Virginia. Stations WLW and WTAM carry the broadcasts of spray information during March, April, and May of each year.

The new radio "workshop" also is intended to aid Ohio colleges in perfecting their programs for presentation over commercial stations in their respective communities. One of the first to make use of this service was Oberlin, for a program in Cleveland.

Facilities of the station have been extended freely to many groups whose activities are of interest to the general public, bringing to the microphone many persons in no way connected with the University.

Each year Ohio colleges are invited to present programs telling of the work of their institutions, and about twenty accept.

Mrs. L. T. Teeter, manager of a Columbus bookshop, has had a regular weekly broadcast of Informal Book Chats for more than three years. New books are outlined and reading suggested in many fields of literature. She interviews many of the authors who come to Columbus.

The University radio station has been the means of vastly increasing the "attendance" at campus events. As often as possible Station WOSU carries portions of the programs for meetings in Columbus, including Farmers' Week, the police school, the annual alumni college, and the like.

Various Columbus organizations, such as the Audubon Society, the Federation of Women's Clubs, and the American

Legion Auxiliary, have conducted programs on their work. The attorney-general's office has had a regular weekly period on the station for some years, as have the State Department of Health and the State Division of Conservation.

The station has been doing considerable recording of programs of all kinds so that they may be studied later as a means of improving the broadcasts. Incidentally, this recording has opened the way to other uses of transcriptions. Seniors in dairy technology, for instance, are brought to the studio each year to make short talks which are recorded. These recordings are kept in the Dairy Technology Department as a permanent record of the graduate and are also used by the faculty members as a means for instruction in better delivery.

Co-ordinating the far-flung radio education activities of the University is a faculty committee of eight headed by Professor James R. Hopkins, chairman of the Fine Arts Department. Represented on the committee are such varied interests as adult education, English, sociology, engineering, educational research, and agricultural extension.

Mr. Robert C. Higgy, director of Station WOSU, is a member of this committee. He is an Ohio State University graduate. During his student days he was intensely interested in radio and spent most of his spare time at the studio and the transmitter. He was made a part-time worker in 1923 and has been a full-time member of the staff since 1925.

Mr. Cecil S. Bidlack is technical supervisor of the station.³

³ Data furnished by Mr. Harold K. Schellenger, director of the News Bureau at the Ohio State University; Mr. Higgy; and files of the Federal Communications Commission.

OKLAHOMA COLLEGE FOR WOMEN

CHICKASHA, OKLAHOMA

ON OCTOBER 3, 1924, the Oklahoma College for Women was granted a broadcast license to operate the radio transmitter which it had recently purchased from the Chickasha Radio and Electric Company, permission for transfer of license from the electric company to the School having been granted previously. This license authorized operation on 1,190 kc, with 50 watts power, for "unlimited" time. The call letters assigned were KFGD.

Immediately the students and faculty members of the College began to broadcast programs of an educational nature, while the Science Department, especially students of physics, made use of the equipment as a laboratory for the study of maintenance, repairing, and operation of radio instruments.

The broadcasts served as a means of training, entertainment, and education, especially for fine arts students, though also for all departments of the College. The extension service made considerable use of the facilities for home-making lectures, home economics education, and the general dissemination of information.

On January 14, 1925, the station was authorized to increase its power to 100 watts and, on April 11 of the same year, was permitted a further increase to 200 watts. The call letters were changed to KOCW on August 19, 1926.

On April 21, 1927, the station was shifted to 1,110 kc and permitted to use 500 watts power. On June 1 it was again shifted, this time to 1,190 kc, and its power reduced to 250 watts.

The College at no time operated the station as a source of revenue and no advertising or commercial contracts were solicited. The policy was always to broadcast nothing but "worthwhile, wholesome, and instructive programs."

In 1928 the station was leased to the Chickasha Broadcasting Company under an agreement by which the College was to re-

tain ownership of the facilities while the broadcasting company was to operate them for the College. During this year, on October 30, the station was placed on 1,420 kc and its power reduced to 100 watts. However, on April 9, 1929, the station was placed on 1,400 kc and permitted to use 500 watts power until "local sunset" and 250 watts power at night.

Requirements of the Federal Radio Commission that more modern and efficient equipment be installed, which would have cost the College approximately \$25,000, were far in excess of what the College was able to do. Further, the strict regulations of the Commission as to minimum and maximum use of time on the air "did not fit into the campus situation."

Consequently plans were made for sale of the station and the equipment was silenced on July 15, 1931. An application to the Commission for permission to sell the station and transfer its license to Mr. J. T. Griffin was denied on October 30, 1931, and the station came back on the air with a schedule of broadcasts. However, the equipment was not satisfactory and the station was again silenced on June 1, 1932.

Another application for permission to sell the station and transfer the license to Mr. Griffin was granted and the sale was completed on December 2, 1932. At this time it was understood by the College officials that the station would remain in Chickasha and that educational broadcasts from the institution would be used by the new owners. However, the purchaser soon received permission to move his station to Muskogee, Oklahoma, and any plans for use of the facilities by the College had to be dropped. This understanding on the part of the College seems to have grown out of a lack of understanding of the professed intention of the new owner, since, during the time of the negotiations for sale of the station in 1931, it was definitely understood that the station was to be moved by Mr. Griffin if transfer of the license was permitted.¹

¹ Data furnished by Dr. M. A. Nash, president of the Oklahoma College for Women, and files of the Federal Communications Commission.

UNIVERSITY OF OKLAHOMA

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NORMAN, OKLAHOMA

EARLY in September, 1922, Mr. Maurice Prescott, a student in the College of Engineering at the University of Oklahoma, made the first steps toward securing a broadcast transmitter for the University. At that time he owned a small station which was being operated under an experimental license. Gathering about him a small group of interested students, Mr. Prescott inaugurated the Oklahoma Radio Engineering Company for the purpose of gathering apparatus for broadcasting purposes.

A few weeks later, on September 26, 1922, the group was granted a broadcast license authorizing operation on 360 meters, with 100 watts power, for "unlimited" time. The call letters WNAD were assigned. Dr. O. W. Walters, professor of electrical engineering at the University, acted as sponsor of the venture and it was through him that the license was obtained.

The station went on the air almost immediately from the basement of Mr. Prescott's home, presenting phonograph records, play-by-play accounts of University athletic events, and a few other features gleaned from campus life.

On January 2, 1923, since the station was using only 50 watts power, the official power allowance was placed at that amount. On the following May 18 the license was issued in the name of the University of Oklahoma, Department of Electrical Engineering, and the power increased to 100 watts. Under this new arrangement the station became a part of the electrical engineering laboratory equipment of the College of Engineering. Immediately steps were taken to improve the equipment and add new pieces to the transmitter. This work was done under the supervision of Dr. Walters. Mr. Prescott became chief operator. When, in his senior year, Mr. Prescott found that his work was too heavy to permit his participation in the activities of the station, he withdrew from the station and was succeeded by Mr. C. E. Bathe, a student in the department.

On January 29, 1924, the power was reduced to 50 watts and on May 19 it was placed back at 100 watts. On October 7 the station was placed on 1,180 kc. On January 5, 1925, the power was increased to 250 watts and on August 19, 1926, a further increase of power to 500 watts was granted.

At the opening of the 1925-26 school year the station officially went on the air with this power increase from its improved studios in the old engineering laboratory building. The work of assembling this new equipment was done by Mr. Bathe and Mr. Byron McDermott, both sophomore students in the School of Electrical Engineering. At that time Mr. Willard Darrow, an assistant professor of violin in the College of Fine Arts, became program director of the station. Reports of fine reception of the new station were received from all parts of the United States and from many of the provinces of Canada.

With this advance it was recognized that the station was an important factor in placing the University before the nation. Thus careful attention was given to the preparation of programs which would reflect the high educational standards of the institution.

In 1927 Mr. T. M. Beaird, director of the town and country service of the University Extension Division, assumed his duties as program director. The following year Dr. C. V. Bullen, an assistant professor in the Department of Electrical Engineering, was appointed mechanical director of the station and Mr. William Cram, a student in the School of Law, became chief announcer. Mr. Scott Hammonds, a student in the College of Engineering, served as Dr. Bullen's assistant and chief operator of the station until the second semester of 1931-32, when Mr. Wilmer Ragsdale succeeded to that position.

On November 6, 1928, the station was placed on 1,010 kc and ordered to share time with Station KGGF.

When Dr. Bullen resigned from the University faculty in 1931 to accept a position with a Texas college, Dr. Clyde L. Farrar was appointed chief engineer and mechanical director of the station. Upon Mr. Cram's retirement during the first semester of 1931-32, Mr. Jim Robinson and Mr. Hicks Epton, students

in the School of Law and members of the University debating team for several seasons, became co-announcers for the station.

During the school year 1932-33 Mr. Walter Emery, University debate coach, was appointed chief announcer and studio manager.

At this time a special University Radio Committee was appointed to supervise the activities of the station. Members of this committee were: Dr. William Bennett Bizzell, president of the University, as ex-officio chairman; Dr. Paul L. Vogt, dean of the Extension Division, as active chairman; Mr. T. M. Beaird, of the Extension Division, secretary of the committee; Dr. F. G. Tappan, director of the School of Electrical Engineering; Mr. G. Milton Dieterich, instructor in Music in the College of Fine Arts; and Dr. John F. Bender, professor of educational administration.

The scope of the work of the station can be realized more fully by noting its report for the school year 1931-32. A total of ninety-three cities in the state reported favorable reception of the programs from the station and forty-one states and foreign countries reported receiving the programs, a total of 451 out-of-state reports being received. Among the places reporting were Canada, Mexico, Alaska, and the Panama Canal Zone. Fan mail in 1931-32 showed an increase of 1,200 pieces over that received during 1927-28.

During the school year 1931-32 approximately 173 programs were broadcast during the 301 hours in which the station was "on the air." This hourly figure did not include the time used in broadcasting special programs, such as the University athletic contests.

During these periods of broadcasting there were 191 special lectures "on the air." The program data was divided as follows: campus organizations, 13 lectures; astronomy, 8; education, 16; journalism, 12; landscape gardening, 8; geography, 7; pharmacy, 7; religious subjects, 12; literary subjects, 34; engineering, 8; political science, 15; health, 14; geology, 8; university history, 7; art, 6; medicine, 6; and music, 3. The station was on the air three days each week—Tuesday, Wednesday, and

Thursday—with a total of five hours broadcasting time each week for regular programs plus extra time for special programs. Co-operating with Station KGGF, the University has been able to arrange time for special broadcasts without friction.

During the years 1930-32 officials of the station were active in promoting the organization of special radio service groups such as the WNAD Players, a dramatic organization directed by Mr. H. R. Heck, office manager of the Extension Division, and the WNAD Miniature Symphony Orchestra, directed by Professor Dieterich of the University College of Fine Arts. These groups presented regular weekly broadcasts.

Through the supervision of the University Radio Committee and Mr. Beaird the station has maintained a high standard of educational programs. The station has always been operated primarily for educational purposes and has never sought to compete with commercial stations using paid entertainment talent. Though its programs have been entertaining, it has never attempted to present features of a popular nature, but has rather endeavored to reflect at all times the educational standards of the University.

Programs have been presented by members of the faculty and student body on a no-fee basis. High schools, junior colleges, and other educational institutions within the state have been invited from time to time to participate in the activities of the station by presenting special programs of plays, debates, addresses, and lectures. In this manner the University has sought to correlate the educational interests of the state and to offer to the citizens of Oklahoma a cross-sectional view of Oklahoma education.

In January, 1934, the studio manager, Mr. Walter Emery, resigned and Mr. Homer Heck was appointed in his place as program director and studio manager.

On October 10, 1934, the power of the station was increased to 1,000 watts and a determined effort was made to utilize to the full the educational facilities of the institution and make them available to the people of the state through the medium of radio.

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On July 1, 1935, Mr. Heck took leave of absence from the University and Mr. Harold McCollum was made studio manager, remaining in this position until July 1, 1936.

During the summer of 1936 the station was moved into new studios atop the tower of the Union Building on the campus and began broadcasting in October from this location under the management of Mr. J. F. Malone.

On October 15, 1936, Mr. Heck returned to the University and took his former position as program director, continuing with Mr. Malone's assistance.

WNAD is now broadcasting from 2:00 to 4:00 P.M. on Monday, Tuesday, Wednesday, and Thursday; from 7:15 to 9:15 P.M. on Tuesday and Thursday nights; and from 8:15 to 9:15 P.M. on Wednesday night—a total of thirteen regular broadcasting hours per week.¹

¹ Data furnished by Mr. T. M. Beaird, program director of Station WNAD, and files of the Federal Communications Commission.

OMAHA CENTRAL HIGH SCHOOL

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OMAHA, NEBRASKA

EARLY in 1923 Mr. C. H. Thompson, instructor in "drafting and radio class work" at the Central High School, assembled a broadcast transmitter in the school building. This equipment was granted a federal license on February 14, 1923, to operate on 360 meters (834 kc), with 300 watts power, on "unlimited" time. The call letters assigned were KFCZ.

On May 8 of the same year the power was decreased to 150 watts and on July 16 a further reduction of power was made to 100 watts and the station placed on 1,160 kc. On April 5, 1924, the power was again reduced to 50 watts.

On April 7, 1925, the call letters were changed to KOCH.

Regular class work in radio was offered by the School beginning with the inauguration of the station. A Central High School Radio Club, consisting of students of the school, was organized and presented programs on each Monday from 8:00 to 9:30 P.M. These programs consisted of orchestral presentations, vocal recitals, dramatic readings, plays, discussions, and lectures.

Remote control lines were established between the Rialto Theater, the Schmoller and Müller Piano Company, and the station's studios on the campus. Music from the theater was broadcast daily, except Saturday, at 3:00 P.M. On Saturday night leading organists were presented in special recitals. Studio programs were broadcast at 7:30 P.M. on Monday, Tuesday, and Thursday.

Reports from listeners showed that these programs were being heard throughout the United States, in Canada, and in Mexico.

On July 24, 1925, the power was increased to 100 watts and another increase to 250 watts was permitted on October 21. On November 17, 1926, the power was increased to 500 watts while, on June 1, 1927, the power was reduced to 250 watts and

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the station ordered to share time with Stations WNAL and KFOX.

On April 11, 1927, the name of the licensee was changed to the Central Radio School (Central High School), C. H. Thompson. Since July, 1923, Mr. Thompson had signed each application for license.

In January, 1928, two applications for license covering the facilities of Station KOCH were filed with the Federal Radio Commission. One was signed by Mr. C. H. Thompson for the Central Radio School and the other by Mr. J. G. Masters as principal of the Central High School. Attached to the latter application was a letter from Mr. Masters, under date of January 27, 1928, stating that, with the application for renewal of the broadcasting license, letters were filed "asking and suggesting that broadcasting radio license belongs to and should be issued in the name of Omaha Central High School, J. G. Masters, Principal." In this letter Mr. Masters states:

Mr. C. H. Thompson, a member of the faculty here in charge of the radio station, by misrepresentation obtained a statement from me to the effect that the radio property was his. Such statement has long ago been recalled but Thompson refuses to return my letter or note.¹

Mr. Masters stated further that all the equipment for the station was either purchased from high-school funds or given to the high school by various Omaha firms and that Mr. Thompson, when he was "dropped from our staff of teachers," took the material "without permission."

Owing to the controversy which developed over the ownership of the station, and to the further fact that the Federal Radio Commission had notified the Central High School of its policy to discontinue a number of the stations then operated by high schools, Station KOCH was discontinued after March 1, 1928. Continued efforts were made on the part of the School to secure a reopening of the case and a continued grant of license, but these were unsuccessful. Finally, on July 18, 1928, the Commission ordered the station deleted.

¹ Letter attached to application for license in files of the Federal Communications Commission.

OMAHA CENTRAL HIGH SCHOOL

For a short period of time the Omaha Central High School held another license under call letters WNAL. License to operate a 20-watt station on 1,160 kc, with "unlimited" time, was granted on July 22, 1924. This license was held by the school until September 18, 1926, when it was issued to Mr. R. J. Rockwell, who had held a license under these same call letters prior to the granting of such license to the school.²

² Data furnished by J. G. Masters, principal of the Omaha Central High School, and files of the Federal Communications Commission.

OMAHA TECHNICAL HIGH SCHOOL

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OMAHA, NEBRASKA

ON MARCH 3, 1924, the Board of Education (Technical High School) of Omaha, Nebraska, was licensed to operate a broadcast transmitter on 1,210 kc, with 100 watts power, for "unlimited" time. The call letters KFOX were assigned.

This equipment was used for the instruction of students in the technical branches of radio and for the broadcasting of music, debates, lectures, and the like. The project was supported from the general school fund.

On June 1, 1927, the station was shifted to 1,160 kc and ordered to share time with Stations KOCH and WNAL.

In May, 1928, the Federal Radio Commission issued General Order No. 32, notifying 162 station owners and operators throughout the country that their licenses would not be renewed after August 1 of that year unless they were able to show sufficient reason to the effect that "public interest, convenience, or necessity" would be served by such. Station KFOX was among this number.

This order was issued because a great many more stations were being operated at that time than the wave band in use could accommodate efficiently without interference.

Representatives of Station KFOX met with members of the Commission on June 7, 1928, and sought to justify renewal of the license. Reasons presented were that the station was being operated by a public institution, that it was being used for the training of operators and that such were urgently needed at the time, that it used only daytime hours when interference was not a problem, and that the programs broadcast, consisting for the most part of recorded music and entertainment by the school orchestra and glee club, were on a par with those of other stations within the area.

Nevertheless, after investigating the matter, the Commission was convinced that "public interest, convenience, or necessity"

would not be served by renewal of the license and, on July 25, 1928, the application of the School was denied and the station ordered silenced. No further attempt was made on the part of the School to resume broadcasting, though the course in radio has been continued.¹

¹ Data furnished by Mr. H. E. Bennett, radio instructor at the Omaha Technical High School; Mr. Leon O. Smith, assistant to the superintendent of the School; and files of the Federal Communications Commission.

OREGON INSTITUTE OF TECHNOLOGY

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PORTLAND, OREGON

ON MAY 9, 1922, the Oregon Institute of Technology was licensed to operate a broadcast transmitter on 485 meters, with 1,000 watts power, for disseminating weather reports in accordance with the United States Weather Bureau schedule. The call letters **KDYQ** were assigned.

On November 16, 1922, the station was placed on 360 meters (834 kc), permitted to use 1,000 watts power, and granted "unlimited" time on the air. Mr. Lloyd Simpson was chief operator of the station and Mr. Walter Haynes was general supervisor and responsible for administrative and financial details.

During 1923-24 three power changes were ordered: on February 19, 1923, a reduction to 5 watts; on November 23, 1923, an increase to 100 watts; and on April 1, 1924, a reduction to 50 watts.

The station was operated for three hours daily: one hour in the morning and two in the evening. During the morning hour, from nine to ten o'clock, weather and market reports were broadcast. The evening programs were usually introduced by music and consisted of lectures on subjects of interest to the listening audience. The programs offered were arranged in "courses" and included care and culture of orchards, a popular course in physics, lectures on music, and lessons in astronomy. These lectures were presented by members of the Institute faculty and such qualified talent as could be obtained elsewhere.

Reports which were received from listeners were very encouraging and indicated that many came to know the Institute through its broadcasts. Thus college officials felt justified in crediting some of the expense of operating the station to advertising.

However, it was found to be "quite a task" to keep good live programs on the air and to secure lecturers for such programs. Consequently the broadcast license was eventually allowed to

expire, on July 24, 1924, and the station was deleted by the United States Department of Commerce, Radio Division, on January 23, 1925.

Though there has been no further attempt at operating a broadcasting station at the Oregon Institute of Technology, the school has held a license to maintain radio equipment for instructional purposes for its courses dealing with communication.

For approximately ten years a group of students interested in radio and organized as the "I Tapha Key" has held a license under call letters W7YG for instructional and entertainment purposes.¹

¹ Data furnished by Dr. Walter Haynes, dean of the College of Engineering at the Oregon Institute of Technology, and files of the Federal Communications Commission.

OREGON STATE AGRICULTURAL COLLEGE

•
CORVALLIS, OREGON

IN JANUARY, 1922, Mr. Jacob Jordan, of the Department of Physics at Oregon State Agricultural College, built a 50-watt radio transmitter in his laboratory on the campus. This equipment was placed in operation on an experimental basis, broadcasts coming from a studio which consisted of a screened corner of Mr. Jordan's laboratory.

Success of this experiment was such that a broadcast license was obtained by the College on December 7, 1922, authorizing operation of the transmitter on 360 meters (834 kc), with 50 watts power, for "unlimited" time. The call letters KFDJ were assigned.

A planned, systematic use of the College station dates from March 26, 1923, when the Agricultural Extension Service began a series of broadcasts which were continued until June 25 of that year. Beginning with the fall of 1923 these broadcasts were transferred to Station KGW at Portland, Oregon.

A special institutional radio technical committee was named on May 25, 1923, to study the radio situation at the College and make recommendations for expansion and improvement. Its recommendations included the installation of a 500-watt transmitter.

On January 14, 1925, the station was assigned to operate on 1,180 kc.

During the summer of 1925 Mr. Jordan built a new 500-watt transmitter in accordance with the recommendation of the technical committee appointed in 1923, and this equipment was placed in operation on October 2, 1925, under license issued on August 21 of that year permitting use of 500 watts power. On November 11, 1925, the station was placed on 1,160 kc and ordered to share time with Station KFAU, operated by the Boise High School, Boise City, Idaho. At this time the studio was moved to a room in a suite used by the College Music Department in the oldest classroom on the campus.

On July 19, 1926, the station was moved to 1,070 kc and permission granted to change its call letters to KOAC. Approximately a year later (June 1, 1927) the station was shifted to 1,110 kc and on October 30, 1928, a further shift was made to 560 kc. On this frequency, on January 17, 1929, permission was granted the station to increase its power to 1,000 watts. Under this permit the College placed in service a new Western Electric 1,000-watt transmitter and provided modern studios in the new physics building.

This position on the dial was kept until September 11, 1929, when the station was moved to 550 kc. On June 18, 1932, the transmitter was altered by installation of the latest type Western Electric frequency-control equipment. A frequency monitor was installed in order that any frequency change could be noted and corrected. Compliance with the 50-cycle deviation regulation of the Federal Radio Commission made this installation necessary.

During December, 1932, new switching and control equipment was designed and constructed by Mr. Grant S. Feikert, chief engineer at Station KOAC, to modernize the operation of studio programs.

Plans were submitted on June 1, 1934, to further extend the use of Station KOAC in the interest of the people of the state by the installation of studios on the campus of the University of Oregon at Eugene, Oregon, and at the state capitol at Salem, Oregon. These proposals to extend the service of the station are still pending.

During the same month instantaneous recording equipment was purchased to be used for the benefit of the station and for the use of other departments of the state system of higher education. With this equipment numerous features have been added to the station's activities. A few such are:

1. Local talent is recorded for use in radio programs.
2. College and university lectures are recorded for future use.
3. Recordings are prepared for use in clinical work in the speech and music departments.
4. Lectures are made available to schools.
5. Programs are made available for other stations outside the service area of Station KOAC.
6. Recordings can be made for various educational organizations.

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On January 15, 1936, sound equipment was installed in the studios of Station KOAC to permit the playing of sound-effect records and recorded theme music directly into the studio. This method of producing sound effects for dramatic productions has greatly improved their presentation in that the cast of players can hear the sounds as they are produced and thereby get into the spirit of the play more naturally.

This installation was followed on March 1, 1936, by that of new studio audition equipment, permitting complete auditions of any program at any time of day regardless of the program on

TABLE 1

Period Covered	Total Hours	Average Hours per Week
1925-26 (41 weeks).....	186	4.33
1926-27 (53 weeks).....	301	5.33
1927-28 (44 weeks).....	382	8.75
1928-29 (44 weeks to October 1)...	955	21.75
1929-30 (52 weeks).....	1,470	28.25
1930-31 (52 weeks).....	1,569	30
1931-32 (40 weeks to June 30)....	2,564	60
1932-33 (52 weeks).....	3,576	68.67

the air. Before this equipment was available it had been necessary to conduct auditions after the station had left the air.

During 1925-26 the budget for operation was \$1,007. Personnel for all phases of the station's work was supplied by the physics department and Extension Service of the College. Professor Jordan was in charge of the engineering work, Mr. Grant Feikert was employed as a part-time student operator, and Mr. W. L. Kadderly, then in charge of the department of information in the Extension Service, did the program planning and announcing.

Development of the station from that point is indicated by the summary of broadcasting activity shown in Table 1. Comparable development has continued with the station "on the air" throughout the year presenting a full program of broadcasts.

From the outset the test of every program has been: "Will this broadcast contribute to the cultural betterment of the Oregon citizenry; will it perform a service to a substantial portion of that citizenry?"¹

In addition to programs of general interest the station, following this policy, has stressed broadcasts arranged especially for special groups such as farmers, homemakers, retail merchants, 4-H members, garden clubs, Future Farmers of America, and the like. The listener's interests have been paramount at all times. The station has never been used for propaganda for the State College. On the contrary it has been conceived as a means of enabling the College to serve better the state that supports it. "Constructive service" and "wholesome entertainment" have been the watchwords at all times.

The period from June 6, 1926, to September 23, 1927, marks the first year of continued broadcasting throughout the year for Station KOAC. Regular programs were given each week on Monday, Wednesday, and Friday nights. With September 26, 1927, regular daily, except Saturday and Sunday, broadcasts were begun, but only during the evening hours. Noon broadcasts were added on April 1, 1928. These were on the air daily, except Sunday, from 12:15 to 1:00 P.M. At this same time evening broadcasts were expanded to include Saturdays and periods from 6:30 to 7:00 P.M.

With the opening of the new 1,000-watt station on November 19, 1928, the broadcast schedule was revised to cover periods from 12:00 to 1:00 P.M., 2:30 to 4:00 P.M., and 7:00 to 8:00 P.M. Under this new schedule several features were added, including news items from the *Morning Oregonian* and a market service. Daily, except Sunday, weather forecasts from the office of the United States Weather Bureau at San Francisco were added on January 5, 1929. Gradually the program features were expanded and new items added as the interest of the listening audience seemed to demand.

Twice Station KOAC has had to fight to hold its frequency

¹ Quoted from an article prepared for this study by Mr. W. L. Kadderly, former manager of Station KOAC.

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assignment. The first fight came when Station KTFI at Idaho Falls, Idaho, and Harry B. Read petitioned the Federal Radio Commission for Station KOAC's unused time. A hearing was held before the Commission at which the College was called upon to defend its use of this time. The application was denied on January 29, 1931, and the College permitted to hold all the time on the frequency.

The Thirty-first Oregon Legislative Assembly immediately adopted Senate Joint Resolution No. 25 empowering the State Board of Higher Education to provide for use of the station by state boards, commissions, officers, and the like. On May 11, 1931, the state officers first began to use the facilities of the station. A schedule was arranged enabling the traffic division of the secretary of state's office to broadcast at noon each Monday and the State Board of Forestry to use the station facilities each Tuesday noon.

This, however, did not fill all the time on the wave-length. Consequently the Federal Radio Commission issued an order demanding that the station stay on the air twelve hours each day. Attempts were made to get relief from this demand owing to the fact that the station was operated by an educational institution. This was not successful and on September 1, 1931, Station KOAC was cited by the Commission for failure to meet the requirements of the order, and a hearing was set for October 13, 1931. This citation resulted in the station's adopting a twelve-hour schedule on September 21, 1931. This move on the part of the College was satisfactory to the Commission and the hearing was canceled.

The financial resources of the station were found to be inadequate for maintaining such a schedule. Thus on March 18, 1932, the State Board of Higher Education voted to appropriate \$36,000 during the fiscal year 1932-33 to insure this schedule. The appropriation followed a survey of the station's listening audience conducted for the purpose of discovering what value the station actually had. This survey brought in 2,209 letters and fifty-three petitions with 695 signatures.

The station's second battle to hold "unlimited" time on its

assigned frequency came in 1933. On July 15 of that year the station was informed that its application for renewal of license was set for hearing on September 18 owing to the application made by the Eastern Oregon Broadcasting Company of La Grange, Oregon, for a station at the expense of the facilities of Station KOAC. After preliminary hearings and taking of testimony the Commission's examiner recommended that the application of the broadcasting company be denied. The Commission accepted this recommendation and, forthwith, denied the application, leaving the state with full time on the frequency. Since then Station KOAC has been undisturbed on its frequency.

The definite educational broadcasting program of Station KOAC has grown steadily since the early days of the station. Lectures, special musical programs, addresses by authorities in various fields, and the like were part of the earlier programs broadcast from the station. In June, 1930, a definite move was made on the part of the station to furnish broadcasts to schools. Conferences were held with numerous county school superintendents of the state and with Mr. C. A. Howard, state superintendent of public instruction, regarding the matter.

An experiment in this direction was inaugurated on March 29, 1932, with the broadcasting of lectures directly from a classroom on the campus. Once a week Dr. E. H. Moore met his class in general sociology in a large lecture room in the physics building and in front of a microphone.

Interest in the use of the station for purely educational purposes was growing. On July 1, 1932, Station KOAC was made a department in the General Extension Division of the state system of higher education and administration of the station was taken over by Mr. Alfred Powers, dean of general extension. The programs were expanded to an "all-state" status, including contributions from the University of Oregon, Oregon State College, and the three normal schools in the state, as well as from many departments of state government.

Work to extend the service of Station KOAC to public-school classrooms bore its first fruits on January 4, 1933, when instruc-

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tion was broadcast in a rural electrification course. This marks the first time that classroom instruction by radio was undertaken in the state. A course arranged by Mr. Clyde Walker, associate professor of agricultural engineering, was given to thirteen co-operating high-school classes in advanced farm mechanics in the state of Oregon. Teachers were supplied with lesson outlines for distribution to the students. Enrolment in the course was large.

This was followed on March 13, 1933, by the inauguration of a course in music appreciation under the supervision of Mr. Byron Arnold. No lesson outlines or follow-ups were prepared for this course.

Success of these two projects very soon began to attract other programs and to cause the station officials to enlarge their plans. On August 23, 1933, arrangements were made to broadcast programs contributed by staff members of the Oregon Normal School located at Monmouth, Oregon. A few days later (August 27) initial arrangements were completed for co-operation with the office of Mr. C. A. Howard, state superintendent of public instruction, and for a program entitled "The Citizen and His School."

The start of the new school year on October 1, 1933, marked the first programs contributed by members of the state system of higher education off the Corvallis campus and the initial expansion of the station schedule to represent the entire system of education in the state.

On February 4, 1934, two courses in music appreciation, organized and conducted by Mr. Arnold, were begun. These were nontechnical and were designed one for high schools and the other for grade schools. With these courses the first systematic attempt was made to get a definite check on the success of such broadcasting. Mimeographed outlines and forms were issued with each lesson. The total number enrolled for the twelve weeks of the course was 292. Other school broadcasts tried for the first time that year were those covering the work of vocational counsel and general science.

October, 1934, marked the beginning of a new method of

arranging school broadcasts. Instead of scheduling programs for the school audience at various times throughout the day, the hours between 1:00 and 2:00 P.M. were set aside for this purpose and a series of twelve-minute lectures was arranged with a three-minute period of music separating each lecture. This new School of the Air included such subjects as lessons in Spanish, Music Appreciation, Art Appreciation, Oregon History, Heroes of Health, Famous Scientists, Rural Electrification, and Vocational Counsel.

In September, 1935, Mr. Alexander Hull was added to the station staff to direct the School of the Air. Programs for school broadcasts were greatly enlarged for this year and the hour was changed to one more desirable from the standpoint of the schools listening—10:45–11:45 A.M. For the first time direct contact was made with the schools of Oregon through an extended trip over the state made by Manager Luke L. Roberts, Mr. Hull, and Engineer Feikert.

This service was constantly extended. In October, 1935, Station KBPS at the Benson Polytechnic High School, Portland, Oregon, added features from the School of the Air to its group of programs rebroadcast in Portland through its facilities. These rebroadcasts included an Elementary Education program and Drama Guild productions of Oregon History Plays.

January, 1936, marked another step in this development. At that time an attempt was made to correlate broadcasts with actual work done by the listener at the time. Professor Bernard Hinshaw, of the General Extension Division, broadcast once each week to a key class in the studio and to the radio audience lessons in art under the general title "Discovering New Meanings in Everyday Art." For a fee of seventy-five cents Station KOAC supplied working materials, including a group of twenty black-and-white prints, chalk, and lesson outlines. Response to this work and the success attained has encouraged station officials to plan further broadcasts of a similar nature.

The techniques used in classroom broadcasting have also been employed for general educational broadcasting. Examples are the study clubs organized in connection with the station's

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parent-education programs. These clubs consist of women interested in child care and parent education. The members are furnished with suggested outlines for study and procedure. The weekly radio lecture is part of the schedule. The club meets every two weeks and the radio lecture on that day forms a part of the program. A suggested program with supplementary material is sent to each club well in advance of the meeting. The club in turn files reports on each meeting, sends in questions, and otherwise takes an active interest in the procedure. Station KOAC was a pioneer in this form of education by radio.

Oregon being a state with a large agricultural population, Station KOAC has, from the beginning of its program service, given special attention to farm broadcasts. With the growth of the station and the development of these programs it became necessary to appoint specialists in radio and subject matter to care for their planning and production. Accordingly, on September 1, 1932, Mr. C. R. Briggs was made director of agricultural programs for the station. Two full-hour programs a day have been presented for the past seven years. But since the direction of them has been in charge of a full-time expert they have attained a position second to none in the United States. The present director is Mr. Burton Hutton, who has had many years of experience in the field of agricultural editing.

Station KOAC has also given special attention to programs for women. As in the case of agricultural broadcasts, the station has from the beginning broadcast Homemaker Hours. On September 1, 1932, Mrs. Zelta Rodenwold was appointed full-time director of women's programs.

These daily hours, one in the morning and one in the afternoon, include not only home economics information but also programs dealing with art, parent education, literature, recreation, health, music, character education, etc. That these programs have been a genuine contribution to the practical and cultural life of the women of Oregon is evidenced by the daily response from over the state.²

² Data furnished by Mr. W. L. Kadderly, former manager of Station KOAC; Mr. James M. Morris, acting manager of the station; Mr. Luke L. Roberts, manager; and files of the Federal Communications Commission.

PALMER SCHOOL OF CHIROPRACTIC

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DAVENPORT, IOWA

IN MARCH, 1922, the Palmer School of Chiropractic purchased Station WOC from Mr. Robert Karlowa, of Rock Island, Illinois. This station had been developed by Mr. Karlowa from a small experimental wireless transmitter which he built early in 1907. Permission was granted by the Radio Division of the United States Department of Commerce to move this station from Rock Island to Davenport, Iowa, and to instal it in the building occupied by the Palmer School.

This work was completed and license issued to the School on May 9, 1922, authorizing operation of the transmitter on 360 meters (834 kc), with 1,000 watts power, for "unlimited" time. The call letters formerly used by Mr. Karlowa, WOC, were assigned to the station under this new license.

The station was placed in a room 14.5 feet long, 5.5 feet wide, and 6 feet high. This space housed both the transmitter and the studio and was so small that the batteries and generator were placed under a long seat in the hall. When preliminary tests were made Dr. D. D. Evins, of the Palmer School, took a receiving set into the apartment house across the street from the school and there received broadcasts put "on the air" by operators working in the studio. Dr. Evins would sit in the apartment house, listen to the broadcasts, and raise the window to shout instructions across the street to those in the studio.

On October 14, 1922, the station was authorized to use, also, 485 meters for broadcasting weather forecasts. At this time the power was reduced to 500 watts.

On August 11, 1923, the station was shifted to 620 kc. Then, on February 2, 1925, it was authorized to increase its power to 1,500 watts. A further increase to 5,000 watts was granted on October 26 of the same year. On June 1, 1927, the station was moved to 850 kc and on October 1 of the same year was again moved, this time to 800 kc.

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On October 15, 1928, the station was placed on 1,000 kc and ordered to share time with Station WHO, owned by the Bankers Life Company of Des Moines, Iowa.

Late in 1929 the Central Broadcasting Company was formed with Dr. B. J. Palmer, president of the Palmer School of Chiropractic, as chairman of the Board of Directors and Mr. Frank W. Elliott, vice-president of the School, as vice-president. This organization purchased both Station WOC and Station WHO. The license of the former station was transferred to the broadcasting company on February 15, 1930.

These two stations were operated by synchronization until April, 1932, when, upon the granting of 50,000 watts power, the station at Davenport was closed and the station at Des Moines was continued under the call letters WOC-WHO.

Though "the Palmer School has never ceased its interest in radio," nevertheless, "because of the nature of granting licenses and also as a matter of good taste," the radio facilities of the School have never been used for deliberate propaganda purposes. However,

the educational features have always been paramount in the minds of the operators of our station. The public reception of radio is something that has to be studied and lived with. A balance of program material must be attained and any preponderance of one class of material will greatly diminish your listening audience.¹

Though the station has always been operated on a strictly commercial basis, the School has considered most carefully at all times the educational effect of programs broadcast.

On October 2, 1934, the Palmer School purchased Station KICK from the Red Oak Radio Corporation. This was the station formerly owned by the Sweeney Automobile School and sold by this organization to the Red Oak Radio Corporation on October 23, 1928.²

Permission to purchase this station and to move it from Carter Lake, Iowa, to Davenport, Iowa, was granted by the Federal Communications Commission after listening to protests

¹ Quoted from a letter by Mr. W. M. Brandon, controller of the Palmer School of Chiropractic, dated January 29, 1936.

² See account under heading "Sweeney Automobile School" in this study.

from the Rock Island Broadcasting Company and the Iowa Broadcasting Company.³

On November 5, 1934, the call letters were changed to WOC, these letters having been surrendered by Station WOC-WHO, thereby leaving the designation of the latter station as WHO. This new station was licensed on this date to operate on 1,420 kc, with 100 watts power, for "unlimited" time.

On January 8, 1935, the station was shifted to 1,370 kc and, on June 4 of the same year, was authorized to use 150 watts power until "local sunset" and 100 watts at night.

On December 17, 1935, the station was transferred to the Tri-City Broadcasting Company in which the Palmer School owns 100 per cent of the stock.

Thus the Palmer School of Chiropractic at present holds interest in two radio stations: Station WHO located at Des Moines, Iowa, and operating with 50,000 watts power, and Station WOC located at Davenport, Iowa, and operating on 250 watts power to "local sunset" and 100 watts at night. Both stations are operated on a strictly commercial basis, though considerable attention is given to educational features.⁴

³ *Federal Communications Commission Reports*, I, 163-66.

⁴ Data furnished by Mr. W. M. Brandon, controller of the Palmer School of Chiropractic, and files of the Federal Communications Commission.

PARKER HIGH SCHOOL

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DAYTON, OHIO

ON MAY 2, 1923, the Parker High School was granted a license to operate its transmitter on 1,060 kc, with 10 watts power, for "unlimited" time. The call letters WABD were assigned.

This license was used to operate an amateur telegraph station using the same equipment as Station WEBT, licensed under the name of the Dayton Cooperative Industrial High School. The same group of boys operated both stations.

The equipment was home-constructed and used as a means for training students in radio communication. The operation of the station from this standpoint was highly successful, the station signals being heard throughout the United States and in several foreign countries. The circuits used were continually varied as new parts were constructed from old ones. Many home-made coils were tried out by the boys.

On May 12, 1924, the power was reduced to 5 watts.

Interest in the work gradually died out so that when the license expired on January 16, 1925, no application for renewal was made and the project was abandoned.¹

¹ Data furnished by Mr. S. W. Thompson, of the Parker High School, and files of the Federal Communications Commission.

PENN COLLEGE

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OSKALOOSA, IOWA

PENN College was licensed to operate a broadcast transmitter on May 7, 1923. Under this license permission was granted to use 1,320 kc, 10 watts power, and "unlimited" time. The call letters KFHL were assigned. This license was permitted to expire and the station was deleted by the United States Department of Commerce, Radio Division, on September 4, 1923.

Then, on November 3, 1924, a new license was issued to the College authorizing operation of its transmitter on 1,250 kc, with 10 watts power, for "unlimited" time. The same call letters as those used formerly, KFHL, were assigned. On June 1, 1927, the station was shifted to 1,410 kc.

Mr. Earl Paulsen, a commercial chemist, acted as operator of the station during its existence. When, however, he received a position elsewhere and left the institution, there was no one to continue his work, though sporadic attempts were made by other members of the faculty to keep the station on the air.

Financial troubles and the growing difficulty of furnishing regular programs led eventually to the abandonment of the project. Thus, when officials of Penn College were called to appear before the Federal Radio Commission to show that their operation of this station was in "public interest, convenience, or necessity," it was thought best to abandon further efforts to maintain the license and the station was ordered deleted on July 25, 1928.

Though occasional broadcasts are given by the College over the facilities of commercial stations in the vicinity, no program of educational broadcasting is followed. The financial crisis of the last few years has materially curtailed even this slight endeavor.¹

¹ Data furnished by Dr. Ella H. Stokes, head of the Department of Education at the William Penn College, formerly Penn College, and files of the Federal Communications Commission.

PENNSYLVANIA STATE COLLEGE

STATE COLLEGE, PENNSYLVANIA

THE history of radio at the Pennsylvania State College may be divided into two parts: the first, purely historical and indicating difficulties which the work faced technically, economically, and otherwise; the second, a record of the College's experience in producing programs.

I. HISTORICAL RECORD OF TECHNICAL, ECONOMICAL, AND OTHER CONDITIONS RELATIVE TO DEVELOPMENT OF RADIO ON THE CAMPUS OF THE PENNSYLVANIA STATE COLLEGE

During the late winter and early spring of the college year 1909-10 the Department of Electrical Engineering at the Pennsylvania State College undertook its first experimental and instructional work in radio communication. Professor C. L. Kinsloe, then acting head of the department, and Mr. Nugent H. Slaughter, personally interested in "wireless telegraphy," were given authorization to outline a course of study in radio communication and "rig up" equipment for a wireless station on the campus. Mr. Slaughter obtained donations from manufacturing companies and purchased a few pieces of apparatus. With this as a nucleus he set up what later developed into an up-to-date station for that time. Communication was established between several other stations in Pennsylvania and adjoining states. This work was confined entirely to the transmission of messages by code. The aerial for this station was located on the roof of the wooden building known as Engineering F.

In 1912, following the passage of the Radio Act of 1912 by Congress, the college station was issued an experimental license and assigned the call letters 8XE. This was one of the first licenses to be issued by the government under this act.

During the winter of 1911-12 a severe and destructive sleet storm occurred in Pennsylvania and surrounding states, causing much damage to the telegraph lines of many of the railways and

seriously interfering with the operation of trains. The Pennsylvania Railroad Company, through its Department of Telegraph and Signals, became much interested in the possibilities of using radiotelegraph to supplement its regular wire service in times of emergency. Thus the Department of Electrical Engineering at the College, under Dr. Kinsloe, now its head, was asked to cooperate with the railway company, and the railroad assisted in procuring for the College a steel aerial tower. The class of 1912 of the College contributed a sum of money to build a small brick structure to the west of Engineering F to house the equipment and support the tower.

Experiments were conducted between the College and Harrisburg which proved to be unsuccessful. It was thought that absorption occurred by reason of mineral deposits located near the College and partly because of the copper roof on the dome of the state capitol building at Harrisburg. Under the direction of Professor Slaughter, who was made assistant professor in the Electrical Engineering Department in 1911, a lengthy series of investigations was carried on and numerous tests made to determine influences of mineral deposits on overland wireless transmission.

A convention of railroad telegraphers and others interested in radio communication was held at the College at this time and Professor Slaughter helped with the installation of some display equipment provided by the Marconi Company. Those in charge of the exhibit made Professor Slaughter an offer to leave the College which he accepted and, in the fall of 1912, Mr. Waldeman M. Stemple was employed to take his place.

The work in radio communication continued in a routine manner until Mr. Stemple left after the college year 1914-15. During this year radio work at the College was at a standstill, but the following year Mr. George H. Mills was employed as an instructor in the department and his duties included the work in radio communication. During this year, 1916-17, radio had become fairly well established industrially and formal classes of instruction were introduced by the department, with Mr. Mills in charge.

With the entrance of the United States into the World War the station was closed and its equipment sealed by the federal government. However, the Pennsylvania State College was made a training center for commissioned officers of the United States Army Signal Corps as well as for hundreds of drafted men. At this time, Mr. Mills having enlisted in the Ordnance Department of the United States Army, Mr. James O. Perrine was employed as assistant professor for the college year 1917-18. Upon Mr. Perrine fell the burden of this special training of army and navy men.

When Mr. Mills enlisted it was difficult for Professor Kinsloe to replace him, as the army was also in need of trained communication men. Thus Professor Kinsloe went to Washington to consult with the War Department and, while there, found that Professor Slaughter was lieutenant colonel in charge of radio development for the Signal Corps. It was through the efforts of Colonel Slaughter that Professor Perrine was obtained for the training work previously mentioned.

When Professor Perrine arrived at the College, soon after declaration of war by the United States, he found a very discouraging situation in the lack of equipment. He searched electrical, physics, and chemistry laboratories before he found a few items with which to start the work of training men. Since the radio station at the College was sealed he, of course, had nothing to do with the operation of the station and left before the station was opened after the war.

He began with about forty men, mostly seniors in the electrical engineering course, all of whom had enlisted in the Signal Reserve Corps. These men were allowed to finish their education by their local draft boards. Most of them were sent later to officers' training camps and at the close of the college year Professor Perrine was commissioned a captain in the Signal Corps and transferred to College Park, Maryland. Captain Perrine is now Dr. J. O. Perrine with the American Telephone and Telegraph Company and much credit should go to him for his contribution in developing the radio work at the College during the war period against the odds he found when he first took

charge. Many of the men that he trained received commissions and stood very high in their work.

At the close of the war, in 1919, the station was reopened for experimental work and the same call letters, 8XE, assigned for its use.

It was at this time that Professor Kinsloe employed Gilbert L. Crossley, an undergraduate student with considerable radio experience, to take charge of the actual operation of the station under his direct supervision. To Mr. Crossley more than to any other single individual should go the credit of building the radio station into a modern broadcasting plant. Dr. E. C. Woodruff had been a member of the electrical engineering staff since the fall of 1914 and was much interested in radio theory. However, Dr. Woodruff's primary interests were in the electrical railway field and he could not be responsible for the radio station. Since 1921 he has been in charge of the radio courses and theory offered by the Department of Electrical Engineering. Mr. Crossley has assisted Dr. Woodruff in helping with the instruction.

For several years little was accomplished at the station, but, with the coming of the three-element vacuum tube and experimental work on undamped waves, Station 8XE was not far behind other stations in code work.

Some slight experimentation was done in the fall of 1920 on a low-power radiophone using grid modulation. A phonograph was used as a source of audio which could be heard about one-eighth of a mile with fair reproduction. As a source of plate potential a 35KW 500-volt set was operated in the railway laboratory. This is an interesting item because of the necessity, at that time, of using a 35KW generator to operate a 5-watt transmitter.

In the fall of 1920, also, a demonstration of telephonic communication was made between two buildings on the campus about 500 feet apart. Considering the fact that the reception was in a steel building the demonstration was fairly successful.

In the spring of 1921 equipment valued at \$1,000 was donated by the Pittsburgh alumni of the College and, from this equip-

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ment, there was built the first crude broadcasting transmitter to be owned by the College. Construction of this transmitter was started in the early fall of 1921 upon receipt of assurance that a broadcast license would be issued to the College. The apparatus was moved west of Engineering F to a small building that is now the studio, located near the University Club beyond Burrowes Street. The steel tower was taken down and three modern wooden towers were erected near the new location to support the antenna.

On November 1, 1922, the United States Department of Commerce, Radio Division, issued a license to the College authorizing operation of its transmitter on 360 meters (834 kc), with 1,000 watts power, for "unlimited" time. The call letters WPAB were assigned.

The first broadcast under this license took place in April, 1923, and was followed by other broadcasts throughout the remainder of the school year. On May 17, 1923, the power was reduced to 500 watts and on November 4 of that year the station was shifted to 1,060 kc.

On December 29, 1924, the station was moved to 1,150 kc and the call letters changed to WPSC.

During the college years 1923-24 and 1924-25 no funds were available for the station and consequently there were very few broadcasting activities. During the last few months of the school year 1925-26 much experimentation was conducted which resulted in several recommendations for the next year. During the summer of 1926 a sum of \$700 was allowed by the College authorities to rebuild the transmitter, which was moved to a new operating room, and to partition the generator room into three compartments. This latter was used wholly as a studio. During that year underground lines were installed to the College auditorium and to the athletic field. In the fall of that year, with the opening of the football season, broadcasting was undertaken, using but one 250-watt tube of the 500 watts allowed under the license. This reduced power was made necessary by lack of funds for necessary tubes and other equipment.

On June 1, 1927, the station was shifted to 1,000 kc and

ordered to divide time with Station WBAK. At this time the first regular budget allotment for the station was authorized, consisting of a grant of approximately \$2,000 for modernization of the transmitter. By this time it was possible to purchase parts of good quality and the transmitter was designed and built locally. It was estimated that a commercial transmitter of similar type would have cost approximately \$15,000. This third transmitter was placed in operation in October, 1927, and, with some slight alterations, was the one used during the last broadcast from the station. Each year from 1927 until its close the station was provided for in a modest way in the regular budget of the College, but the sum allowed was sufficient only to maintain and operate the transmitter without major improvements.

On November 1, 1928, the station was placed on the 1,230 kc frequency and permitted to broadcast only during daytime hours.

In that same year experimental restrictions resulted in the renewal of the College's experimental license under call letters W8XE and, in June, 1929, the College was also issued a technical and training school license with call letters W8YA.

In May, 1930, the experimental license was denied and designated for hearing before the Federal Radio Commission, and a month later the technical and training-school license was refused on the grounds that its operation would not comply with amateur regulations, General Order No. 89. After much correspondence the Commission denied the right of the College to hold such a license in its own name, but consented to issue a similar license in the name of "Gilbert L. Crossley, Trustee for the Pennsylvania State College."

During all this time technical requirements for broadcast transmitters made it more and more difficult for the College to comply with various orders of the Commission because of financial and technical difficulties. Several attempts to comply with these orders resulted in a temporary license being issued to the College on March 31, 1931, subject to a hearing called by the Commission for September 2 of that year. This license authorized daytime broadcasting plus the use of those nighttime hours

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when other stations operating on the assigned frequency had signed off.

With the various regulations of the Commission requiring additional expenditures, the Board of Trustees of the College began to feel that too much money would be required in the future to maintain and operate the station satisfactorily. Members of the Board expressed interest in radio and were willing to give additional support provided such could be justified. The principle objections were that the College did not seem to have a sufficiently definite program and that there was no sufficient measure of assurance that such an expanded program would be permitted as to justify the use of more funds in the face of the many more concrete and exact needs which were constantly pressed upon the College.

In order to crystallize thought and develop a definite radio program, college officials suggested the organization of a Pennsylvania School of the Air in co-operation with other state agencies and various educational institutions in the state. In essence the plan called for a merger of Station WBAK, the state police station at Harrisburg, and Station WPSC. A bill was introduced in the legislature in the spring of 1931, proposing this plan, by the Honorable J. L. Holmes, but, because of unforeseen complications, it was not pushed by the agencies concerned.

Soon thereafter, following an examination of the College's application for renewal of license, notice was given the institution by the Commission stating that it was not satisfied (1) that operation of the station had been in "public interest, convenience, or necessity" nor (2) that the applicant had complied with General Orders Nos. 111 and 115 regarding equipment and operation. It was further stated in the notice that the applicant was summoned to appear before the Commission on December 2, 1931, and defend its right to renewal of license.

Mr. Crossley represented the College at the hearing and secured renewal of the license on October 16, 1931.

At the request of the National Committee on Education by Radio, Director H. J. Umberger, of the Kansas State College of Agriculture and Mechanic Arts and a member of that commit-

tee, visited the College and made a report to his committee in which he stated:

The attitude of Professor Kinsloe and President Hetzel is that they desire to continue their present broadcasting license. General Order No. 97 was issued at a very disadvantageous time for Station WPSC. There is no opportunity to secure funds from the legislature with which to reconstruct the transmitter to accord with General Order No. 97 by June, 1932, the date set by the Commission. It is the plan of Professor Kinsloe, when the Radio Commission threatens the existence of their present license on the grounds of failure to comply with General Order No. 97, to appeal to the Commission to be allowed to operate beyond June, 1932, as an exception to the General Order, and until such time as an appropriation can be secured with which to improve transmitter WPSC.

There is, however, another aspect to this problem. Radio Station WPSC is assigned to a frequency of 1,230 kilocycles with 500 watts power, and is restricted to daytime broadcasting hours. This makes it impossible for Station WPSC to effectively reach a very large part of the state. There is some question, therefore, as to whether they will be justified in improving their present facilities, since their license is inadequate with respect to power and frequency.

The governor of the state expressed his interest in the station and it was decided by the College authorities to request the Commission to extend the time which Station WPSC might be given to comply with General Order No. 97. Accordingly, on February 11, 1932, Professor Kinsloe made the request in writing.

In a report to the Board of Trustees of the College, President Ralph D. Hetzel made the following statement:

Professor Kinsloe estimates that the necessary equipment would cost not less than \$20,000 if purchased in the usual way. He suggests that through the assistance of some of our alumni who are associated with manufacturers of this equipment, we might be able to have it installed for not less than \$15,000. I have had to advise Professor Kinsloe that so far as I knew, the College did not have the necessary funds at this time.

On April 7, 1932, the Committee on Radio of the Council of Administration of the College made a report urging an immediate decision concerning the future policy of broadcasting at the College and that the broadcast series, which was to close on April 10, 1932, be continued up until the last day of the license. The College authorities decided to comply with this request.

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On April 23 of the same year the station received from the Federal Radio Commission a letter containing the following:

Referring to your application for renewal of license, dated April 12, 1932, the present license of WPSC expires on June 22, 1932. This expiration date was incorporated in your license due to the fact that the equipment used is not capable of being operated in accordance with rule 144, requiring maintenance of assigned frequency within 50 cycles on and after June 22, 1932.

Unless your present transmitter is redesigned so as to conform to all the Commission's rules, or a new transmitter is to be installed capable of so doing, it will not be possible to make a favorable recommendation on your application for renewal.

At the meeting of the Executive Committee of the Board of Trustees, President Hetzel presented the letter from the Federal Radio Commission and the report of the Radio Committee of the College which stated that improvements to the transmitter to make it conform to the Commission's rules would cost \$20,000 and operation for one year and the maintenance of good programs would cost another \$10,000. The Executive Committee decided that the finances of the College at that time did not permit the expenditure of the amount necessary to meet the requirements of the Commission in addition to the cost of operating the station.

On May 17, 1932, Dean Charles W. Stoddart, chairman of the Committee on Radio, notified President Hetzel that Professor Kinsloe had obtained information to the effect that the Western Electric Company had just developed a new piece of radio-frequency control apparatus which it was believed could be associated with Station WPSC's transmitting equipment so as to comply with the ruling of the Commission. The cost of the equipment was estimated to be approximately \$2,700. The budget for broadcasting for the current year was \$3,975. By reductions, which would mean a personal sacrifice on the part of Mr. Crossley, the new equipment could be added, it was estimated, at an increase in the regular budget of \$190. In view of this information Dean Stoddart asked that the latest action of the Executive Committee of the Board of Trustees be reconsidered.

President Hetzel replied that considering the imperative ne-

cessity at that time for reducing the College budget for the following year, and the necessity for protecting the essential work of the institution, it would be impossible to provide the budget item called for plus an additional amount for programs. There was a question, he maintained, of the advisability of attempting to hold the license considering that the Commission might impose additional regulations, and further considering that the College could not that year—and probably not for several years to come—afford programs which would actually accomplish a genuine educational purpose. The deciding factor at that time, however, was the necessity for retrenchment.

Mr. W. W. Dunlap, also of the Radio Committee, wrote on June 1, 1932, that the estimate for the new equipment was found to be \$500 under the figure mentioned by Dean Stoddart, which would allow the station to be operated on a budget of \$310 less than that set aside for radio for the year 1931-32. The amount would not, of course, provide for programs.

On June 21, 1932, the secretary of the Commission wired the College as follows: "Renewal application designated for hearing today *stop* Temporary license expires 3:00 A.M. Eastern Standard Time, June 22, 1932 *stop* Any operation of station after that date will be in violation of Radio Act of 1927 as amended."

President Hetzel replied by telegram the same day as follows: "Pennsylvania State College Station WPSC unable to finance equipment change demanded by Commission *stop* We protest this demand upon public educational institution at time when public funds are seriously curtailed *stop* In compliance with your telegram we have ceased our broadcast."

The following day President Hetzel wrote the Commission, explaining the situation in detail.

Since the College had made an application for renewal of its license, the Commission, on June 21, 1932, designated this pending application for hearing, setting the date of such hearing as August 22, 1932. The National Committee on Education by Radio offered to appear before the Commission at that time and ask permission to discontinue operation until the economic con-

dition became better. In reply to this offer the College explained the dire curtailment of its funds and that, because of the general complex situation, it had decided not to appear before the Commission at the time of the hearing.

Since the College, therefore, failed to appear when the hearing was called, the Commission, in a release of August 29, 1932, denied the application for renewal upon the report of its examiner. On January 6, 1933, the Commission informed the College that a station at Lancaster, Pennsylvania, had applied for its frequency. This was simply an opportunity for the Commission to protest the Lancaster application which would be in the College channel if it had been operating. No protest was made and thus broadcasting at the Pennsylvania State College Station WPSC was abandoned.

Since this termination of broadcasting the station has continued to operate experimentally and under a technical and training license, with call letters W8YA. For a number of years the station has been a member of the Army Amateur Radio System and, on May 21, 1934, it was made a member of the Army Net Control No. 2, with call letters W8YA-WLMA. The station alternates with Station WLM, located in the Munitions Building at Washington, D.C.

Mention was made previously of the sleet storm in 1911-12 when the College station was used most efficiently for emergency purposes. On April 28, 1928, a severe snow and sleet storm occurred which paralyzed communications and traffic in central Pennsylvania. The station had been for a number of years a member of the Pennsylvania Railroad Emergency Net. This system was discontinued in the spring of 1928. However, by reason of drills and training which had been required under this emergency system, the station was prepared to handle emergency calls and operate from Friday, April 28, 1928, at 10:00 P.M. until Sunday, April 30, 1928, at 8:00 P.M. Railroad telegraph lines were out between Harrisburg and Altoona, and the station was used by the Pennsylvania Railroad for train dispatching and emergency messages. Also, emergency messages were taken for both the telephone and telegraph companies.

Recently the flood conditions throughout the northeastern United States made it necessary for the station to serve in an emergency capacity. Having been a member of the Pennsylvania Storm Patrol, a system for emergency control, the station staff had received much valuable training for emergency situations. Likewise, the station was head of a net in western Pennsylvania for the American Radio Relay League.

Activities started, in this particular instance, on Tuesday evening, March 17, 1936, when first word was received that rivers and mountain streams in that section of the country were causing much concern. Contacts were established immediately with Pittsburgh, Johnstown, Altoona, Harrisburg, Philadelphia, Williamsport, and later with DuBois. These contacts, along with others which were established as need arose, were maintained throughout the period of the emergency. Frequent contacts were also made with Station WLM-W3CXL at Washington, D.C., and Station WLQ-W3SN at Baltimore, the Third Corps Area station, for handling official and Red Cross messages to and from these points. The College station staff maintained a full watch continuously from 7:00 P.M. on Tuesday, March 17, 1936, until 5:00 A.M. on Sunday, March 22, 1936.

Upon request of Red Cross and local relief agencies, a portable transmitter and two operators were sent to Renova, Pennsylvania, on Friday afternoon. The transmitter was not needed, but the operators acted as relief to the amateur operating a station at that point. These men returned on Saturday morning.

Station W8YA-WLMA handled over 750 emergency messages during the period of the trouble, approximately 20 per cent of which were United States Army, Red Cross, or official, the remainder being personal messages. National Guard units were mobilized by messages broadcast through the station. Orders to move were also broadcast. Relief messages to the governor of Pennsylvania and his messages to stricken areas, Red Cross requests for supplies, railroads and utilities, all used amateur facilities and routed messages through Station W8YA.

Twelve persons, Professor G. L. Crossley and eleven students,

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were used in this relief work. Likewise, the station was called upon by the Bellefonte air mail field for vacuum-tube equipment for relief operation and was able to comply with the request.

Operation returned to normal and regular station schedules began on Monday, March 23, 1936, with all students returning to classes.

All radio work done at the College since surrender of its broadcast license has been along instructional and experimental lines and assistance in emergency situations.

II. PROGRAMS PRODUCED

In the report of the Radio Committee, dated May 6, 1929, is the following:

Programs now consist of farm talks and weather reports for 15 minutes, five days each week; Sunday morning chapel services; and, in season, play-by-play descriptions of football games and afternoon indoor sports. The station is on the air possibly two or three hours per week. There is remote control in the Auditorium and on New Beaver Field. Recreation Hall is wired for control.

This gives pretty much the type of program schedule that had been followed more or less successfully from early in 1927 until May, 1929.

At first the opportunity to broadcast talks was received enthusiastically by faculty members throughout the College, but, as the novelty wore off, it became harder to obtain well prepared talks and the director of public information, Mr. D. M. Cresswell, who was in charge of the programs, was hard pressed to work out satisfactory educational broadcasts. As time went on, programs were taken from the following sources:

1. Remote control: Sunday morning chapel, performances of Thespians and Players, public lectures, liberal arts lectures, all auditorium events suitable for broadcasting such as alumni meetings, Mother's Day meetings, Scholarship Day meetings, intercollegiate debates, and the like, opening exercises, commencement, athletic events outdoor and indoor, afternoon and evening
2. Studio: Daily farm hour, weather reports, market reports, current news, good entertainment of music (some of it by victrola) and humorous talks; a series of talks on timely topics in many fields of thought, such as science,

economics, history, and literature, book reviews, agricultural and engineering topics; less frequently studio plays, orchestra, band, glee club, quartet, debates, announcement of research results of sound and scientific importance, and other items of legitimate academic interest

Mention has been made of closer co-operation between Station WPSC and the state police station, WBAK, at Harrisburg. It was even suggested that the two stations might be connected through wires leased by the state with remote control in Harrisburg, broadcasts being sent out from the College aerials. There was considerable difficulty in reaching the entire state which resulted in much talk of requesting an increase of power from 500 watts to 1,000 watts and of obtaining a more satisfactory frequency. It was decided, however, to accept a proposal of the Crosley radio station, WLW, to rebroadcast some of its material. Later the Ohio School of the Air suggested that the College also rebroadcast its material. To do this, equipment costing approximately \$250 would have been needed, but this equipment was never purchased.

It became more and more difficult to obtain good broadcasting material, and, with the Federal Radio Commission becoming more strict with regard to using all the hours allotted to a station, the Department of Engineering Extension offered to plan a series of programs. Accordingly programs were broadcast on Sunday and Wednesday by this Department under the direction of Professor E. L. Keller. These usually consisted of a dramatic sketch and chamber or symphony music interspersed with short talks of from five to seven minutes in length. Various departments throughout the College co-operated with the Engineering Extension Department to make these programs a success, and, as announcer, the services of Mr. Herbert Koepf-Baker, a member of the Department of Speech who had experience as a radio announcer, were obtained.

On or about October, 1931, it became apparent that, unless provision for complete use of the broadcasting schedule assigned was made, the Federal Radio Commission would not renew the station's license. Both the Department of Public Information and the Department of Electrical Engineering deter-

mined to meet the emergency by extending the program production schedule to eight hours of broadcasting per week. The Committee on Radio of the Council of Administration solicited the co-operation of each school of the College and Mr. Koeppe-Baker was made acting director of radio programs. A series of broadcasts lasting twenty-five weeks, from October 12 to April 1, was planned. The noonday program, which had been broadcast fifteen minutes daily, was lengthened to thirty minutes and put on the air from 11:45 A.M. to 12:15 P.M. each day except Sunday. A new cultural and educational program of one hour was also added to the schedule, being broadcast every Monday, Wednesday, Friday, and Sunday at 4:00 P.M. To produce eight hours of quality programs each week without a special musical organization and with a somewhat uncertain organization for providing other talent seemed unsurmountably difficult. By an arrangement with the local music store and through the generosity of various individuals, four double-disc popular records were obtained for each noonday program, as well as other records of classic selections for afternoon educational programs.

To improve the broadcast of records Mr. Crossley bought the parts for an electrical transcription machine and assembled the apparatus himself. In this way the College obtained this instrument for \$50 instead of having to pay approximately \$350.

The various schools provided speakers and prepared other educational material each week. Through the co-operation of the School of the Liberal Arts ten additional days of broadcasting were provided with eight additional speakers and two musical events. A student radio council was formed which supplied additional talent and student announcers who were taking training in this work.

With the additional programs this series of broadcasts lasted until April 10, 1932, when arrangements were further made to keep the programs going until June 22, 1932. Mr. W. W. Dunlap took charge of the programs after April 10 of that year. In addition to the regular agricultural broadcasts at noon, these programs consisted of talks by various members of the faculty and musical features.

From the outset the director of programs was guided by the belief that a college station does not exist to entertain, but rather that such a station should use its facilities to present reliable information, unusual music, and other items of an educational nature.

In order to determine how generally the programs were being received and what the attitudes of the listeners were toward the College's offerings, it was decided to conduct a survey of coverage and response. Accordingly the director obtained the co-operation of the Division of Agricultural Extension, the Department of Engineering Extension, and the Alumni Office, and organized and conducted a survey for a period of three months. From one to five designated agents of the College in each county of the commonwealth agreed to co-operate by sending to the station three reports each one month apart, these reports written to indicate the quality of reception in that section and to give their judgment as to the quality of the offerings on the programs broadcast.

The study indicated that the mechanical equipment was extremely inadequate, both because of its limited power and because of its obsolescence. It further indicated that the production of programs in which a comparatively small portion of the state was able to participate as listeners was not only unprofitable but wasteful. Only about twenty-six of the counties had consistent reception, while reception was fair in about seventeen counties. In the remaining twenty-four the reception was poor or the programs were not received at all.

The last broadcast from the station was given on June 21, 1932, when, by telegram that afternoon, the Federal Radio Commission ordered the station off the air, effective at 3:00 A.M. on June 22, 1932.¹

¹ Data furnished by Mr. J. O. Keller, assistant to the president in charge of extension, the Pennsylvania State College, and files of the Federal Communications Commission.

PETOSKEY HIGH SCHOOL

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PETOSKEY, MICHIGAN

ON JANUARY 31, 1924, the Petoskey High School was granted a broadcast license authorizing operation of its transmitter on 1,220 kc, with 10 watts power, for "unlimited" time. The call letters WBBP were assigned.

On July 10 of that year the power was increased to 100 watts and on December 12 the station was shifted to 1,400 kc.

On March 10, 1925, the station was again shifted, this time to 1,260 kc, and three months later (June 10) a power increase to 200 watts was authorized.

On April 21, 1927, the power was reduced to 100 watts and on June 1 of the same year the station was placed on 1,250 kc.

When the station made application for a new license on January 11, 1928, it was notified by the Federal Radio Commission that it was not satisfied that granting of this application would be in "public interest, convenience, or necessity" because of past performance of the station. A hearing before the Commission was called for July 9, 1928, and the station authorities summoned to justify their use of this frequency. Upon failure of the applicant to appear, the application was denied on July 25, 1928, and the station was deleted.¹

¹ Data gathered from files of the Federal Communications Commission and authenticated by Mr. Frank S. Jacobs, principal of the Petoskey High School.

PHILADELPHIA SCHOOL OF WIRE- LESS TELEGRAPHY

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PHILADELPHIA, PENNSYLVANIA

SOON after its founding in 1908, the Philadelphia School of Wireless Telegraphy began experimenting with wireless telegraphy and did some broadcasting in code.

On November 4, 1912, the School established a record by broadcasting, in code of course, the complete election returns of the Wilson-Taft campaign to amateurs and ships at sea. These returns were furnished the station by the *Philadelphia Evening Bulletin* as fast as they came into the newspaper office and were broadcast just as quickly. After completing the broadcast with the announcement of a "landslide for Wilson," the operator closed down his station and went out on the street to watch a parade celebrating the supposed victory of Mr. Taft.

A great many letters were received from amateur operators and from operators of stations aboard ships at sea that the broadcast had been picked up clearly.

This code broadcasting of election returns was repeated at the time of the 1916 election.

Just before the 1920 election the School constructed a radio-telephone transmitter for use in conjunction with its code transmitter. This equipment consisted of two complete telephone transmitters, one built by the De Forest Radio Company and another of a somewhat later design built by the staff of the School. These transmitters were used alternately along with the code transmitter.

This equipment was put into service in time for broadcasting, both in code and by voice, of the election returns of the Harding-Cox campaign. This was the station's first big broadcast on radiophone and it coincided with the broadcast of the same election results by Station KDKA.

The first code broadcasts put on the air by the School came from its offices at Ridge Avenue and Green Street in Philadel-

phia. The broadcasts of 1916 and 1920 came from the Parkway Building at Broad and Cherry streets.

For two years following the 1920 broadcast the School continued transmission, mostly in the evenings, sending out announcements and publicity, along with some music and news items, regarding work of the institution and advertising planned to be of help to its merchandise department which carried all manner of parts for amateur receiving and transmitting equipment. This was carried on a purely voluntary basis and no time was sold by the station.

In addition to this form of advertising, the transmitter was used for experimental work in broadcasting and for instructional purposes, serving students who desired to obtain practical experience in the operation of a broadcast transmitter.

The School was convinced that broadcasting on any commercial basis was becoming a business which was far too strenuous to be carried on along with school activities.

Further, when the federal government began to license broadcast stations separately from amateurs, all attempts at broadcasting were abandoned and no attempt made to secure a broadcast license. However, the amateur standing of the School was continued, using both code and phone transmitters for experimental purposes.

Thus for several years the School confined itself to the limited work of experimenting. Then, on December 17, 1926, the School was granted a broadcast license authorizing use of 1,270 kc, with 50 watts power, for "unlimited" time. The call letters WLBA were assigned. The transmitter licensed under this authorization was located at 1533 Pine Street, a place which, from the technical standpoint, did not permit of satisfactory transmission except for South Philadelphia and the New Jersey area directly south and along the river to Chester and Wilmington.

By April 21, 1927, when the station was granted a renewal of its license, the call letters had been changed to WPSW. On June 1, 1927, the station was shifted to 1,480 kc and on December 15 of that same year it was placed on 1,450 kc.

On November 1, 1928, the station was shifted to 1,500 kc and ordered to share time with Stations WALK, WHBH, and WOO.

The rapid development of the art of broadcasting from 1927 to 1929 was such as to convince the School authorities that broadcasting was becoming "too much of a business to be operated with a school." Studios that had been built and equipped were already outgrown and outmoded. The strict requirements of the Commission as to new equipment required the expenditure of more funds than could be spared for that purpose. Further, in order to retain its license the station was required to broadcast more hours per day than could be cared for by the School.

In view of these facts the William Penn Broadcasting Company was formed and, on April 19, 1929, the license of Station WPSW was transferred to this organization. A new transmitter was built by the engineer of the station, Mr. Howard S. Frazier, at a location in Fairmont Park, about six miles from the center of the city. After the station had been purchased by the William Penn Broadcasting Company it was placed on a purely commercial basis and consolidated with Station WALK, a station which had been licensed by Mr. Albert A. Walker on February 11, 1927, on 1,052 kc, with 50 watts power, for "unlimited" time, and which later (November 1, 1928) was ordered to share 1,500 kc with Station WPSW. The consolidated station is now in operation under the call letters WPEN.

Says Dr. J. C. Van Horn, president of the School: "The reason why we really gave up broadcasting as an activity of the school, was that the continued increasing expenditures necessitated by the more rigid requirements of the Radio Commission prohibited us from continuing without separating the station from the school."¹

¹ Quoted from a letter by Dr. Van Horn, dated April 3, 1936. Data furnished by Dr. Van Horn and files of the Federal Communications Commission.

PORT ARTHUR COLLEGE

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PORT ARTHUR, TEXAS

ON JUNE 15, 1934, Port Arthur College purchased from Mr. Frank P. Jackson Station KWWG, which had been in operation in Brownsville, Texas, and received permission from the Federal Communications Commission to move the equipment to the College campus and rebuild the transmitter.

This work was completed and the station went on the air from the College on August 23, 1934. On October 16 of that year the College was granted a license authorizing operation of this transmitter on 1,260 kc, with 500 watts power, for daytime hours only. The call letters were changed from KWWG to KPAC.

The purpose of the station has been to carry on the work of the College. Its program schedule has included a quarter-hour period daily dealing with vocational guidance, a half-hour period once each week devoted to the student assembly, and Sunday broadcasts by the Port Arthur College Alumni Association presenting speakers from industries in and around the area served by the College. Likewise, the station has been instrumental in the establishment of a radio group in the Port Arthur schools. This group has presented dramatic sketches broadcast from the station studios and rebroadcast through a public-address system in every room in the senior high school. The station has worked closely with the Port Arthur public schools, broadcasting the various athletic activities and commencement exercises.

The station has always been operated on a nonprofit basis. However, a small amount of time has been sold to advertisers and others desirous of using the facilities, the returns from this being used to help defray expenses of operating the station. No advertising of alcoholic beverages is accepted.

At present fourteen people are employed in the operation of the station and many students are given actual experience in

broadcasting from the station, operating the panel board, and running the transmitter.

One program of particular interest and educational value is known as the Parade of Announcers, a thirty-minute daily feature. At this time students in the radio class at the College are presented as amateur announcers. The audience is asked to select its favorite announcer and watch his progress. This interest on the part of the audience serves as a stimulus to the students and encourages them to continue their work vigorously. From this class have gone a number of announcers who have been able to take places on commercial stations and do creditable work there.¹

¹ Data furnished by Mr. Glenn Hewitt, manager and director of Station KPAC, and files of the Federal Communications Commission.

PURDUE UNIVERSITY

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LAFAYETTE, INDIANA

DURING 1910, so far as the records available indicate, the first attempt to instal a wireless station on the campus of Purdue University was made. This venture was part of a thesis project in which Mr. O. W. McIndoo and Mr. R. A. Garret were interested. An aerial was erected from the top of the old power-house smokestack to the north wing of the old electrical engineering building. The wireless apparatus was installed in Room 8 on the northwest corner of the first floor of this building, in a room used at that time as a calibrating laboratory.

The receiving apparatus was constructed, as far as was practicable, by these two students, while the transmitting equipment used was adapted from apparatus loaned by Professor H. T. Plumb, who was engaged at that time in experimental work with high-frequency currents.

During this time there was no electrical communication established with any other wireless station, the experimentation being devoted wholly to an investigation of the performance of crystal detectors. Indoor antennae were used for both transmission and reception tests.

During 1911 the second attempt at installation of a wireless station was made after the equipment formerly assembled had been dismantled and rebuilt. This alteration work was done by Mr. A. E. Hague and Mr. G. R. Pigman as part of their thesis requirement. At this time the outside aerial was replaced by one suspended between the power-house smokestack and the tower of the electrical building. Since there was no provision for climbing to the top of the stack, a kite was constructed and used to pass a rope over the lightning rod support which was located near the top of the stack. This scheme enabled the suspending cables to be pulled into place.

The station equipment was then moved to the third floor of the electrical engineering building and located in the tower

room. At this time some new equipment was purchased, including aerial wire, an antenna switch, and some copper strip for the antenna tuning helix. The station was of the directly coupled class and therefore did not comply with the existing law. Since, therefore, the station could not comply with the law regarding specific wave-length and decrement, no license for its operation was granted by the United States Department of Commerce, Radio Division.

The receiving equipment consisted of a set of Western Electric 3,000-ohm headphones, a loose-coupler, and a silicon detector. This apparatus was used successfully in copying many spark stations within the United States. Attempts were made to establish two-way radio contact with the station at the University of Illinois during its electrical show, but they failed because the Purdue station was unable to receive signals. However, successful communication was established with operators in and near Lafayette, Indiana.

During 1912 Mr. R. E. Cleveland designed, constructed, and installed a rotary type of spark gap. Nevertheless, the transmitter efficiency remained poor since the transformer was designed for high-voltage testing and did not function satisfactorily for wireless use.

During the winter of 1912-13 a storm blew the aerial from the smokestack. This end was then fastened to the corner of the electrical laboratory wing, since it was impractical at that time to rehoist it.

From 1912 to 1915 the station was operated only as a receiving set, there being no appreciable work in progress on the transmitter. Then, in 1915, Mr. E. H. Pullis and Mr. G. M. Wilson attempted to further improve the station by designing, constructing, and installing some additional equipment. Their plan was to fit out a radio room in the basement of the electrical engineering building and erect a new aerial. An oscillation transformer and a high-tension condenser were constructed. The condenser consisted of a collection of milk bottles set in a metal tank filled to about two-thirds of the height of the bottles with salt water acting as an electrolyte. The same solution was

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used within the bottles and to the same level. These two students also constructed some new receiving equipment.

The funds available previous to the year 1915 for the purchase of equipment were practically negligible. During 1912 a total of \$50 was appropriated. In 1915 it was planned to select a permanent station location and expand the equipment and activities. At this time some additional equipment was purchased, including a 2-kw Packard transformer especially designed for operation with radio transmitting apparatus. However, the progress planned was impossible, as no satisfactory room was available at the time. Later, in 1916, a room was provided in the basement under the electrical laboratory, but progress of this work was interfered with by the entrance of the United States into the World War in 1917. This resulted in discontinuance of further efforts.

During 1918 the University inaugurated courses in radio communication in conjunction with the United States Army Signal Corps. About thirty men were enrolled in the initial course which consisted of six class and six laboratory hours per week. To assist in this instruction some equipment was purchased in addition to that supplied by the government.

During June, 1918, the University, in connection with the army training detachment stationed on the campus, undertook the instruction of 150 radio operators. Later this quota was increased to 300. The nature of the instruction given was that required for United States Army radio electricians. This work was conducted as Section B of the Student Army Training Corps until December, 1918.

In 1919 the government granted a temporary experimental license for operation of a University wireless station. This was followed by a considerable advance in construction work. A new oscillation transformer of the pancake spiral type was constructed and the rotary spark gap was again rebuilt. A new leadin of copper tubing with aerial changeover and grounding-switch was also added. Also, a Weston thermocouple type of high-frequency ammeter was connected in the antenna circuit. The call letters 9YB were assigned and the station authorized to

operate on 200 and 375 meters. The transmitting equipment at this time consisted of a 2-kw commercially built transformer, a rotary spark gap with a 15-inch bakelite disc on which were mounted 20 aluminum electrodes rotating at a speed of 1,800 revolutions per minute, and a Clapp-Eastham type of glass plate condenser. The rotary gap was driven by a $\frac{1}{4}$ -horsepower induction motor. The antenna current at 375 meters was approximately 6 amperes.

During 1919 Mr. F. F. Hamilton, of Indianapolis, Indiana, designed and constructed a more efficient long-wave receiving set as part of the requirement for his professional degree. The complete equipment was donated to the University after its completion and was installed as part of the permanent station equipment. A set of honeycomb coils with an adjustable mounting was also available for long-wave reception. At this time the University did not own any short-wave equipment. The set in use was the personal property of Professor R. V. Achatz.

This circuit was of the regenerative type using a tuned plate circuit. During 1915 a De Forest ultra-audion detector had been purchased. This was rebuilt in 1920. This detector was used with a SCR-72 (Signal Corps Reserve) type of amplifier supplied by the United States government to the Purdue Reserve Officers' Training Corps unit. In 1921 this equipment was superseded by a type RA-10 Parragon receiver.

At this time a five-night schedule was maintained each week with broadcasts in charge of a senior operator.

The antenna consisted of four wires each consisting of seven strands of No. 21 gauge hard-drawn copper. The effective length of the flat top aerial was 138 feet and the lead-in was 80 feet. This was supported at one end by the tower of the electrical building and at the other by a wooden tower and iron-pipe mast, totaling about 50 feet in height and erected on the roof of the electrical laboratory. The average height of the flat portion was about 75 feet. This aerial broke down on April 4, 1921, and a new cage-type aerial was erected on April 7, 1921. This consisted of six symmetrically spaced wires supported on the circumference of three wooden automobile steering-wheel rims.

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The station was capable at this time of sending and receiving over an area of approximately 900 miles. Communication was successfully established with stations located at Beaudette, Minnesota; Ellendale, North Dakota; Iowa City, Iowa; Rapid City, South Dakota; Little Rock, Arkansas; Auburn, Alabama; and Savannah, Georgia.

During 1921 Mr. R. H. Vehling undertook the construction of a radiophone set as a part of his thesis. The experimental radiophone set in use at the time was assembled from laboratory parts and required the operation of a large motor-generator set in the main laboratory to supply the necessary power. A single panel type set was designed and constructed. The source of power consisted of a small 500-volt motor-generator purchased for this purpose. The vacuum-tube circuit employed used the Heising system of modulation and operated on a wave-length of 360 meters.

This set was licensed on April 5, 1922, to operate on 360 meters (834 kc), with 20 watts power, during specified hours. The call letters WBAA were assigned. On June 24 of that year the power was increased to 45 watts and the station permitted to use "unlimited" time. Then, on December 28, the power was increased to 50 watts and on March 9, 1923, a further increase of power to 250 watts was granted.

During 1922 and 1923 Mr. W. G. Modlin made many improvements in the station and, for his thesis, designed, constructed, and tested a filament-heating transformer for the station. Professor Achatz supervised the construction of a 50-watt, and later a 250-watt, broadcasting station.

During 1923 and 1924 Mr. L. W. Franklin, one of the station operators, did his thesis work on the design, construction, and testing of a condenser microphone for improving the quality of the station transmission. Tests were made for quality by having various persons talk and the listener determine who was speaking.

Numerous educational features were broadcast over the station during 1923. These included lectures on farm problems, on material of interest in the various fields of science, from the

field of industry, and the like. Also accounts of various athletic events were put on the air.

On March 6, 1924, the station power was reduced to 25 watts but was returned to 250 watts when, on July 8, 1924, the station was placed on 1,060 kc.

In 1924 Professor Achatz resigned from the staff of the University to enter the commercial field of telephony and Mr. J. W. Stafford came into the department. Mr. Stafford had been teaching at the University for several years, often assisting Professor Achatz, as one of his pupils, in the administration of a general military electrical communication course designed for the Juniors at the University who were members of the Purdue Reserve Officers' Training Corps. He was also one of the organizers of the broadcasting station and assisted in the daily market report transmission at 9:50 A.M. with agriograms furnished by the United States Department of Agriculture. He also served as an operator during the transmission of the regular Monday-to-Friday educational talks broadcast from 7:15 to 7:30 P.M.

During 1925 Mr. Stafford appointed Mr. G. W. Earnhart as student chief operator in charge of the broadcasting station as well as the development of the amateur station. Mr. Wade Gunkle was placed in charge of programs and announcing.

At this time broadcasts were initiated from the Memorial Union Building. The 250-watt transmitter was changed from the box-frame type of support to a breadboard layout. This temporary design facilitated testing, altering, and adjusting owing to the accessibility of the parts. In the new design provision was made for additional circuit parts to enable the transmitter to operate on 500 watts by the mere addition of tubes, one in the modulator and one in the oscillator circuit.

Baseball returns from the athletic field and frequent banquet talks were broadcast at this time and reception was good over a wide range as indicated by listener responses received at the station.

On January 15, 1925, the station was moved to 1,100 kc and a power increase to 500 watts was permitted. However, the

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power was reduced to 250 watts on April 7 of that year and returned to 500 watts on April 23, 1927.

At this time the old equipment was moved from the basement to new and larger quarters on the first floor. The same cage-type antenna was used, suspended between the electrical and mechanical building towers. The new quarters were partitioned off into four rooms—a broadcasting transmitter room, a studio, an amateur station and workroom, and a small supply room. The studio was acoustically treated with burlap.

The student personnel was studied and grouped for the best instruction according to their aptitudes. This division included assignments on the program or technical staffs. Students interested in amateur radio were similarly organized, with one student assisting in the instruction and operation during the scheduled assignment period.

During 1926 and 1927 Mr. D. A. Snick was appointed by Mr. Stafford as student chief operator, while Mr. Gunkle continued in charge of developing a program staff. At this time Mr. Snick made many tests for the further improvement of transmitter performance and did much experimental work on resistance-coupled amplifiers.

Programs presented during this period emphasized work of the Agricultural Extension Division of the University, consisting to a great extent of informational addresses of vital importance for farmers.

On June 1, 1927, the station was ordered to share its frequency of 1,100 kc with Station WRM. On November 2, 1928, it was shifted to 1,400 kc where it shared with Stations WCMA and WKBF.

During 1927 and 1928 Mr. G. F. Metcalf and Mr. W. F. Lanterman served as semester alternates in the operation, as students, of Station WBAA. Mr. W. E. Brown succeeded Mr. Gunkle as program manager while Mr. P. V. Tierney and Mr. Harry Clark were University athletic events announcers.

The broadcast equipment was moved at about this time to quarters on the third floor of the new electrical engineering building. These quarters were planned by Mr. Stafford to in-

clude a studio, a transmitter, and an antenna system. The latter consisted of two 85½-foot galvanized steel Milikan towers, the bases of which were fastened to the steel work of the building 60 feet above the ground. A six-wire, flat-top, T-type antenna was used with a six-inch cage-type leadin made up of six symmetrically spaced conductors each consisting of seven strands of No. 22 gauge enameled hard-drawn copper wire.

The studio was treated acoustically with blue burlap and later changed to porous celotex blocks. The transmitter was built and mounted on a welded-steel-angle iron frame with thick front-slate panels for instrument mounting.

In the fall of 1927 the University printed its first program schedule for general circulation. This showed a schedule of musical features, dramas, athletic events, lectures and discussions dealing with scientific matters, materials of importance to agriculturalists, health talks, and a number of special educational events presented by members of the faculty, guest speakers, and representatives from community organizations.

From 1928 to 1930 Mr. P. C. Sandretto was acting as student chief operator. During this period many improvements were made in the radio transmitter such as to improve its performance considerably.

On March 14, 1929, a fire destroyed the station and studio and necessitated complete reconstruction of the equipment. This task was placed in the hands of Mr. Stafford who, during the following summer, with student aid, constructed a station of greater power and efficiency. This new station was licensed on January 25, 1930, to operate on the same basis as the former transmitter. Then, on October 17 of that year, permission was granted to use 1,000 watts power during daytime hours, though 500 watts was the limit authorized after "local sunset."

On April 15, 1932, the power allowance was placed at 500 watts and the station permitted to broadcast during specified hours only. However, when on June 29, 1934, the station was shifted to 890 kc, the 1,000 watts power during daytime hours was returned and remained the schedule upon which the station continued to operate.

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Since March, 1929, Purdue University has done research work in television in co-operation with the Grigsby-Grunow Company of Chicago, Illinois. A construction permit for an experimental television station on the University campus was granted by the Federal Radio Commission on May 12, 1930. After the station was completed it was licensed for experimental visual broadcasting on September 29, 1931. This license authorized broadcasts on the 2,750–2,850 kc frequency, with 1,500 watts power, for “unlimited” time. The call letters W9XG were assigned. On September 15, 1936, the station was also permitted to use the band between 2,000 and 2,100 kc.

Much valuable and interesting work has been done in this field by the University and pictures of remarkable clarity have been broadcast over long distances.¹

¹ Data furnished by Mr. J. W. Stafford, manager of Station WBAA, and files of the Federal Communications Commission.

RENSSELAER POLYTECHNIC INSTITUTE

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TROY, NEW YORK

ON JULY 18, 1922, the Rensselaer Polytechnic Institute was granted a broadcast license to operate its transmitter on 360 meters (834 kc), with 1,500 watts power,¹ for "unlimited" time. The call letters assigned were WHAZ. The original equipment, installed in August, 1922, was a standard Western Electric 500-watt set, a gift of the Roeblings, graduates of the Institute and famous for their building of the Brooklyn Bridge. The station came on the air on September 11, 1922.

The major purpose of the station was to furnish laboratory equipment for courses in communication engineering. However, it was felt from the beginning that the Institute was obligated to the community by virtue of the fact that it held its license from the government to a particular unit of the radio band. Consequently the policy of regular periods of general broadcasting each Monday evening was inaugurated early in the station's career. The remainder of the week was devoted to experimental and test programs and teaching-work in connection with classes in the field of radio engineering.

On September 27, 1922, the station was placed on the 400-meter frequency and its licensed power reduced to 500 watts, the power actually being used by the station.

February, 1923, was an eventful month in the station's history, for it was then that a long-distance transmission record for radio was established by reaching to New Zealand, under ordinary broadcasting conditions and with only 500 watts power. Other distance records were made by the station, while steady coverage of the United States was maintained almost from the first. Reports of its signals being heard distinctly and regularly on the European continent were received frequently.

As early as November, 1922, the station was heard in France

¹ Though licensed to use 1,500 watts power, the transmitter operated with only 500 watts.

and Belgium. By January, 1923, the operator was able to carry on at will radiotelephonic communication over a distance of more than 200 miles over land.

On May 17, 1923, the station was shifted to 790 kc. On October 9, 1925, the power was increased to 1,000 watts. This was reduced on April 8, 1927, to 500 watts. On June 1, 1927, the station was ordered to share time with Station WGY at Schenectady, New York. Five months later (November 1, 1927) the frequency assignment was changed to 720 kc and the station permitted to broadcast during specified hours. A month later (December 1, 1927) the station was placed on 980 kc and ordered to share time with Stations WHT and WIBO. Another frequency change was made on October 30, 1928, when the station was assigned to 1,300 kc and ordered to share time with Stations WBBR, WHAP, and WEVD. It has remained on this frequency ever since.

Mr. Rutherford Hayner, who was the first announcer and who was very soon put in charge of programs, has constantly sought to make the Monday evening periods of broadcast novel and unique. The first minstrel show ever broadcast came from Station WHAZ. The first Boy Scouts' program, the first broadcast of old-time songs, and a number of other "firsts" are claimed by the station.

Educational features have always held an important place in the program schedule of the station. Members of the faculty of the Institute have contributed addresses on subjects of interest and in nontechnical terms. Numerous prominent speakers have been presented from the studios. Likewise, the Institute's various extracurriculum activities have been featured over the station. Among these latter have been the Symphony Orchestra, the Campus Serenaders, a dance orchestra, the Glee Club, and various organizations of students.

At present the station is used largely for laboratory purposes in connection with the radio and electrical engineering courses offered by the Institute. Other equipment than the actual operating station used in this work embraces practically every variety of apparatus. There are numerous long- and short-wave

transmitters and receivers. Transmission and experimentation is almost continuous. There is also the first wireless telephone equipment ever sold, an old De Forest set, by means of which Professor Wynant J. Williams, professor of communication engineering, delivered lectures to students as far back as 1910. Likewise, there is a Marconi wireless telegraph set built in 1902, including a coherer of the original type, a German Telefunken system wireless outfit, and pieces representing the infinite variety of apparatus that has been developed during the history of broadcasting.

The present broadcasting schedule consists of a six-hour period each Monday evening. This is divided as follows: four fifteen-minute addresses of educational nature, two fifteen-minute playlets, from thirty to forty-five minutes of music by one or more of the various student musical organizations, from forty-five minutes to one hour of commercial broadcasting. The remainder of the time is devoted to programs by local artists and entertainers.

Though supported largely from funds of the Institute, the station receives some money for expenses through commercial advertising.²

² Data furnished by Professor W. J. Williams, professor of communication engineering at Rensselaer Polytechnic Institute, and files of the Federal Communications Commission.

RICE INSTITUTE

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HOUSTON, TEXAS

RICE Institute was granted a license on November 21, 1922, to operate a broadcast transmitter on 360 meters (834 kc), with 200 watts power, for "unlimited" time. The call letters WRAA were assigned. The station license was permitted to expire on November 20, 1923, and deletion by the United States Department of Commerce, Radio Division, followed.

A new license was issued to Rice Institute on December 2, 1924, authorizing operation on 1,170 kc, with 100 watts power, for "unlimited" time. The same call letters as were assigned by the former license, WRAA, were carried over into this new license.

The type of programs broadcast varied widely, including athletic events, popular music, classical music, and extension lectures.

The station was of low power and its coverage was small. With the advent of more powerful local stations it was felt by Rice Institute authorities that such broadcasting as was possible was of only slight value. Further, studios were not available and the expenditures necessary to keep the station on the air seemed out of proportion to the benefits to be derived from it.

Consequently, when the license expired on May 23, 1925, no application for renewal was filed and the station was deleted on July 15, 1925.

Rice Institute has operated a short-wave telegraph station for a number of years, first under call letters assigned to the school and later under letters issued to an individual, since the Federal Radio Commission had advised that regulations made no provision for a school to hold such a license.

At present the Rice Radio Club holds an amateur call, though the license to operate under this call has not been issued by the Federal Communications Commission. The Club is remaining off the air until such time as the license is issued.¹

¹ Data furnished by J. S. Waters, assistant professor of electrical engineering at Rice Institute, and files of the Federal Communications Commission.

UNIVERSITY OF ROCHESTER

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ROCHESTER, NEW YORK

FORMAL announcement was made on June 26, 1922, that Dr. Rush Rhees, president of the University of Rochester, had assented to a project to erect a broadcast station in the Eastman School of Music under the joint auspices of the *Times Union* and the *Democrat and Chronicle*, Rochester newspapers. The motivating factor in this plan was the possibility of broadcasting musical programs originating in the Eastman School.

On July 5, 1922, the University was licensed to operate a broadcast transmitter on 360 meters (834 kc), with 100 watts power, for "unlimited" time. The call letters assigned were WHAM. Then, on Monday, July 10, 1922, the last program was broadcast over the *Times Union* station, WHQ, which station, according to the plan, was merged with the new project. The next day, July 11, Station WHAM began operation.

For several years the major part of program time over this station was devoted to musical and stage entertainment emanating from the Eastman Theater, and recitals and concerts from the School.

On February 10, 1927, the station was sold to the Stromberg-Carlson Telephone Manufacturing Company with the understanding that programs from the University of Rochester and the Eastman School were to constitute a major portion of the station's offerings. The new owners immediately erected a 5,000-watt transmitter at Victor, New York, and established main studios in the Sagamore Hotel in Rochester. Complete broadcasting facilities were installed in all parts of the Eastman School and Theater, and a large studio for symphonic groups was erected.

In January, 1933, the station was granted a power increase to 50,000 watts and placed on 1,150 kc. At this time Dr. Herbert S. Weet, superintendent of schools of Rochester, became interested in radio education and, in co-operation with Station

WHAM, began experimenting with the use of the radio as an instrument of teaching. With the assistance of Miss Laura McGregor a program consisting of three subjects was broadcast to about twenty schools which were then equipped with radio receivers. These subjects were: seventh-grade science and seventh-grade social studies, taught by Mr. Harry A. Carpenter and Mr. Charles E. Finch; and geography for the same grade, taught by Mr. Mark Ewald. These three individuals were members of the WHAM staff at the time.

By 1935 eight subjects had been added to the three originally taught, making a broadcast program of eleven subjects consuming four hours of broadcast time each week.

Indication of the success of this venture was obtained from examination data in science, particularly, which showed that children who received instruction via radio did as well, or slightly better, than those who were taught without the use of the radio.

Schools in widely scattered sections of the country were found to be making use of these broadcasts with considerable success, the known list of schools using this service being something over one hundred.

Discussing the project, Mr. William Fay, manager of the station, says:

The method used in presenting the various subjects by radio differs somewhat in the various fields.

The Library Hours, supervised by John A. Lowe, director of Rochester's Public Libraries, comprises discussions by members of the city library staff, of children's books. Frequently scenes from these books are dramatized. Lists of current books for young people are posted each week in all city libraries, labeled "The Rochester School of the Air," and these books are made available in all branches. Many pupils write their reaction to these broadcasts, expressing their approval or suggestions for future broadcasts. Some ask for "more biographies"—"more about authors"—and, not infrequently, "more dramatized mysteries"—reflecting perhaps the type of program they are choosing outside school hours.

The Music programs for second grade, recently introduced, have been highly successful. An especially trained teacher in our studio sings children's songs and invites pupils in the school room to join her. To step into a classroom and see and hear forty of these seven-year-olds listening intently for

directions, then singing lustily with no self-consciousness whatsoever, gives ample evidence of the potentiality of radio teaching. Of course, the children learn some of the songs in class before the broadcast, but others are taught completely over the air. To Howard H. Hinga, Supervisor of Music, and Miss Marion Colgan, the singing teacher, go credit for this unique offering.

The Rochester Civic Orchestra broadcasts from one of the several Junior High School assemblies every other Tuesday during the concert season. These broadcasts are received by innumerable schools. Two broadcasts are transmitted on these days. The first is for junior and senior high school students. During this period Gay Fraser Harrison, conductor of the orchestra introduces the selections with interesting and informative remarks. This broadcast has proven so popular that we were requested to make it available for the WJZ-NBC Network. The second period is played for children in the grades and is presented by Mrs. Warren S. Parks, Educational Director of the Rochester Civic Music Association, in cooperation with Mr. Hinga of the Public School staff.

"Affairs from Afar" is broadcast each Friday morning at 8:45, designed to acquaint children in the sixth, seventh, eighth, and ninth grades with current events. Paul C. Reed, director of visual and radio education, is doing an excellent thing in presenting this information in a manner that intrigues adults as well as children. The pupils compile scrapbooks of news items and pictures as a concrete record of subjects discussed by Mr. Reed.

The Science broadcasts were the first to be scheduled by WHAM and this program is by far the most extensive of all our educational broadcasts. During the Science lessons children are actually brought into our studios and classes are conducted much as they are in the school rooms.

Preliminary discussion serves to motivate the work in science. Elementary and rural schools are not equipped with laboratories or equipment. It has been interesting to learn of numerous experiments which have been worked out at home by the radio students. One boy wrote Mr. Carpenter:

"I like science as well as ever. Mother had me whitewash the coal bin and then she gave it to me as a laboratory because we now have automatic heat. I got a chemistry set for Christmas."

Another boy writes:

"The pupils of Theodore Roosevelt School and of other schools are not the only ones that listen to your science lessons. I find the children's parents of our 7A-1 class also listen. I forgot to mention that twenty-five of our group saw Venus."

Parents have an excellent opportunity to become acquainted with the methods used in the instruction of their children. Here is a typical letter from a mother:

"For the first time I have been able really to understand some of the changes and advances that education has undergone since I left school. There

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is a vast deal of difference between looking over textbooks and curricula, even explained by someone, and actually hearing a grade taught from the material and getting some of the reactions from the pupils."

The Rochester Board of Education and those directly planning these presentations by radio, including Lewis C. Stark, the station's director of education, are to be congratulated for their foresight, and it is safe to say that their efforts have not been in vain, for teaching school by radio is no longer in the stage of experimentation. There are so many advantages to the use of this new medium that I predict the Rochester School of the Air will supplement the usual method of instruction for many years to come.¹

The 1936 educational program from Station WHAM was similar to that of 1935.

Extensive use of the station has been made by the University of Rochester and the Eastman School of Music each year since sale of the station. The University has had use of the facilities whenever it has desired them. In 1936 a number of important lectures were presented by the Department of Government. Among the features presented by the School in 1936 were: the Eastman School of Music Symphony of one hundred pieces, in weekly concerts; the Rochester Philharmonic Orchestra, under the direction of Dr. Howard Hanson, director of the Eastman School, in a series known as the American Composers Concerts; and the Rochester Civic Orchestra, in regular broadcasts of educational concerts to the children of the Rochester public schools.

The University has plans by which it will be enabled to participate further in the work of the station as personnel for specific projects can be obtained.²

¹ William Fay, "WHAM Pioneers in Radio Education," *Rochester Commerce*, December 23, 1935, p. 7. Published by the Rochester Chamber of Commerce, Rochester, New York.

² Data furnished by Dr. Alonzo G. Grace, assistant professor of education at the University of Rochester; Mr. William Fay, general manager of Station WHAM; and files of the Federal Communications Commission.

ROLLINS COLLEGE

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WINTER PARK, FLORIDA

EARLY in 1924 the class in physics at Rollins College, under the guidance of Professor Edward F. Weinberg, set up a small radio station and, on May 19 of that year, a license was obtained in the name of the College to operate on 1,250 kc, using 50 watts power, for "unlimited" time. The call letters WDBO were assigned. The Southern Bell Telephone Company granted the use of its patents for a charge of one dollar a year.

Operation of the transmitter was largely experimental, the equipment being used as laboratory material by the Physics Department of the College. On one memorable evening, however, while broadcasting phonograph records, the operator received a communication from the United States relief ship stationed 225 miles south of San Diego that these broadcasts were being received clearly. This acted as a stimulus to radio enthusiasts on the campus to expand the work.

Consequently authority was obtained on May 18, 1925, to increase the power to 100 watts and on November 9 of that year another increase to 500 watts was authorized. However, operation was retained on an amateur basis. Programs were supplied by the various departments of the College along with phonograph records and the use of some "live" entertainment talent.

On June 15, 1927, the station was shifted to 1,040 kc and was authorized to use 1,000 watts power during daytime hours and 500 watts power at night.

Early in 1927 the Orlando Broadcasting Company was formed by those radio enthusiasts who could and would furnish the necessary finances. On March 29 of that year Station WDBO was leased by this company with the understanding that the lessee was to assume full financial responsibility for the station while ownership was to remain in the College.

After some expansion of the program service it was decided that better program material would be obtained if the station

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was moved to Orlando, Florida. This plan was finally consented to and the station moved to the Newell Electric Store in Orlando, a branch broadcasting station being maintained on the college campus. Later the transmitter was located in the Fort Gatlin Hotel in Orlando.

On October 30, 1928, the station was placed on 620 kc and permitted to use 1,000 watts power. On this frequency it was ordered to share time with Station WDAE.

Under the lease arrangement the College contributed one hour, or more if advisable, each day to the program schedule. These programs were relayed from the campus studios by telephone wires to the transmitter in Orlando. Such programs consisted of lectures and music by members of the faculty and special performers whose talents were available.

It became increasingly evident that the College was not in a position to consider operating the station on a full-time basis. Consequently, on December 19, 1929, the Orlando Broadcasting Company took full charge of Station WDBO, the license being transferred to it by the College.¹

¹ Data furnished by Dr. E. T. Brown, treasurer of Rollins College; Professor E. F. Weinberg, professor of mathematics at the College; and files of the Federal Communications Commission.

ROSE POLYTECHNIC INSTITUTE

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TERRE HAUTE, INDIANA

ON APRIL 21, 1927, the Rose Polytechnic Institute was licensed to operate a broadcast transmitter on 1,380 kc, with 100 watts power, for "unlimited" time. The call letters WRPI were assigned. Though located on the campus of the Institute, the station was financed largely by alumni and friends of the institution.

Soon after its opening on March 21, 1928, the station was taken over by the Banks of Wabash Broadcasting Association and the call letters changed to WBOW.

In 1932 the Banks of Wabash Broadcasting Association built another station, turning over use of its old building and aerial to the Institute. With this as a basis a new station was constructed by the Institute and an experimental license obtained under call letters W9NAA. This station had a range of approximately two hundred miles and could be operated either from its own building or by remote control from the campus of the Institute.

In the spring of 1933 code lessons for the benefit of amateurs in the area were taught for four weeks by means of this station. These lessons have been repeated each year since and the period lengthened to six weeks. This is the only educational work that has been done by the station. However, members of the Rose Radio Club have kept in constant touch with amateurs in various parts of the world. No general broadcasting has been attempted over these facilities.¹

¹ Data furnished by Dr. D. B. Prentice, president of Rose Polytechnic Institute, and files of the Federal Communications Commission.

RUFFNER JUNIOR HIGH SCHOOL

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NORFOLK, VIRGINIA

THE career of Station WBBW was “short and hectic,” according to Mr. Lee M. Klinefelter who built its first transmitter and operated it for the duration of the license. Made possible by funds provided by the Norfolk School Board, student organizations, and the faculty of the School, the station was licensed on February 18, 1924, to operate on 1,350 kc, with 50 watts power, for “unlimited” time. The call letters WBBW were assigned under this license.

On June 1, 1927, the station was shifted to 1,270 kc and, on December 1 of that year, it was authorized to increase power to 100 watts, but ordered to share time on its assigned frequency with Stations WTAR and WSUF.

Operation of the equipment was intermittent. The programs were made possible by co-operation of the various departments of the School and consisted of music and general educational features. The city schools, as well as other schools in the area, were invited to use the facilities of the station at various times. During one season two scheduled programs were broadcast: one, a Bible-study lecture one night each week; the other, a church choir program of an hour once a week.

On July 9, 1928, the Federal Radio Commission notified the School that its station was not operating “in public interest, convenience, or necessity” and called a hearing to investigate the matter. For some time it had been evident that certain improvements and additions to the equipment were necessary if the station was to meet the regulations of the Commission and give satisfactory broadcasting service. These included changing of the circuit to master oscillator-power amplifier and purchase of crystal frequency check and a new set of tubes for the transmitter. The cost of these improvements was estimated at between \$350 and \$400.

Further, it was held necessary, in order to finance the station properly, that commercial programs be accepted. This would mean the establishing of certain remote-control connections via telephone wire and the use of music protected by copyrights held by the American Society of Authors, Composers, and Publishers. The wire connections, it was estimated, would cost approximately \$500 to \$600 a year for license plus \$5.00 per mile per month rental. Cost of copyrighted music was estimated to be \$250 or more per year.

In a report made to the Norfolk School Board at this time, setting forth the needed changes in the station, it was pointed out:

If the station is operated purely as a school station, as it has been in the past, neither of these licenses are needed, but this will mean that all programs must be broadcast from the Ruffner studio and that no popular music must be used except by students of the city schools. This does not seem to be particularly desirable or profitable in view of the cost of operating the station, as we have not been able to get any cooperation from any of the schools in the system in the use of the station. Since the station has been in operation we have done everything possible to encourage the schools of the system to put on programs at the station but with very poor results. The programs that we have been able to get were good and were well received by the public, but they were few and far between. I personally believe that had we received proper cooperation in the past, the interest aroused among school patrons by our programs would have fully justified any reasonable expenditure at the present time to keep the station on the air. With conditions as they are, I doubt it seriously.¹

Though the station was granted a license to continue operation on November 11, 1928—a license which placed the station on 1,200 kc and permitted “unlimited” time for broadcasting—school authorities felt that money then being used for operation of the station was needed more to help keep deserving students in school. Further, since the School Board could not appropriate anything to assist in the project, finances were difficult to obtain. Thus the station was shut down and an attempt made

¹ From a carbon copy of a report made in 1928 to the Norfolk School Board by Mr. Lee M. Klinefelter entitled *Present Status of Radio Station WBBW*.

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to sell it to the Virginia Broadcasting Company. Application for this transfer was denied by the Federal Radio Commission.

Consequently the School made no further efforts to use the equipment or to obtain renewal of its license to broadcast. In that the station was granted no license after 1928, it was deleted on June 11, 1931, to close the files of the Commission regarding this matter.²

² Data furnished by Mr. S. A. MacDonald, principal of the Ruffner Junior High School, Mr. Lee M. Klinefelter, and files of the Federal Communications Commission.

ST. JOHN'S UNIVERSITY

COLLEGEVILLE, MINNESOTA

EXPERIMENTATION in wireless communication began at St. John's University in 1915 when an amateur sending and receiving set was constructed. The transmitter, of spark construction, was licensed under call letters 9MB. Later an experimental license was granted under call letters 9XT. From 1915 to 1921 Dr. Hilary Doerfeler, head of the Physics Department at the University, served as operator of the station and conducted some interesting and valuable experiments in radio communication. Foreign "hams" were worked with occasionally.

In 1921 the spark transmitter was replaced by a 10-watt continuous-wave set and further experimental work undertaken. This equipment was in constant use until 1923, when the strength of the transmitter was increased to 100 watts.

On September 20, 1924, the University was granted a broadcast license authorizing operation of its transmitter on 1,270 kc, with 50 watts power, for "unlimited" time. The call letters WFBJ were assigned under this license.

On November 11, 1925, the station was permitted to increase its power to 100 watts. Then, on June 1, 1927, the station was moved to 1,100 kc, where it remained until October 30, 1928. On this latter date it was shifted to 1,370 kc.

During this time the technical difficulties to be surmounted in the operation of the equipment were not great. However, the economic difficulties were such as eventually to cause abandonment of the project. By the purchase of second-hand generators and the acceptance of gifts from friends of the University, the necessary materials and apparatus were assembled and kept in good condition. It was also possible, for a time, to keep the current operating expenses within the limits of the funds available.

The range of this small, 100-watt station was quite wide, reports of hearing its programs coming from points as far as 1,000 miles away.

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Programs were presented by the University Symphony Orchestra, the Student Band, the Student Orchestra, the Student Glee Club, and the Seminary Choir. In addition, several football games were broadcast. Often organ recitals made up part or all of a program. Smaller musical groups and solo instruments performed for still other programs.

During this time programs were broadcast bi-weekly—Friday afternoons and Sunday evenings, though, at times, the latter were omitted.

No advertising was ever allowed over the station. Though professors and other talent of a cultural nature were welcomed, the University authorities sought at all times to keep the program offerings strictly on a cultural level, broadcasting informative lectures on scientific, social, artistic, and religious topics and music and entertainment of a more classical stamp.

During the autumn of 1925 the regular Sunday evening feature was a lecture on "Topics of Current Interest to Catholics and Non-Catholics," broadcast by members of the faculty. Organ music usually preceded and followed these lectures.

In 1928 Dr. Doerfeler was transferred elsewhere and Reverend Angelo Zankl was brought to the University and put in charge of the technical work on the station. He dismantled the transmitter and set about completely rebuilding and modernizing the equipment with crystal and remote controls, and the like, with a view of enlarging and perfecting its service.

However, the station was never again put into operation. At its completion ill health caused Dr. Zankl to abandon the work and to leave the University for an extended leave of absence.

Added to this was the fact of the general lack of funds to sustain broadcasting. Since an extensive building program had been entered into in 1928, and since the University was endowed only in its professorships, the appropriations for broadcasting were meager. Further, no commercial advertising had ever been allowed by the University authorities, thus making impossible the securing of funds from this source to meet the operating expenses and the full-time salaries of a personnel necessary for adequate operation of the station.

A further difficulty which the station experienced was that of securing program material during vacation months. The Federal Radio Commission was insisting that an all-year program of broadcasts be maintained by all holders of station licenses. Further, there was no fund to care for the operation of the station during these summer months.

Thus, even though during the school year there was no dearth of program material, this being supplied gratis by various professors and student organizations, the lack of such material during the vacation period plus the increasing impossibility of financing broadcasting at the University made reopening of the station impossible. However, the station license was renewed until January 31, 1930. At that time no application for renewal was made and the station was deleted by the Commission.

Despite these facts College officials regret very much that the station had to be discontinued, as they feel "it was supplying a very positive cultural and social value to those within its range of power."¹

¹ Data furnished by Dr. Owen Tekippe, of the Department of Physics at St. John's University; Reverend Angelo Zankl, of the University; and files of the Federal Communications Commission.

ST. JOSEPH'S COLLEGE

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PHILADELPHIA, PENNSYLVANIA

ST. JOSEPH'S College became actively interested in radio early in 1912 when the late Father James B. Mahoney founded an experimental station on the College campus. His work was done in connection with the Physics Department of the institution and caused considerable interest in the department.

Following the International Radio Convention and the adoption of the Radio Act of 1912, this station was granted the first experimental license to be issued by the United States Department of Commerce. The call letters 3XJ were assigned and the license bears the serial number 1. Under this license the station was permitted to use 2-kw power.

The station engaged in radiotelegraphic communication with various institutions of learning throughout the eastern, southern, and central United States. Active membership in the American Radio Relay League brought a host of air friends to the station and led to considerable development of various types of radiotelegraph transmitting and receiving equipment.

During these early days some experimentation was conducted in radiotelephony.

When, in 1917, the United States entered the World War, Station 3XJ, although closed by order of the federal government for transmission along with all other experimental and amateur stations, was selected by the War Department as a special receiving station and assigned the task of covering the frequency band in search of possible spy stations. Another duty of the station was that of copying messages from transoceanic German stations. This work was carried forward for several months until the government transferred this phase of the communication service to the supervision of the Philadelphia Navy Yard. Following this the station was closed for the duration of the war.

Early in 1920 when, at the conclusion of the war, stations

were permitted to resume broadcasting, Station 3XJ returned to the air operating with a 2-kw transmitter. Later a 50-watt tube transmitter was installed.

Then, in 1922, the College installed a De Forest radiotelephone broadcasting station. This equipment was granted a license to operate on April 5, 1922. Under this license authorization was granted to use 360 meters (834 kc), with 15 watts power,¹ for "unlimited" time. The call letters WPJ were assigned.

This station was on the air twice weekly, presenting a brief program consisting of music, school notes, sporting news, and other features.

The license of Station WPJ expired on November 30, 1922. Owing to the inception at this time of the major commercial broadcasting stations, transmission was discontinued and no application for renewal of the license made. Consequently the station was deleted by the federal government on January 19, 1923. The experimental Station 3XJ was continued until 1924.

Since surrendering its broadcast license the College has made use of free time on the air granted by the principal commercial stations in the Philadelphia area. Events of interest from the campus have been broadcast from time to time with the complete co-operation of the commercial interests.²

¹ Records of the College are to the effect that the station used 100 watts power at this time.

² Data furnished by Reverend Thomas H. Moore, S.J., and Reverend John W. Tynan, S.J., of the Physics Department at St. Joseph's College, and files of the Federal Communications Commission; checked by Dr. Alfred H. Weber, professor of physics at the College.

ST. LAWRENCE UNIVERSITY

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CANTON, NEW YORK

THE first transmitter at St. Lawrence University was obtained in 1921. This had a power of 50 watts and was licensed for radiotelephone and radiotelegraph experimental work. Later it was used exclusively by the staff of the Physics Department in conjunction with instruction in radio communication.

On May 4, 1922, the University was granted a broadcast license to operate its transmitter on 485 meters, with 100 watts power, for the broadcasting of weather reports according to the schedule of the United States Weather Bureau. The call letters WCAD were assigned.

To operate under this license the Department constructed a 250-watt transmitter and located it in the Physics Laboratory.

On December 7, 1922, the station was permitted to operate on 360 meters (834 kc), with 100 watts power, for "unlimited" time. On June 8, 1923, the station was shifted to 1,070 kc and its power reduced to 50 watts. However, on September 21 of the same year, the station was permitted to increase its power to 250 watts. On November 26, 1924, the station was shifted to 1,140 kc.

Under the station license issued on April 21, 1927, a power increase to 500 watts was authorized. To take advantage of this the University constructed a transmitter capable of operating with 1,000 watts power, and completed installation in June, 1927. Before the new transmitter went on the air on June 1, 1927, authority came putting it on 820 kc and permitting 1,000 watts power to "local sunset" and 500 watts power at night.

The 250-watt transmitter became part of the regular equipment to be used by students pursuing radio courses at the University. However, it was kept in condition at all times and equipped with a separate set of power generators so that it might be forced into service should an emergency develop.

On November 1, 1927, the station was shifted to 1,230 kc and

on October 29, 1928, it was moved to 1,220 kc where it was permitted to use 500 watts power and to broadcast only during daytime hours. The license issued on October 28, 1932, specified the hours during which the station might be on the air.

At various times this main transmitter is used for observational work during the University courses in radio and its construction and operation explained to the students.

There is also a 50-watt radiotelegraph transmitter available for use in radio instruction and a short-wave receiver used daily to obtain meteorological data for the United States Weather Bureau.

In addition to this equipment a General Electric PM12 oscillograph is available for student instruction in wave-form analysis.

The power supply for the main transmitter is from special motor-generator sets located in the basement of the Carnegie Science Hall, in which building the studio and operating room are located. A special receiver for rebroadcasting the programs of Station WGY is a part of the equipment. A radiola super-heterodyne receiver with a special short-wave unit is also part of the station equipment. The studio has a piezoelectric oscillator for monitoring frequency. The laboratory also possesses other radio apparatus for experimental and teaching purposes. All equipment is from the General Electric Company.

The station is supported wholly by the University and has no other source of income. All salaries and other expenses come out of the general University budget. The station is in charge of a licensed operator who is in turn assisted by the personnel of the Department of Physics.

Staff members of the University, Clarkson College, New York State Normal School, and the Crane Institute of Music appear before the microphone as part of their academic assignments. The value of this talent is estimated at \$400,000. The only salary is that of the operator. Students, faculty members, and residents of northern New York co-operate without compensation in programs from the station.

At Potsdam is located the Clarkson College of Technology,

the New York State Normal School, and the Crane Institute of Music, a part of the Normal School. Ever since the establishment of the University station, faculty and students of the Institute have regularly furnished musical programs for the University broadcasts. In an effort to broaden its usefulness the station has sought to afford use of its facilities to the Clarkson College of Technology and the New York State Normal School. As a result of this policy members of the faculty of Clarkson College have regularly appeared upon the station programs in series of talks on various aspects, problems, and achievements of science as related to education, research, and invention. Owing to lack of wire connections between the station and the institutions at Potsdam, all broadcasts are made from the studios in Canton.

Owned and operated by an educational institution, the station does no commercial work, accepts no pay for services, and offers its facilities for all proper public causes, developing its work along educational lines whatever the source of its material. It has endeavored to make all its programs of the highest possible type in line with the standards of the College. Further, its programs are designed to be of service to the citizens of the area served.

Daily the station gives the weather forecast from Canton for the immediate vicinity served. A temperature, barometer, and wind report is also given daily, this at the request of navigators on the Great Lakes and the St. Lawrence River. Each Friday the observer of the Weather Bureau reads the weekly weather summary, as well as the *United States Department of Agriculture Crop Bulletin*.

In addition to speakers from the sources mentioned, there are regularly scheduled talks by representatives of various public agencies to whom Station WCAD throws open its facilities without charge. These include the County Farm Bureau, the County Home Bureau, the County 4-H Club, state and county child welfare organizations, the county nurse, and a health talk each week by the district health officer of New York State. Executives of the Boy Scout organization and the Citizen's

Military Training Camp have appeared before the University microphone. Musical features from the University and from allied institutions are constant attractions from the station. Likewise, broadcasts are often heard under the auspices of the Clarkson College Dramatic Society, the St. Lawrence University debating teams, and the Women's Dormitory Glee Club. Numerous other features by University and College organizations, by local groups, and by special talent are heard regularly.

The New York State Historical Society has since 1931 broadcast series of programs dealing with the history of New York State.

During 1935 the Crane School of Music, under the sponsorship of the American Association of University Women, arranged a series of music hours for the teachers and students of rural schools. The programs included both musical numbers played by students and faculty members of the School and talks and discussions on musical appreciation, the history of music, and descriptions of composers and their works. Advance programs were sent to approximately one hundred rural schools.

The New York State Conference of Mayors has, from time to time, furnished series of talks on municipal and government problems. The station facilities have been offered to such departments of the government of the state of New York as have matters of interest to the citizens of the state. Talks furnished by the State Motor Vehicle Bureau, the Labor Department of the State, the Conservation Department, and the State Department of Health are offered regularly. In addition, the University of the State of New York has furnished papers on various topics, such as the pre-school child, adolescent school activities, and the like.

A daily news commentary, both local and general, is also offered.

Students are assigned to various duties at the station, ranging from announcing to continuity writing and setting up and caring for remote-control broadcasting apparatus. Six graduates who have worked at the station and who elected radio courses have found positions with two of the largest radio corporations.

According to authorities of the University:

WCAD is peculiarly the property of the people of northern New York. It represents to many of them their only contact with the advanced educational institutions of the section. It is looked to, to furnish instruction and entertainment of a kind that no other station in the section can perform. Being as it is the only radio station of its kind in northern New York, it feels that it has a particular and important mission, one that cannot be neglected, but must on the other hand be developed to greater usefulness. No other station in its area can furnish programs of the same high and useful character. Independent of all commercial considerations, it judges matter solely by its usefulness to the people of northern New York. It desires to retain its field, unhampered by conflicting interests, that it may be free to serve the people of northern New York. . . .¹

¹ Data furnished by Mr. Richard C. Ellsworth, secretary of the St. Lawrence University, and files of the Federal Communications Commission.

ST. LOUIS UNIVERSITY

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ST. LOUIS, MISSOURI

AS EARLY as 1912 St. Louis University was sponsoring experimental work in radiotelegraphy, its station being at that time one of the three such centers in the country.

Under the direction of officials of the Science Department of the University, this experimenting was continued until the period of the World War. At that time experimental work was curtailed in order that the facilities of the station might be employed in the training of radio operators for service in the United States Army. The University provided training for more than three hundred men during this period.

When, at the close of the war, the De Forest tube was released for general use, St. Louis University was among the first to instal it as part of its transmitting equipment. On the basis of this, in 1921, the University inaugurated a broadcast experimental station sending out weather forecasts. This service met with immediate favorable response from farmers and others whose occupations depended more or less upon such information. Soon a market news service was added to the program offering of the station. This service was expanded in time to include quotations and news from the chief middle western markets. It is believed that this was the first regularly scheduled market news service to be broadcast by radio telephone in this country.

On March 23, 1922, the University was granted a broadcast license, authorizing operation of its transmitter on 485 meters, with 150 watts power, for broadcasting market and weather reports in accord with the schedule of the United States Weather Bureau. On May 31 of that same year the station was authorized to operate on 360 meters (834 kc) and the power permitted was 200 watts. The call letters WEW were assigned to the station.

On October 31, 1922, the power was reduced to 30 watts and

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on March 16, 1923, was further reduced to 25 watts. However, on June 1, 1923, the station was placed on 1,150 kc and permitted to use 100 watts power. Two shifts in frequency assignment followed: on May 6, 1924, to 1,070 kc and on January 13, 1925, to 1,210 kc.

On July 27, 1926, the station was placed on 834 kc and permitted to increase its power to 1,000 watts. The following April 28 a further shift was ordered to 830 kc. The final assignment (November 3, 1928) and that upon which the station operates at present was to 760 kc where the station was permitted to use 1,000 watts power and confined to broadcasting during daytime hours.

During this development three transmitters have been used by the station, each one more powerful and efficient than its predecessor. Two different buildings have been occupied, the earlier studio being located in the Administration Building on Grand Avenue and the present one in a suite of five rooms atop the Law Institute on Lindell Avenue.

From its very beginning Station WEW undertook definite work in education via radio and conducted numerous experiments in this general field. Talks were presented by members of the University faculty who were specialists in the various areas of learning. Further, the station has always been a broadcasting center for government reports dealing with home and farm welfare. It was among the first to carry the Aunt Sammy Housekeeper Chats, a daily feature of instructions for housewives. The Farm School was another important government release presented by the station. In addition to these there were special government reports and programs which the station broadcast. The various market news services have been featured by the station since its beginning.

There have been innumerable series of educational programs featured by the station. A few such are: the Parents' Forum, a weekly chat with parents around subjects dealing with child welfare; the Science Series, bringing the latest news of developments in the field of science to the microphone; the Farm School, presenting a "three-a-week" class of instruction in vari-

ous farm activities such as dairying, stock raising and poultry; the Anniversary Series, presented by the station during the morning hours in the form of two- or three-minute talks, featuring, usually, the anniversary of the days; a series of Travelogues, fifteen-minute programs featuring travel to points of interest and presented with a serious attempt at entertainment as well as education; the Amateur Radio Forum, a presentation involving instruction in radio, discussing the latest developments in receivers and program production and written in non-technical language in order to interest listeners who want to know "why and how" their radio works; the Citizens' Forum Series; a series of talks on mental hygiene by a prominent member of the Psychology Department of the University; a series of discussions presented in 1931 by members of the English Department of the University and dealing with the chief English and American poets. One of the most popular features that has been presented by the station was the Editorial Page of the Air, broadcast by Mr. Laurence E. Neville, a law student, and consisting of a ten-minute period at the noon hour embracing comments on the political and industrial situation. This did not involve any attempt at presenting late news but sought to remain wholly editorial.

The earliest series of educational talks is believed to have been presented by a group of students from the School of Divinity of the University and consisted of discussions of literary subjects presented once each week. This series was begun either late in 1923 or early in 1924—there is some uncertainty as to the exact date.

Although the complete records are not intact, the material which is available seems to indicate that the major portion of the early programs from the station were educational, usually talks preceded and followed by music. There were instances of short series of talks presented by faculty members and students throughout the early history of the station, the subjects embracing literature, science, and philosophy.

Shortly after his appointment as station director in 1927, Reverend William Doyle, S.J., began a series entitled Fifteen

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Miautes with the Poets, a weekly presentation extending over a period of many months.

From the examination of a group of typical programs it is revealed that during 1928 the station was on the air on an average of eight hours weekly, seven and one-half of which were used for educational programs.

Among the station's speakers have been some of the leading educators of the country. An outstanding sociologist, Reverend J. Husslein, S.J., presented two series of discussions during the school years 1929-30 and 1930-31. The first dealt with primitive man while the second was concerned with a discussion of the encyclical of Pope Leo XIII. These broadcasts were presented every Sunday at 5:00 P.M.

With the appointment of Father Charles T. Corcoran, S.J., as director of the station in early 1932 there was inaugurated a program of expansion in the University's radio activities, a program which was presaged during the term of his predecessor, Reverend Thurber Smith, S.J., who was director during the last half of 1931. During the fall and early winter of the school year 1931-32 the station's operating time was increased to twenty-three hours weekly and of this twenty were used in presenting educational and instructional materials.

During 1932 the impetus of this expansion movement increased and, from that time on, operating time was increased with proportionate increase in the amount of time devoted to educational material. In 1932 the station's operating time was increased to about four to five hours daily and, of this, three hours were devoted to purely educational programs and half of the remaining time was devoted to materials which were classified as either educational or "high-class" entertainment.

In January, 1932, many of the departments of the University signified their agreement to broadcast series of talks and lectures during the semester then beginning. This was the first time that a really complete inclusion of the various University departments was made for broadcasting. Lectures were presented on anthropology, economics, philosophy, education, history, English, physics, mathematics, and the English ballad. These pro-

grams continued throughout the second semester of the school year 1931-32.

Impressive plans were laid during the succeeding summer for the development of a more complete educational program. By October, 1932, the station was operating under a schedule that called for approximately nine hours of transmission daily, the most ever recorded in a regular schedule of the station. Included in this expansion was a reorganization of the program idea, less accent being placed upon the quantity of educational features and more upon the quality and appropriateness. Education became systematized. Series of programs were inaugurated with a view of obtaining audience interest in a degree never before attempted. Educational features were interwoven with entertainment programs so that interest and listening strength were not lost by continuous educational offerings. Further, educational offerings were brought more intimately within the experience of the listener.

One impressive instance of this change is found in the series of talks on government and civics, broadcast throughout the school year 1932-33. Senior members of the Law School of the University prepared and presented these talks under the supervision and direction of Reverend Linus Lilly, S.J., regent of the University Law School and a recognized authority on constitutional law and the history of jurisprudence. This series proved to be one of the most popular ever presented during the University of the Air group, which was begun in February, 1932.

Included also in this University of the Air series were regular lectures by members of the Psychology and History departments.

One of the oldest continuous presentations of the present is the weekly book review period broadcast by Reverend H. Regnet, S.J., the librarian of the University. This review has been presented regularly since 1930.

There have been innumerable special broadcasts in the interest of education, among these being reports by direct wire of the meeting of the National Congress of Surgeons and of the proceedings of the American Hospital Association.

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At present the station is on the air fifty-seven hours weekly, broadcasting programs for "service, education, and entertainment." Outstanding among its offerings is the University of the Air, a one-half hour period broadcast each day at 4:00 P.M. The content of this feature during 1935-36 was: the Social Order Program, fifteen minutes five times a week; the Law School Series, fifteen minutes three times a week, dealing with the philosophy and administration of law; Science News of the Week, fifteen minutes once each week under the auspices of the National Committee on Education by Radio; and Foreign News, fifteen minutes once a week under the auspices of the Carnegie Peace Foundation.

Other programs scheduled were: Day's Dedication, a half-hour feature presented daily and dealing with biblical history and philosophy; Parents' Forum, a fifteen-minute program presented weekly; Endorsed Motion Pictures, a fifteen-minute program giving lists and descriptions of the best pictures available and presented weekly; Weekly Book Review, a fifteen-minute program presented weekly by the librarian of the University; Moments with the Masters, a half-hour daily program of classical music with biographies of the masters and comments on their work; and Home Economics, a fifteen-minute daily program. Also, government bulletins, weather reports, and all markets have been broadcast.¹

¹ Data furnished by Reverend Charles T. Corcoran, S.J., of St. Louis University, and files of the Federal Communications Commission.

ST. MARTIN'S COLLEGE

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LACEY, WASHINGTON

IN 1914 Reverend Sebastian Ruth, O.S.B., established a 1-kw amateur radio spark set on the campus of St. Martin's College as a personal hobby. This set was licensed to operate using call letters 7CM. In 1915 the call letters were changed to 7YS. For seven years this set was operated on a purely amateur basis by Reverend Ruth.

In July, 1921, two small 5-watt tubes were secured and a small broadcasting set constructed. This equipment was operated under the amateur license covering the earlier station. Such operation proved most successful and reports that the signals were heard in twenty-one states of the United States, as well as in Alaska and Canada, reached the College. The northern record for reception was White Horse, Yukon Territory, and the most distant eastern station reporting reception was Lambertville, New Jersey.

Short programs made up of the usual phonograph records were broadcast twice each week. These lasted approximately one hour.

As the station was increasing in popularity it became necessary for the College to make application for a broadcast license in order to continue operation. This was granted on March 30, 1922, in the name of Reverend Sebastian Ruth (St. Martin's College) and authorized operation of the transmitter on 360 meters (834 kc), with 5 watts power, during specified hours. The call letters KGY were assigned.

On February 14, 1923, the license was issued in the name of St. Martin's College and on May 8, 1923, the station was shifted to 1,160 kc. On January 14, 1925, the station was placed on 1,220 kc and on November 4 of that year authority was granted to increase the power to 50 watts. Three changes of frequency came during the years following: on August 5, 1926, to 1,080 kc; on June 1, 1927, to 1,230 kc; and on March 1, 1928, to

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1,220 kc where time was shared with Stations KFPY and KFIO.

On November 5, 1928, the station was placed on 1,200 kc and permitted to broadcast during specified hours, using 50 watts power until "local sunset" and 10 watts at night. On January 17, 1929, it was authorized to use this power and frequency for "unlimited" time. However, on July 25, 1930, the station was limited to 10 watts power at all hours of broadcasting.

Throughout the history of the station, programs were broadcast from 8:30 to 9:30 P.M. each Sunday, Tuesday, and Thursday. No attempt was made to operate the station on a strictly educational basis. The programs consisted of music, drama, and other entertainment features, the emphasis being all the time on entertainment. For these programs College talent and accomplished individuals from outside the College were used to supplement recordings.

The station was financed by relatives of the operator, Reverend Ruth, by alumni, and by donations from friends of the institution. The American Society of Publishers and Composers and the American Telegraph and Telephone Company extended to the College complimentary licenses.

During the first five years of its existence the station enjoyed its greatest popularity. After that time stations multiplied so rapidly and wave bands were so "cluttered up" that only the more powerful stations could be heard with any degree of satisfaction. However, even during the latter years of its history the station had a strong following from the immediate vicinity.

Two distinctions are claimed by the station: first, it was the first to make use of records and continuity to present complete operas. The first opera so presented, *Carmen*, was broadcast on June 4, 1922. Twelve others were put on the air in the same manner at intervals of three weeks. Second, the same individual announced the call letters of the station for the entire ten years of its existence. This announcer, Reverend Ruth, was at the same time manager, engineer, and "general factotum" of the station as well as builder of the apparatus.

By 1932 the financial burden of operating the station was

proving too heavy for the College to carry. Upon suggestion from the inspector of the Federal Radio Commission, the equipment was sold and the license assigned to the KOL Broadcasting Company at Seattle. The new owners moved the transmitter to Olympia, Washington, and set it in operation as KGY, Incorporated. Modern apparatus was installed and the station put on a strictly commercial basis.

Those in authority at the College feel that the fate of Station KGY was inevitable since the development of the radio industry was such that only those stations with powerful backing could meet the requirements of the Federal Radio Commission and present programs of a quality to justify holding a wavelength.

A member of the faculty points out: "We got along very well in the matter of the entertainment we afforded our listeners, but we realized later that we could never compete nor even keep up with the high degree of excellence that broadcast stations were showing.¹ Thus the sale of the station to an organization more in a position financially to meet these requirements and serve the listener was inevitable.

Though the College does no broadcasting at present, Reverend Ruth is continuing his amateur work in radio communication on the College campus.²

¹ From a letter by Reverend Ruth dated January 25, 1936.

² Data furnished by Reverend Sebastian Ruth, O.S.B., of St. Martin's College, and files of the Federal Communications Commission.

ST. NORBERT COLLEGE

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WEST DE PERE, WISCONSIN

ON MAY 28, 1925,¹ St. Norbert College was licensed to operate a broadcast transmitter on 1,200 kc, with 50 watts power, for “unlimited” time. The call letters assigned were WHBY. This station had existed on an experimental basis since 1924.

Established first as an educational enterprise to extend the work of the College, the station was very soon a popular force in the listening area. Reverend James A. Wagner, of the College, managed this early station and had complete charge of all its activities.

On October 31, 1928, the station power was increased to 100 watts and its broadcasting limited to specified hours. In 1929, in order to offer better radio service to its constituents, the College moved the main transmitter and studios to Green Bay, Wisconsin, although it maintained a studio in West De Pere. On January 31, 1930, the station was authorized to employ “unlimited” time on the air.

With the moving of its main studios to Green Bay the station became a commercial and educational enterprise under the management of Reverend Wagner. WHBY, Incorporated, was organized as a subsidiary of the College for the handling of its radio activities, and, on January 29, 1932, Station WHBY was leased to the corporation on the basis that, although the station was to be operated as a separate corporation for the service of the area, it was to broadcast, under the College auspices, as many educational features as the College wished. On November 9, 1932, the station license was transferred to the corporation to be held by it under lease agreement until 1942.

Until February, 1935, the station operated on 100 watts power. Then it was permitted to use 250 watts to “local sunset” and 100 watts at night. It is operating on this basis at present.

¹ Files of the College give this date as March 25, 1925.

The station's educational features consist of: five periods daily of news; a fifteen-minute period each day dealing with Something about Everything; a quarter-hour weekly Library Chat; a half-hour weekly program from the Radio Institute of the Audible Arts; three half-hour periods each week from the College, consisting of lectures by department heads on philosophy, current history, literature, economics, etc.; a Boy Scout period once a week; a half-hour weekly program under the auspices of the Parent-Teachers Association; a half-hour period each week dealing with art lectures, garden clubs, and hobbies; and a quarter-hour period weekly concerned with farm problems. All high-school and college sports are broadcast in season.

The station is on the air daily from 7:00 A.M. to 11:00 P.M. Throughout its history the station has emphasized educational broadcasts so far as possible, offering its service constantly to those speakers and projects that appeared to be of public service and value. Lawrence College, at Appleton, and the public school systems in Appleton, Green Bay, Oshkosh, and De Pere are granted free time on the station, studios being maintained in all these cities for this purpose.

On October 1, 1935, WHBY, Incorporated, purchased Station WTAQ from the Gillette Rubber Company of Eau Clair, Wisconsin. The transmitter was moved to Green Bay and installed in quarters adjoining those of Station WHBY in the Bellin Building. Reverend Wagner was made manager of both stations.

New equipment was installed and the station granted a license to operate on March 27, 1936. Under this license permission was granted to use 1,330 kc, with 1,000 watts power, for "unlimited" time. The call letters WTAQ were assigned.

This station, as also Station WHBY, though owned by the College, is operated on a commercial basis with sustaining educational programs presented whenever such are deemed of public interest. These consist of thirty-minute periods daily dealing with farm information; a fifteen-minute program daily on governmental policies; and a quarter-hour program weekly devoted to the Girl and Boy Scouts. Also, three Trans-radio news

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flashes are given daily. Facilities of this station are granted free of charge to St. Norbert College, Lawrence College, and the University of Wisconsin whenever desired.

The station maintains auxiliary studios at Appleton, De Pere, and Oshkosh, Wisconsin.²

² Data furnished by Miss Athlyn Deshais, former publicity director of WHBY, Incorporated, and files of the Federal Communications Commission.

ST. OLAF COLLEGE

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NORTHFIELD, MINNESOTA

ST. OLAF College was among the pioneers in the field of radio communication. In December, 1918, after the ban on amateur "wireless telegraphy," as it was then known, was lifted following the World War, the Department of Physics began experimental work in the field using the call letters 9AMH. In 1920 the letters were changed to 9YAJ and voice transmission was successfully carried on.

This preliminary work was so successful that, on May 6, 1922, the station was granted a broadcast license authorizing operation of its transmitter on 360 meters (834 kc), with 100 watts power, for "unlimited" time. The call letters WCAL were assigned.

On November 22, 1922, the power was increased to 200 watts. Two other increases followed: on February 17, 1923, to 250 watts, and on November 30, 1923, to 500 watts.

On January 27, 1925, the station was shifted to 890 kc. Then, on June 1, 1927, it was placed on 1,270 kc and ordered to share time with Station KFMX at Carleton College, Northfield. On December 1, 1927, a further shift was made, this time to 1,050 kc, which the College shared with Station WDGY. On October 29, 1928, authority was granted to increase the power to 1,000 watts and the station was shifted to 1,250 kc, where it has since remained, and was ordered to share time with stations KFMX, WRHM, and WLB.

During 1931 the station was completely rebuilt at a cost of approximately \$16,000. Its new transmitter, with direct crystal control, was capable of 100 per cent modulation. It was modern in every respect and had an output of 1,000 watts, with provision in its original design so that increase to 10,000 watts could be accomplished with a minimum of change. Because of the excellent location of transmitter and antenna there was found

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to be an absolute minimum of absorption loss and field distortion near the station.

The studios were of good construction, adequately insulated acoustically, and equipped with the best available transmitters and amplifiers.

Located about thirty-five miles south of the Twin Cities and in the heart of a rich agricultural country, the station, under normal conditions, had a potential audience of approximately two million people living in Minnesota and adjacent states. A large percentage of this population, because of its Lutheran character, had a direct interest in the station, owned and operated as it was by a Lutheran College.

In corroboration of this fact is the *St. Olaf College Bulletin* for April, 1931, in which contributions received during 1930 for the reconstruction and maintenance of the station are recorded. A total of \$13,221.36 is shown as contributed by approximately 1,550 individuals and 112 organizations of various kinds, all living within the area served by the station and the College. These gifts ranged from twenty-five cents to \$250. Contributions came from 311 localities in 13 states as follows: Minnesota, 178; Wisconsin, 60; Iowa, 45; South Dakota, 11; North Dakota, 7; other states, 10. All gifts came without personal solicitation by representatives of the station.¹

Considerable difficulty was experienced by the station in getting and holding a reasonable share of good broadcasting hours on its frequency, particularly in the face of efforts put forth by a commercial station on the same frequency to secure the greater amount of the time available. These difficulties culminated in a costly hearing before the Federal Radio Commission in the spring of 1932.²

Out of this conflict came the license of November 25, 1932, in which the hours during which the station might operate were specified.

¹ *St. Olaf College Bulletin*, Vol. XXVII, No. 4 (April, 1931).

² For a more complete account of these difficulties see the history of Station KFMX, owned and operated by Carleton College.

On September 11, 1934, the station was authorized to use 2,500 watts power until "local sunset" and 1,000 watts at night.

Throughout its history the station has followed a policy of broadcasting educational, cultural, and religious programs of the highest possible order. Some of its features have been:

1. Book talks by the head of the Department of English at the College. In these talks books of a wide variety of contents were reviewed in a scholarly, yet nontechnical, manner. These talks proved popular among a large group of listeners.
2. Popular science talks by teachers in the various science departments.
3. Music appreciation talks by members of the faculty.
4. Practical gardening talks.
5. Cultural background of people of the Northwest—talks by teachers in the Departments of History and Norwegian.
6. American literature, dealing with the life and writings of standard American authors in historical sequence.
7. Contemporary political problems.
8. Educational problems with particular reference to adult education.
9. Morality plays by the play production classes.
10. Daily college chapel services. These include throughout the year a wide variety of features: community singing, classical music, and informational and inspirational addresses by members of the faculty and by numerous others who are invited guests.
11. Religious services in English and Norwegian languages by members of the College faculty and guests.
12. Musical programs of a wide variety, including folk songs, orchestra concerts, soloists from the faculty and advanced students in the School of Music, groups of musicians, vocal and instrumental selections, the internationally known St. Olaf Lutheran Choir, under the direction of Dr. F. Melius Christianson, visiting choirs, and interpretations of choral music.

Because a great deal of the talent presented in these broadcasts came directly from the College or from organizations associated with campus life, many individuals of the area have felt that the programs are inseparably associated with the distinctive educational, cultural, and religious character of the College and are, therefore, unique to Station WCAL.

Throughout the years, as time and facilities have permitted, Station WCAL has broadcast information in the interest of various public agencies or activities, including the United States Public Health Service, the United States Department of Agri-

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culture, and other government departments. Likewise, it has presented political addresses by men in positions of United States senator, congressman, governor, or other public place. Bulletins of the Safety Commission, materials relative to Red Cross, Scout movements, American Legion, American Legion Auxiliary, civic service clubs, Christmas Seal sales, Poppy Day, unemployment relief agencies, George Washington Bicentennial Celebration, and the like have been broadcast.³

³ Data furnished by Mr. Martin Hegland, director of Station WCAL, and files of the Federal Communications Commission.

SAVANNAH HIGH SCHOOL

SAVANNAH, GEORGIA

AT THE close of the World War, in 1918, the Savannah High School obtained a wireless station that had been silenced when the United States entered the war. This equipment was granted an experimental license and assigned the call letters 4XB.

Though the original purpose of the station was educational, the facilities were employed exclusively for experimentation and study in the field of wireless communication and no direct educational broadcasting was ever attempted.

During the early years of the station's history much latitude was allowed by the federal government in the interest of encouraging experiment and research. Station 4XB took ample advantage of this freedom and made numerous studies which were published from time to time in the radio journal *Q.S.T.* In these years the station co-operated with other pioneer stations in studying the development of modulating systems.

With the growing commercialization of radio and the consequent tightening of regulations on the part of the government, the station lost its experimental license and received in its place a license to operate a broadcast transmitter on 360 meters (834 kc), with 100 watts power, for "unlimited" time. The call letters WRAB were assigned under this license which covered the period from February 24 to May 23, 1923.

Since the station was not designed for broadcasting on anything other than an experimental basis, and since the regulations concerning this type of work were constantly increasing so that the burden of operating a broadcast station was such as to make necessary large investments of time and money, the project was abandoned at the expiration of this first license and the station was deleted by the federal government on September 1, 1923.¹

¹ Data furnished by Miss Virginia L. Heard, secretary of the Board of Public Education, Savannah, Georgia; Mr. Arthur J. Funk, of Savannah; and files of the Federal Communications Commission.

SCOTT HIGH SCHOOL

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TOLEDO, OHIO

ON NOVEMBER 26, 1923, the Scott High School was licensed to operate a broadcast transmitter on 1,110 kc, with 50 watts power, for "unlimited" time. The call letters WABR were assigned.

On December 10, 1925, the station was shifted to 1,140 kc and on April 28, 1927, another shift was ordered to 880 kc.

On June 1, 1927, the station was placed on 1,070 kc and ordered to share time with Station WTAL. When this license expired no application for renewal was made and the station was deleted by the Federal Radio Commission on October 14, 1927.

During this entire period the facilities of the station were employed to broadcast "educational materials and the various sports of the School."¹

¹ Data obtained from files of the Federal Communications Commission.

SENECA VOCATIONAL HIGH SCHOOL

BUFFALO, NEW YORK

ON NOVEMBER 4, 1925, the Seneca Vocational High School was licensed to operate a broadcast transmitter on 1,370 kc, with 50 watts power, for "unlimited" time. The call letters WJBP were assigned. In a letter dated the following May 6 and written to the radio supervisor of the New York area, it is stated that the programs were "almost exclusively put on by pupils of the Buffalo Public Schools."

On August 19, 1926, the call letters were changed to WSVS.

By April, 1927, the station had become the official broadcasting instrument of the Department of Education of the City of Buffalo. It was owned by the city and operated by the Department of Education as part of its school system.

Two frequency changes were ordered during 1927: on November 10 to 1,470 kc and on November 28 to 1,370 kc. The station has continued to operate on this last assignment, with 50 watts power, during specified hours.

It is on the air weekdays from 8:30 to 10:00 A.M. and from 2:00 to 3:00 P.M., except Saturday, at which time it operates from 8:30 to 10:00 A.M. only. The station is silent on Sunday. Time is shared with Station WBNY of Buffalo, New York, which is on the same frequency.

The licensed operator in charge of the station is a graduate of the Seneca Vocational High School. The transmitter is an integral part of the school equipment and affords an opportunity for student operators to become familiar with the technical problems of broadcasting station operation.

Student announcers arrange programs and write scripts. Programs are presented by groups from adult educational projects sponsored by New York State and the federal government. Among these are the Community Players, the Marionettes, the Playhouse Players, and the Theatre Guild. Other programs, either mimeographed or transcribed, are received regularly from

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the Works Progress Administration, the National Resettlement Administration, the Department of the Interior, and the Department of Agriculture. Educational programs are also received from various travel bureaus, manufacturers, institutes, and magazines.

Although musical programs and other entertaining features are presented from time to time, the major portion of broadcasting activities is of an educational nature.¹

¹ Data furnished by Mr. David Warnhoff, of the Seneca Vocational High School, and files of the Federal Communications Commission.

SOUTH DAKOTA STATE COLLEGE OF AGRICULTURE AND MECHANIC ARTS

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BROOKINGS, SOUTH DAKOTA

ON MARCH 9, 1923, the South Dakota State College of Agriculture and Mechanic Arts was licensed to operate a broadcast transmitter on 360 meters (834 kc), with 100 watts power, for "unlimited" time. The call letters KFDY were assigned.

This station went on the air on April 23, 1923, using only 50 watts power, which power it continued to use until August 19, 1926, though its license permitted double that power.

There were few restrictions of radio at that time and the station operated on an irregular schedule. Usually it broadcast the College assembly exercises each Tuesday and Thursday from 11:00 A.M. to noon. This was followed by a thirty-minute period of news, weather, and market information.

Mr. Robert Bidne, an engineering student, was the first operator of the station. He constructed its first transmitter and did much of the announcing until this latter duty was assigned to Mr. Arthur Reitz, another engineering student.

On September 5, 1924, upon application by the College, the station was shifted to 1,100 kc. Here the same power and approximately the same broadcasting schedule were maintained as before. Athletic events, concerts, and music from the College dances were broadcast in addition to the more or less regular schedule of daily features from 12:00 M. to 12:30 P.M. Broadcasts of addresses and music at the College assemblies were continued. All programs were arranged under the direction of a faculty committee.

Station KFDY continued operating on this new frequency until August 19, 1926, when it was ordered to shift to 980 kc and was granted a power increase to 500 watts. By this time a fairly definite schedule of broadcasts had been established.

On November 24, 1926, the station's frequency was again

changed to 1,000 kc. At this time the schedule of broadcasts consisted of a regular thirty-minute period from 12:30 to 1:00 P.M. daily, the College assembly program each Tuesday, and a feature broadcast each Tuesday and Thursday from 7:30 to 8:30 P.M. Sporting events and dances were broadcast occasionally. Mr. Theodore Schultz, an agricultural student prominent in "forensics," was the station announcer.

On June 1, 1927, the station was ordered to shift to 760 kc. Then, on August 19 of that year, it was ordered to share time with Station KMA at Shenandoah, Iowa. Some difficulty was experienced with this arrangement until the Federal Radio Commission made an adjustment by reserving the noon hour for Station KFDY, a period which the other station had sought to control.

Upon the graduation of Mr. Schultz in June, 1927, Mr. Francis Perkins, an assistant in the College editorial office, was placed in charge of program arranging and announcing.

Again, on November 1, 1927, the station was ordered to shift to 680 kc and to share time with Station WAAW at South Omaha, Nebraska. After one month, on December 1, 1927, the station was moved to 550 kc, where it shared time with Station WDAY at Fargo, North Dakota.

On October 25, 1928, Station WDAY was removed from 550 kc and two other stations, KFYZ at Bismarck, North Dakota, and KFJM at Grand Forks, North Dakota, were placed there. On January 15, 1929, the latter station was moved, leaving only Station KFYZ to share 550 kc with Station KFDY. The College station used regularly the time from 12:30 to 1:00 P.M. daily and from 7:30 to 8:30 P.M. on Tuesday and Thursday of each week. Station KFYZ used the remainder of the time, with the exception of that granted the College station for special broadcasts such as were necessary and convenient.

During the summer vacation of 1928 the station used only the half-hour period from 12:30 to 1:00 P.M. daily except Sunday. In the fall of this year the studios were moved from the

Central Building on the campus to a room on the top floor of the new Library Building.

On March 16, 1929, the station was permitted to use 1,000 watts power until "local sunset" and 500 watts at night.

In June, 1929, Mr. Perkins resigned his position in the editorial office and Mr. Sam Reck, Jr., extension service editor, did the announcing until July 1, when Mr. Walter Ellis was employed to replace Mr. Perkins. Mr. Ellis handled program arranging and announcing for a year and then resigned. His position was filled by Mr. George Thomson, of the Journalism Department, from July 1, 1930, to January 1, 1931. Mr. A. A. Applegate, head of the Department of Printing and Journalism, was actively connected with program arrangement during 1930. When Mr. Thomson resigned, Mr. Applegate placed the arrangement of programs and announcing in the hands of Miss Mary Bruck.

The "out-of-town" program each Tuesday at 7:30 P.M. and the College Air Night each Thursday at the same hour were abandoned at this time, and the station went on the air each day from 12:30 to 2:00 P.M. Miss Bruck continued to arrange and announce the programs during 1931, until June 1.

In the latter part of May, 1931, Dr. Harold M. Crothers, dean of the Division of Engineering at the College, who had been closely in touch with affairs of the station as technical director and adviser since he joined the College faculty, submitted an application to the Federal Radio Commission for a construction permit to instal a 228-A tube in the last stage of the transmitter. On June 22, 1931, the Commission notified him that the equipment of the station was inadequate and that a hearing regarding the station's license would be held in Washington on September 2, 1931. Dr. Crothers replied that the new equipment which the station had been ordered to instal was not yet on the market. On the day before the hearing was scheduled, word was received of its cancellation. Immediately the station's license was renewed and the Commission granted permission for the construction of a new transmitter.

During the summer months of 1931 the station was on the air

EDUCATION'S OWN STATIONS

for a very limited time. Its equipment was old and in poor condition. In August arrangement was made by which the Extension Service of the College should employ a man to handle program arrangement and do the announcing, and the College furnish and operate the equipment.

Mr. Reck, extension editor, took over program arranging and announcing on September 1, 1931, and handled these assignments until November 1 of that year. Then Mr. S. W. Jones was employed to spend half his time arranging programs and announcing over the station and the other half in rural organization work for the Extension Service.

Plans were made for building a new transmitter and work started. During this transition period the station maintained a regular broadcasting schedule consisting of a period from 12:30 to 2:00 P.M. each day except Sunday. However, from November 26, 1931, to January 26, 1932, the station was off the air and the new equipment installed. This work was carried on under the direction of Dr. Crothers, assisted by members of the staff of the engineering division. The new equipment was of the latest improved type and was designed to meet all the demands of the Federal Radio Commission as to modulation, frequency checking, and control.

Mr. William Gamble, assistant professor of electrical engineering at the College, was made chief engineer of the station under the supervision of Dr. Crothers. Mr. Carleton Gray, a licensed radio operator and a Freshman student at the College, was employed as operator.

The new transmitter was placed on the air and regular broadcasting was resumed on January 28, 1932. A license covering operation of this new equipment was issued on February 26, 1932, permitting the use of 1,000 watts power during specified hours of the day and night.

After the new transmitter was in operation an announcer's booth was built in the studio on the top floor of the library building. A new amplifier and a condenser type microphone were installed and lead-sheathed wires were laid to various locations on the campus for remote control broadcasts. A new pub-

lic-address system was made part of the station's equipment. Later on, three velocity microphones, new football and basketball broadcasting booths, a two-speed turntable, and portable remote-control equipment were purchased for the station.

Apropos of a request made by Station KFYZ for full time on 550 kc, the Federal Radio Commission decided, in May, 1934, to permit such if this station would pay all expenses of moving Station KFDY to 780 kc. This was done and, on April 13, 1934, this latter station was granted a license specifying the new frequency and permitting use of 1,000 watts power during specified hours. The station has continued on this frequency, using the 12:30 to 2:00 P.M. period regularly, with occasional extra time for special broadcasting.¹

¹ Data furnished by Mr. S. W. Jones, extension radio specialist at the College, and files of the Federal Communications Commission.

SOUTH DAKOTA STATE SCHOOL OF MINES

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RAPID CITY, SOUTH DAKOTA

THE first entrance of the South Dakota State School of Mines into the field of radio communication dates back to 1913 when a 1-kw spark transmitting set was installed on the campus. This was a "powerful" unit for the times and enabled the School to communicate with another station some fifty miles away. Such communication was a complicated affair and fraught with many difficulties.

First, arrangement of time for transmitting would be made by mail between the two stations. Then, at the appointed moment, the two operators would sit at their respective sets and tick off messages. Not infrequently a letter would come several days later, announcing that one of the stations had actually succeeded in picking up the other.

The equipment was constantly improved so that, by 1914, the station was working regularly with other stations in nearby states.

During the World War the station was inactive, operation being resumed after the signing of the Armistice.

Then it became evident that the whole field of radio communication had been revolutionized because of inventions and developments resulting from experiments conducted during the war. Further, broadcasting stations were being erected throughout the country. To meet these radical changes the School began the installation of equipment for transmitting the human voice.

On May 9, 1922, this new equipment was licensed to broadcast on 485 meters, with 750 watts, for the transmission of weather reports only in accord with the United States Weather Bureau schedule. The call letters WCAT were assigned. The station was officially opened in July, 1922.

Equipment of this early station consisted of a transmitter of

RCA manufacture and was installed by members of the Electrical Engineering Department. It had a power of 100 watts with magnetic modulation in the grid circuit. The source of power was the city power circuit of 110 volts AC, which was transformed and rectified before being applied to the set.

Weather forecasts were broadcast twice daily and another period was set at which time special storm warnings might be put on the air.

On November 29, 1922, the station was placed on 360 meters (834 kc) and on February 5, 1923, the power was reduced to 100 watts, that which the station had been using even though its license permitted 750 watts.

During these winter months special entertainment features were broadcast under the provision of the license permitting "unlimited" time. These consisted of addresses and musical features. On one occasion an old Indian chieftain of the community was featured in an account of his adventures before the coming of the white man. This broadcast was ended abruptly when he attempted to demonstrate the Indian war whoop with such power and reality that two tubes were blown and the station silenced.

On May 10, 1923, the station was shifted to 1,250 kc and on September 24, 1923, the power was reduced to 50 watts. However, on December 27, 1923, the power was increased to 100 watts. Then, on March 26, 1924, the power was again reduced to 50 watts.

On April 26, 1927, the power was put back at 100 watts. On June 1, 1927, the station was shifted to 1,210 kc. A further shift to 1,200 kc was made on October 29, 1928.

As improvements were made in the art and technique of broadcasting, it became necessary for the School to instal new equipment. Owing to the efforts of two undergraduates of the School, the station grew rapidly and became a definite service institution to the community which it reached. These two students, whose preliminary training in radio was acquired through their work on the School station, were Mr. C. J. Burnside, now

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manager, and Mr. S. D. Gregory, assistant manager, of the Department of Radio Engineering of the Westinghouse Electric Company.

In 1932 the studio and transmitter were rebuilt and the station was moved from its old location in the basement of the Administration Building to the top floor of the First Building.

A new transmitter, designed and constructed by Mr. F. J. Burris, a graduate of the School, was built based on a system of low-level modulation after the Heising scheme. The output tube, type 849, operated into a tuned plate circuit which in turn was coupled at optimum of the tuned antenna pickup circuit. A system of center-tapped bridge rectification was used to furnish the 2,500 volts of pure direct current for operation. In this setup mercury-filled 866 tubes were used. An inductively operated filter was placed after the rectifier unit to assure smoother output with capacity operation. The entire system operated at a power factor of 0.07, drawing 8.9 amperes from the 110-volt single-phase line. This transmitter was believed to have been the first commercial job in the country to incorporate the feature of the screen-grid tubes as modulated amplifiers. This feature resulted in higher amplification and made neutralization in that stage unnecessary. A quartz crystal and oven unit were kept at desired temperatures by a mercury thermostat, making it possible to comply with government regulations.

A studio was built adjacent to the control and operating rooms, separated from them by double glass windows. The control room contained the operator's desk, upon which was built the speech amplifier, control panel, and recording pickup equipment. The furniture and window decorations in the studio and the rugs and absorptive substance of the ceiling and portions of the walls were such that sound reflection within the room was largely eliminated.

With few minor changes this same station is in operation today. The transmitter is a 100-watt job, operating on 1,200 kc.

On January 18, 1932, the station was taken off of "unlimited" time and permitted to broadcast at specified hours each day.

At present it is on the air from 12:30 to 1:30 P.M. daily except Saturday and Sunday. On Saturdays only a half-hour period is used, from 12:30 to 1:00 P.M., and on Sundays the station is silent. Addresses, drama, sports, music, and the latest news releases are regular features of the station's program schedule.¹

¹ Data furnished by Mr. C. M. Rowe, director of Station WCAT, and files of the Federal Communications Commission.

UNIVERSITY OF SOUTH DAKOTA

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VERMILLION, SOUTH DAKOTA

AFTER considerable amateur and experimental work in the field of wireless communication, the University of South Dakota began broadcasting in May, 1922, with call letters 9YAM. Almost immediately application was filed for a broadcast license, which was granted on February 6, 1923.

Authority was granted under this license to broadcast on 360 meters (834 kc), with 200 watts power, for "unlimited" time. The call letters WEAJ were assigned.

Work of this early station was in the hands of Ernest Lawrence, then an undergraduate at the University and now a member of the research division of the University of California. The vacuum tubes used by the station were loaned by the Western Electric Company for "experimental use." Most of the transmitter parts were mounted horizontally on benches and tables, and power for plate circuits of the tubes was supplied by a series-connected group of generators in the electrical engineering laboratories.

Very soon, however, a high-voltage motor-generator was purchased and the equipment put into more stable form with one 50-watt, self-exciting oscillator and two 50-watt modulators. This latter equipment was used for some time while practically all other transmitters used the same number and kind of tubes in both modulated and modulating groups. It was generally believed by radio authorities at that time that the two groups should be equal in kind and number of tubes.

During the spring and early summer of 1922 the station continued to use this equipment and broadcast many programs of music which were well received by its listeners.

As is usual with many college and university stations, this equipment was silent during the summer vacation. During the school year 1922-23 no important changes were made in the original transmitter. Few regularly scheduled programs were

broadcast during this year, but several special events of interest to graduates of the University and friends were put on the air as they occurred.

Though the early licenses permitted use of 200 watts power, the station was able to make use of only 50 watts. In the fall of 1923 the transmitter was rebuilt and the power increased to 100 watts, using two 50-watt oscillators and three 50-watt modulators. On November 14, 1923, the station was shifted to 1,060 kc and on February 11, 1924, the power granted by the station license was placed at 100 watts, the amount then being used by the transmitter.

During this year the programs broadcast consisted of a regular period of "high-grade" music each Thursday evening and, as they occurred, intercollegiate debates, play-by-play reports of football games, basketball games, and other athletic events, musical recitals by students of the College of Music, recitals by faculty members, and other events of a similar nature. Consequently, during this year the station was on the air about two and one-half evenings a week, though only one evening program was regularly scheduled.

On December 4, 1924, the station was shifted to 1,080 kc.

During the school year 1924-25 some parts of the transmitter were reconditioned and reception was greatly improved. Operating with only 100 watts power, the station was heard throughout the United States and at points in northwestern Canada clearly. During this year a three-part program was initiated regularly for each Wednesday evening. The first part was an address by a member of the University faculty, the second was composed of "high-class" music furnished by the College of Music, and the third was a program of popular music by one of the student orchestras. This year numerous special programs were presented so that the station was on the air on an average of three evenings per week.

On October 7, 1925, the station was authorized to change its call letters to KUSD.

The year 1925-26 was one of trouble for the station. Conditions were becoming so bad that equipment that had given

excellent service in the past was found to be wholly inadequate. Not only had the number of 100-watt stations on the same frequency as Station KUSD increased to an alarming extent, but several 500-watt and 5,000-watt stations were erected not far away and were operating on this same frequency. This was the period during which most of the receivers in use were not very selective, with the result that a powerful station on an adjacent frequency interfered with reception for most of the listeners quite as much as stations on the same frequency. This general condition was fast resulting in chaos within broadcasting.

Though the College of Music this year was able to offer considerable talent of remarkable quality, the station authorities did not feel justified in asking such individuals to present programs that were prevented from getting out in anything like a satisfactory manner because of congestion of the air waves. Thus broadcasts were confined largely to reports of athletic games and similar events where quality and interference were not prime considerations.

When the control of broadcasting by the United States Department of Commerce, Radio Division, broke down completely, early in 1926, Station KUSD added an output amplifier composed of four 212D Western Electric tubes to its transmission equipment. This worked at about 250 watts output and gave a fine quality of broadcast. Since many stations operating on this frequency shifted to other frequencies, the air cleared considerably and the station, with its increased power, was able to serve its listeners better.

During this year a program schedule was attempted consisting of a pipe organ recital each Sunday from 5:00 to 6:00 P.M., a concert by a girls' chorus each Wednesday from 6:45 to 7:30 P.M., a "de luxe feature" furnished by the College of Music each Thursday from 7:30 to 8:30 P.M. which included an educational talk of about twenty minutes in length by some member of the faculty, and all special events that were of interest to the listening audience.

On April 22, 1927, the station was authorized to use 250 watts power and on June 1, 1927, it was shifted to 620 kc, where it was

authorized to broadcast on "unlimited" time. This frequency was used until November 10, 1928, at which time the station was placed on 890 kc, where it was ordered to share time with Stations WILL and KFNF. At this same time permission was granted for the use of 500 watts power. The time-sharing agreement was such that Station KFNF was granted one-half of the time while the other two stations were instructed to divide the other half between them.

This arrangement has continued to the present and has been found to be eminently satisfactory to the University. Commenting on this, Mr. B. B. Brackett, director of Station KUSD, says:

It seems to us that an arrangement like this is most satisfactory, if the commercial station manager is agreeable and reasonable. All the time can be used by the commercial station during the college vacations, and time for special and irregular broadcasts that is frequently needed by the College can be secured by making requests a reasonable period in advance.¹

In the fall of 1928 direct crystal control was applied to the oscillation system that ended with two 250-watt tubes in parallel and the modulation was applied to the last stage of the oscillating system, using six 250-watt modulating tubes, supplied with a plate voltage higher than that to the modulated tubes. This gave a higher degree of modulation with an excellent quality of output. It permitted overmodulation even when full power was used.

The piezoelectric frequency-control system was developed at the University, including the constant temperature oven for the crystal. Since its final adjustment the entire equipment is both positive and very accurate in its operation.

The station now has a general radio-frequency monitoring equipment composed of a monitoring oscillator and deviation meter. From the indications of this meter and from several checks obtained from outside sources, it is certain that the station is holding its frequency within 10 cycles above or below its assigned frequency or within one-fifth of the allowed deviation.

The station is now using a level or volume indicator and also a

¹ Quoted from a report prepared by Mr. Brackett for this study.

general radio modulation meter, and there are also available two different types of standard oscillographs that can be used to check the modulation, including standard cathode ray oscillographs.

Further, the station has carbon, condenser, crystal, and velocity types of microphones, with excellent input amplifiers, volume control, and mixing equipment.

For the first time in the history of Station KUSD, the year 1935-36 brought a really fine main studio. This consists of a room about forty by sixty feet on the fourth floor of the Students' Union Building. It is equipped with sound-deadening walls and ceilings. It is divided by draperies into two portions of about one-third and two-thirds of the large room. All or either of the parts can be used for broadcasting programs. The acoustic qualities, used in any of the three ways, are excellent.

In addition, the station is equipped with underground and shielded wires that enable it to broadcast from the main University auditorium, the armory and gymnasium, the athletic stadium, and other points on the campus.

The physical equipment of Station KUSD has been made in the shops and laboratories of the University. Parts purchased have been assembled by those connected with the institution. The station has been used, and the authorities maintain that it will continue to be used, for University programs in general and "always in the interest of our own State University and the interest of the people of the State." Most of the work in developing the physical equipment has been done under purely voluntary conditions, in extra and overtime service for which no direct compensation has been granted. The work involved in preparing the program material during all the time the station has been on the air has been under similar conditions. In fact, nearly everything connected with the station and its operation has come from free-will, co-operative service from nearly all departments and divisions of the University.

Room rental and power for operating the transmitter have not been charged to the station. Most of the time such charges could not be assessed to the station because it has had no funds

with which to pay. A piano has been loaned by the College of Fine Arts. Many hours of fine music have been furnished by the Department of Music without charge of any kind. This, and the great labor needed to prepare talks, lectures, and other program features, have been granted from all sources as a service to the University and its listening audience.

The professor of physics acts without any extra compensation as chief engineer and operator. One or more members of the student body are the active operators, receiving a small compensation based on actual hours of service. There are always students who need this help to remain in school. The head of the Publicity Department acts as chief announcer, without any charge for his services. Students, usually from the Speech Department, do most of the announcing. They receive a small compensation for their time and this is charged to the Publicity Department.

The head of the Extension Division acts as chairman of the program committee and, at the expense of that Division, prepares most of the general schedules.

Now, as for several years past, the station broadcasts regularly from 4:00 to 5:00 P.M. each day except Saturday and Sunday, and from 9:00 to 10:00 P.M. on Monday, Wednesday, and Friday. The hour from 9:00 to 10:00 P.M. on Tuesday and Thursday is assigned to the University also, as are several hours each Sunday. Irregular events of unusual importance are put in these hours so that special broadcasts can be presented with only a little advance notice. When events occur on hours not assigned to the University station, two weeks or more are necessary for special time-sharing agreements to be made with other time-sharing stations on the frequency.

The following is a general program outline for the year 1935-36:

AFTERNOON SERIES

The afternoon series, given from 4:00 to 5:00 P.M. daily except Saturday and Sunday, consists of talks, music, readings, and modern language lessons.

EVENING SERIES

The evening series are given each Monday, Wednesday, and Friday from 9:00 to 10:00 P.M. Each of these programs consists of a talk some twenty minutes in length and a musical program of forty minutes.

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EVENING LECTURES

There are nine lectures in each series:

1. "What To See in South Dakota," by E. P. Rothrock, professor of geology and state geologist of South Dakota
2. "Chemistry in Every Day Life," by the Department of Chemistry; Professor A. M. Pardee, Professor A. L. Haines, Associate Professor E. H. Shaw, Jr., and Assistant Professor Ernest Griswold
3. "Famous British Authors," by D. C. Dickey, instructor in speech
4. "Advertising for You and Me," by H. R. Fossler, associate professor of psychology
5. "Astronomy for Everybody," by William E. Ekman, instructor in mathematics
6. "Some Applications of Science," by M. W. Davidson, professor of applied science
7. "History and Development of Plant Life in South Dakota," by Orlin Biddulph, assistant professor of botany
8. "The Law and the Citizen," by members of the School of Law faculty: Dean Marshall McKusick, Professor L. W. Feezer, Professor J. E. Payne, Professor Claude W. Schutter, and Associate Professor Russell R. Reno
9. "History and Museum," by W. H. Over, curator of the museum
10. "Christ's Sermons on the Mount," by C. S. Thomas, professor of Bible
11. "Home Decoration," by Edith Abell, assistant professor of fine arts
12. "Problems in Home Making," by Delia Garrett, instructor in home economics

In addition, the University broadcasts each Sunday from 4:30 to 5:00 P.M. over Station WNAX, a commercial station at Yankton, South Dakota, a program that is similar to the evening series over its own station. These WNAX programs are furnished by the students and instructors at the University and consist of a ten-minute talk or lecture and twenty minutes devoted to music.

During the summer of 1936 the station equipment, while well constructed, was found to fall short of recent requirements of the Federal Communications Commission. Complete reconstruction was undertaken at once and is now well under way. Further, plans were being approved by the Commission to move Station WILL to another frequency, thus leaving the University station and Station KFNF to share 890 kc equally.²

² Data furnished by Mr. B. B. Brackett, director of Station KUSD, and files of the Federal Communications Commission.

SOUTHEAST MISSOURI STATE TEACHERS COLLEGE

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CAPE GIRARDEAU, MISSOURI

ON JANUARY 16, 1923, the Southeast Missouri State Teachers College was licensed to operate a broadcast transmitter on 360 meters (834 kc), with 100 watts power, for "unlimited" time. The call letters WSAB were assigned. This license expired on July 14, 1924, and the station was deleted by the federal government on September 8, 1924.

Then, on October 25, 1924, a new license was issued to the College authorizing operation on 1,090 kc, with 100 watts power, for "unlimited" time.

The station apparatus was built by the head of the Department of Physics and operated by him throughout its history. A regular schedule of broadcasts was established consisting of government health lectures and special addresses by members of the various departments of the College. On one evening each week a special concert was given by the College glee clubs and soloists. A few athletic events were also broadcast.

The first operator worked under a license which he had difficulty in renewing owing to its temporary status. His successor was unable to obtain a license. Consequently the project was eventually abandoned and, when the license expired on July 17, 1925, no attempt was made to have it renewed, and the station was deleted by the federal government.

Authorities at the College regretted having to give up the station, but found it impossible to do otherwise under the circumstances. No further broadcasting was attempted by the institution.¹

¹ Data furnished by Dr. Joseph A. Serena, former president of the Southeast Missouri State Teachers College; Dr. W. W. Parker, president of the College; and files of the Federal Communications Commission.

SOUTHWEST MISSOURI STATE TEACHERS COLLEGE

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SPRINGFIELD, MISSOURI

ON DECEMBER 2, 1922, the Southwest Missouri State Teachers College was licensed to operate a broadcast transmitter on 360 meters (834 kc), with 20 watts power, for "unlimited" time. The call letters WQAB were assigned under this license.

Expenses of this project were met wholly by the College and most of the maintenance and operating work was done by engineering students. The station facilities were made available to practically every department of the College and approximately fifty broadcasts were presented. At first the programs were well received by those fortunate enough to have receiving sets, but later, as larger stations began broadcasting, the signals of Station WQAB so interfered with signals from other stations that its broadcasts were definitely unpopular.

Because of this growing interference with broadcasts from larger stations, and because of the expense involved in operating the transmitter, the College decided, when its license of June 1, 1923, expired on August 30 of that year, to abandon the project and permit the federal government to delete the station. This latter was done on November 11, 1923.

This work was largely of a pioneer nature and was considered a most valuable contribution of the Science Department to the field of radio communication and to the community served by the institution.

Interest in radio continued, however, so that it was not long until another station was projected and construction begun under the supervision of the College Science Department. With the assistance of a mechanic not connected with the College, a station, the exact duplicate of Station WIAI, a commercial station in Springfield, Missouri, was built. This new equipment had an output of 20 watts and was operated both from remote control and from the central studio.

License covering this new station was granted on January 18,

1924, authorizing operation on 1,270 kc, with 20 watts power, for "unlimited" time. The call letters KFNH were assigned.

The primary purpose of this new station was educational and considerable informational material was broadcast. A great deal of this was experimental, as few, if any, principles of educational broadcasting were understood clearly at that time.

After a few months' operation it was discovered that the finances necessary were not forthcoming. Consequently, when the license expired on April 17, 1924, the station was closed and the license surrendered. On May 31 of that year the station was deleted by the federal government and the College withdrew altogether from the field of broadcasting.¹

¹ Data furnished by Dr. A. P. Temple, head of the Science Department at the Southwest Missouri State Teachers College; Mr. G. Pearson Ward, president of the G. Pearson Ward Radio Shop in Springfield, Missouri; and files of the Federal Communications Commission.

SPANISH AMERICAN SCHOOL OF RADIO TELEGRAPHY

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ENSENADA, PUERTO RICO

ON JUNE 16, 1922, the Spanish American School of Radio Telegraphy applied for a license to operate a radio station on the island of Puerto Rico. This application was granted on June 19, 1922, authorizing the operation of a transmitter on the normal frequencies of 300, 360, and 600 meters. The call letters WGAD were assigned.

The station proposed to broadcast “entertainment and light matters at special hours.” Further, it was employed as laboratory mechanism for the teaching of radio communication.

When the station license expired on December 28, 1922, no application for renewal was made and deletion by the federal government followed on May 22, 1923.¹

¹ Data gathered from files of the Federal Communications Commission.

STANFORD UNIVERSITY

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STANFORD UNIVERSITY, CALIFORNIA

RADIO activities at Stanford University divide themselves into two groups: the first concerning use of radio as a means of education and entertainment for the general public and the second concerning the technical training of radio engineers and related activities, notably research.

Use of radio to serve the general public began at Stanford University with the installation, in the fall of 1922, of a transmitter and the granting of a license, on November 20, 1922, for experimental broadcasting. Under this license a 100-watt transmitter was placed in operation. The generating equipment included a 2,000-volt direct-current machine, two 50-watt and two 250-watt three-electrode tubes, and an aerial radiating 100 watts power.

During the ensuing two years, beginning with the Stanford-Pittsburgh football game on December 20, 1922, various athletic events as well as a number of talks by members of the faculty were broadcast. The station did not, however, operate on a regular schedule.

During the period 1923-25 the station co-operated with the Bureau of Standards, United States Department of Commerce, in broadcasting standard radio-frequency signals for the Pacific coast area. This was done several times a week on a regular schedule.

Throughout the entire period 1922-25 the University remained alert to the possibilities of radio, as a new communication art, for educational purposes. Many things were found feasible and permissible, but few that were not prohibitive in cost. Even those that were seen to be mandatory for research and instruction were, in many instances, too expensive for the University to undertake, while those of commercial value required a greater financial outlay than the University could well afford.

On May 7, 1924, the University was granted a license author-

izing operation of a 500-watt broadcast station on 1,110 kc, for "unlimited" time. The call letters KFGH were assigned.

Following this, Dean Theodore J. Hoover, of the School of Engineering, submitted a report to Dr. Ray Lyman Wilbur, president of the University, suggesting the building and equipping of a station under this license. Though favorably reported upon by Dr. Wilbur, funds for the project were not available. Consequently, on December 20, 1925, the license was surrendered and, on December 28, 1925, the station was deleted by the federal government.

No further efforts were made to use radio for the service of the general public until January 8, 1934, when a series of weekly fifteen-minute broadcasts, first over Station KPO and later over Station KGO, were inaugurated in co-operation with the National Broadcasting Company. These consisted of talks prepared and delivered by members of the University staff. They have been continued regularly except for brief interruptions.

Regularly organized instruction of engineering students in radio and related subjects was begun in 1924. During the period 1925-27 the Electrical Engineering Department organized a Division of Communication and inaugurated a systematic program for the building-up of a properly equipped communication laboratory. The objective during this period was to provide a course of study for graduate students desiring specialized training in radio and related communication lines and to provide research facilities for the graduate students and the faculty. The communication work has developed continuously since that period, and the University now has a completely equipped radio laboratory and offers a well rounded two-year graduate course for those interested. During the eight years 1928-36 there were forty-three advanced degrees awarded to students specializing in this field.

Research is considered an essential part of graduate instruction at the University. During the years from 1928 to 1936 there have been published some thirty-five technical papers dealing with research originating in the Communication Laboratory.

At the present time equipment for the construction of experimental vacuum tubes is being completed, and training and research in high-vacuum technique was started early in 1937. There is also in the process of construction equipment for the study of wave propagation, with particular reference to the ionosphere. This latter project was proposed in 1930 and laid aside for the purpose. However, no funds were available and the matter was dormant until recently when a combination of circumstances made it possible to start the program with a relatively low initial investment.

Completion of this work will make the University one of the transmitting as well as receiving centers of radio wave research in co-operation with other institutions on the Pacific coast, throughout the Pacific basin, and, to a limited extent, throughout the world.¹

¹ Data furnished by Dr. Harris J. Ryan, professor emeritus, Department of Electrical Engineering, Stanford University; Dr. Ray Lyman Wilbur, president of the University; Dr. F. E. Terman, associate professor of electrical engineering at the University; and files of the Federal Communications Commission.

STATE TEACHERS COLLEGE

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MAYVILLE, NORTH DAKOTA

ON JANUARY 19, 1923, the State Teachers College at Mayville, North Dakota, was granted a license to operate a broadcast transmitter on 360 meters (834 kc), with 50 watts power, for "unlimited" time. The call letters WRAC were assigned.

This venture grew out of the interest in radio of a member of the College faculty who had equipped a small station on the campus and was sending some messages during 1921 and 1922. He also offered a course in radio in which a large number of students enrolled. Each student purchased his own equipment and built his own receiving set. Instruction in this field was continued with some success for eighteen months.

Any broadcasting attempted by the College station was found to interfere considerably with local reception of other stations, and numerous complaints were made to the Board of Administration of the College by radio enthusiasts in the area.

This, and the fact that the College was unable to get state appropriations sufficient for continuing the work, resulted in the Board's discontinuing the project at the expiration of the first license (April 18, 1923) and the deletion of the station by the federal government on June 15, 1923.¹

¹ Data furnished by Dr. C. C. Swain, president of the State Teachers College; Mr. H. B. Schultz, secretary of the College; and files of the Federal Communications Commission.

STEPHENS COLLEGE

COLUMBIA, MISSOURI

ON OCTOBER 16, 1925, Stephens College was licensed to operate a broadcast transmitter on 600 kc, with 500 watts power, for "unlimited" time. The call letters KFRU were assigned. On June 1, 1927, the station was shifted to 1,200 kc and on October 29, 1928, it was placed on 630 kc and ordered to share time with Stations WOS and WGBF. The station remained on this frequency until it was sold by the College to Mr. Nelson R. Darragh, president of the St. Louis Fur Company.

During the six years that the station was operated by the College considerable difficulty was experienced in maintaining programs on a level comparable with the dignity of the institution. The budget allowance for broadcasting was inadequate to attract a competent operator who at the same time possessed the ability to formulate programs of educational value, or to care for maintenance expenses and necessary additional equipment.

Further, when the station was on the air it was impossible for residents in the area to hear other stations. This caused considerable irritation and made the station increasingly unpopular.

Lack of satisfactory hours for broadcasting was another factor contributing to the difficulties of maintaining Station KFRU as an asset to the College. Another station at Jefferson City, thirty miles away and belonging to the state, was placed on the same wave-length and was able to get the better broadcasting hours on this shared frequency.

All these factors operated to discourage the College from maintaining the station further. Consequently, in 1932, Station KFRU was incorporated and the stock sold to Mr. Darragh. However, provision was made in the sale contract by which five hours per week should be set aside in perpetuity for the College and at no cost to the College.

EDUCATION'S OWN STATIONS

At present the College is using the station for three hours on Sunday and for four half-hour periods scattered throughout the week. The programs broadcast during these periods are prepared by students and members of the College faculty and consist of materials which have been worked out in the radio class.

During the past two years the College has offered its first- and second-year students a course in radio work. This course has as its major objective instruction in oral English, but serves many minor purposes such as offering a means for integrating training in the fields of music, art, literature, and dramatics. A second of these minor purposes is the training of students in the many technical and professional aspects of radio work. This serves two ends: It enables students to discover whether or not they have an aptitude in this field and it makes possible a fuller appreciation of the radio in present-day living.¹

¹ Data furnished by Dr. W. P. Shofstall, dean of administration at Stephens College, and files of the Federal Communications Commission.

STOUT INSTITUTE

MENOMONIE, WISCONSIN

RADIO work at the Stout Institute began in 1919 with experimental researches which continued for a period of approximately six years. During this time considerable information was assembled as regards reception and transmission and some code communication was attempted.

This resulted in the organization of a class in radio in which elementary theory of reception and transmission was taught. Students in the class built a number of short-wave transmitters. One group constructed a transmitter for broadcasting voice. This was licensed on February 2, 1925, with authority to operate on 1,280 kc, with 20 watts power, for "unlimited" time. The call letters WGBQ were assigned. On May 4 of that year the power was increased to 100 watts.

Little or no actual broadcasting was attempted with these facilities. One band concert from the auditorium of the Institute is known to have been put on the air. There was never any educational broadcasting undertaken.

What broadcasting was done caused considerable complaint from listeners in the area on the grounds that the station's signals interfered with reception of other stations. The fact that early receivers were not highly selective accounts for this condition.

After a careful study of the situation, and conference with authorities in other institutions operating broadcasting transmitters, it was decided to abandon the project, and the license was permitted to expire on November 20, 1925. Soon thereafter (December 12, 1925) the station was deleted by the federal government.

Since then nothing has been done by the Institute either in experimental work or in instruction owing to the lack of funds and the lack of interest in such work.¹

¹ Data furnished by F. E. Tustison, of the Physics Department at the Stout Institute; Burton E. Nelson, president of the Institute; and files of the Federal Communications Commission.

SUPERIOR STATE TEACHERS COLLEGE

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SUPERIOR, WISCONSIN

BEGINNING in 1919 the Superior State Teachers College undertook experimental work in wireless communication, operating an amateur station under the direction of the Physics Department.

Later a 50-watt broadcasting station was constructed and application made for license. This was granted on May 23, 1924, authorizing operation on 1,150 kc, with 50 watts power, for "unlimited" time. The call letters WDBP were assigned. Mr. W. C. Bridges was the licensed operator in charge.

Only about five experimental programs were broadcast before Mr. Bridges resigned to become manager of Station WEBC, a commercial enterprise. After he left no one in the College had the time necessary for arranging regular daily broadcasts. Further, funds were not available to keep the station improved and up to the standards that were being set by the rapidly growing commercial stations.

Consequently, when the license expired on June 23, 1925—a license which had placed the station on 1,240 kc—no application for renewal was made and deletion by the federal government followed.¹

¹ Data furnished by Dr. J. D. Hill, president of the Superior State Teachers College, and files of the Federal Communications Commission.

SWEENEY AUTOMOBILE SCHOOL

KANSAS CITY, MISSOURI

ON MAY 10, 1922, the Sweeney School Company was licensed to operate a broadcast transmitter on 360 meters (834 kc), with 1,200 watts power, for "unlimited" time. The call letters WHB were assigned. On November 17 of that year the station was placed on 400 meters and its power reduced to 500 watts.

On May 11, 1923, the station was shifted to 730 kc and on February 17, 1925, it was again shifted, this time to 820 kc.

On April 19, 1927, an order was received to share time on 820 kc with Station WDAF. On June 1 of that year the station was shifted to 890 kc where it shared time with Station WOQ. Then, on November 16, a further shift was made to 880 kc and "unlimited" time allowed.

On November 1, 1928, the station was moved to 950 kc where it shared time with Stations KMBC and KLDS. Here it was granted permission to use 1,000 watts power. Then, on November 24 of that year, it was ordered to use 1,000 watts power only to "local sunset" and after that time to use 500 watts.

On January 11, 1929, the power was placed at 500 watts day and night. On November 23 of that year the station was shifted to 710 kc and permitted to broadcast only during the daytime, but was granted "unlimited" time during this period.

The license issued on December 11, 1929, placed the station on 860 kc. Meantime, on December 9, 1929, application had been made for permission to transfer the license to the WHB Broadcasting Company. This was granted on December 19, 1929, and the station turned over to that organization.¹

¹ Data furnished by Mr. E. J. Sweeney and files of the Federal Communications Commission.

TECHNOLOGICAL HIGH SCHOOL

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ATLANTA, GEORGIA

ON APRIL 20, 1927, the Gilham Electric Company, owners and operators of Station WDBE, donated all the apparatus of its station to the Atlanta public school system and withdrew from the broadcasting field.

The transmitter was set up in the Technological High School, a unit of the Atlanta public school system, and application made for broadcast license. In this application it is stated that the school intended to broadcast courses such as those given in the city's night schools and to offer the station facilities to local firms.

On the basis of this application a license was granted on February 18, 1928, permitting the school to operate a radio station for "unlimited" time on 1,320 kc and with 200 watts power. The call letters WTHS were assigned. On November 7, 1928, the station was shifted to 1,310 kc, its power was reduced to 100 watts, and it was ordered to share time with Station WRBI.

Though equipment was available and a federal license had been granted, no money for operation was available. Consequently when, on January 31, 1929, the license expired no application for renewal was made and the station was deleted on May 27, 1929.

Since then the school has conducted a class in radio, broadcasting by code from a station built largely by the boys of the institution.¹

¹ Data furnished by W. O. Cheney, principal of the Technological High School, and files of the Federal Communications Commission.

UNIVERSITY OF TEXAS

AUSTIN, TEXAS

SOMETIME previous to the fall of 1921 a resident architect at the University of Texas had secured funds from the president of the University with which to establish a radio station on the campus. The purpose was largely that of experimental work in radio communication. The first license covering this station bore the call letters 5XY.

After the station had been in operation on this basis for approximately two years, the Physics Department at the University entered formal protest to the University authorities that its signals, being broadcast at all hours of the day and night, were interfering materially with experimental work on radio in the department. Consequently a request was made for relief and a conference of those interested was called by the president to consider the matter. The result of this was that the station was turned over to the Extension Division of the University to be used as an instrument for extension teaching.

Under this arrangement the University applied for a broadcast license. This was granted on March 22, 1922, authorizing operation on 360 meters (834 kc), with 2,000 watts power, during specified hours. The call letters WCM were assigned. On August 21 of that year the station was permitted "unlimited" time on this frequency and on December 27 the power was reduced to 500 watts.

A stipulation of the agreement under which the Extension Division took over the station was that funds should be supplied to put the equipment in "first-class condition" and an appropriation allowed for operation. However, no funds were supplied with the result that the station was of no value to the Division and no broadcasting could be done effectively.

Consequently the license was allowed to expire on March 26, 1924, and the station was deleted by the federal government on that date.

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At about this time a representative of the state Marketing and Warehouse Division, whose duty, among other things, was to broadcast market reports furnished from Washington, made an agreement with the University Extension Division to the effect that, for the use of the equipment one hour each day, he would replace burned-out tubes and otherwise keep the transmitter in condition. Further, the University was to be permitted to broadcast items of interest from the campus whenever advisable.

Under this agreement the University, in co-operation with the Texas market and warehouse departments, was granted a new license on November 10, 1924, authorizing operation of its transmitter on 1,120 kc, with 250 watts power, for "unlimited" time. The same call letters used under the previous license were assigned, WCM.

While this arrangement was in effect, items of interest were broadcast by the University from time to time and several series of lectures by members of the faculty were presented.

Meantime the Physics Department recognized the value of the station for its uses and requested the Board of Regents of the University to turn over the equipment to its management. As no appropriation had been made for maintenance, and as the work that the station was doing was felt to be unsatisfactory, the license was allowed to expire on June 10, 1925, and a new license was requested by the University which would eliminate the Texas market and warehouse departments and give complete control to the Physics Department.

This license was granted on October 30, 1925, authorizing operation of the transmitter on 1,300 kc, with 500 watts power, for "unlimited" time. The call letters KUT were assigned. At this time the Physics Department made arrangements by which all operating expenses of the station should be borne by a maintenance and equipment fund in the department.

On April 21, 1927, the station was shifted to 1,100 kc and on June 1 of that same year it was again shifted to 1,290 kc. On October 30, 1928, the station was placed on 1,120 kc and ordered to share time with Station WTAW.

During this period programs of music, lectures, and the like were broadcast.

After a few years of operation on this basis the expense of maintaining the station became too great for the department and a committee on radio, appointed by the president of the University to study the matter, recommended that the project be discontinued. Consequently the station was dismantled and the equipment absorbed into the Department of Physics for experimental purposes.

On February 19, 1929, the license was assigned to the KUT Broadcasting Company, which established a station in a local hotel and placed its transmitter at a location just outside the city limits. The station was operated on a purely commercial basis, although the University was allowed use of its facilities as desired.

While the station was still in operation on the University campus some effort was made to introduce a bill into the Texas legislature providing for the establishment of a large and effective station to be operated under the Extension Division of the University. Since the expenses involved in building and maintaining an adequate station were great, the bill, though written and introduced, did not receive favorable report by the committee in charge and thus was never brought to the floor.

Station KUT was later sold and the call letters changed to KNOW. Recently this station has been purchased by Hearst Radio, Incorporated.

At present a line is run from the station to a studio in the Physics Building on the campus and certain programs originating here are broadcast. These programs are entirely of an entertainment nature, no instruction being attempted. Five days each week, between 5:30 and 6:00 P.M., programs are broadcast, largely by students of the University, from the auditorium in the Physics Building. Further, evening programs of organ music are broadcast from this same building. Occasional short talks on campus news are given.

Those interested in radio at the University are hopeful that further expansion of these activities will be made possible in

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the future and that the state legislature can be persuaded to erect a large station near Austin as a state project under the supervision of the University. However, no advance has been made in this direction to date.¹

¹ Data furnished by Dean T. H. Shelby, of the Extension Division at the University of Texas; Dr. C. P. Boner, of the University Department of Physics; and files of the Federal Communications Commission.

TOCCOA FALLS INSTITUTE

TOCCOA FALLS, GEORGIA

ON AUGUST 19, 1926, the Gospel Tabernacle, Incorporated, was licensed to operate a broadcast transmitter on 1,071 kc, with 250 watts power, for "unlimited" time. The call letters assigned were WKBJ.

Shortly after this the Tabernacle, located at St. Petersburg, Florida, donated its station to the Toccoa Falls Institute, and the equipment was assembled in the basement of the Presbyterian church at Toccoa Falls, Georgia, for the purpose of broadcasting Bible lessons and preaching services.

This new arrangement was licensed on September 24, 1927, permission being granted to broadcast on 1,430 kc, with 250 watts power, during specified hours. The call letters WTFI were assigned. New equipment was added later and a regular schedule of broadcasting established.

On April 11, 1928, permission was granted to increase the power to 500 watts and on October 31 of that year the station was placed on 1,450 kc and granted "unlimited" time. On April 27, 1929, the power was reduced to 250 watts but on July 7, 1930, it was increased to 500 watts.

Better to care for operation of the transmitter and financial considerations, the station was incorporated as the Toccoa Falls Broadcasting Company, a corporation in which the Institute held all the stock, and the license transferred to this corporation on March 28, 1931. Soon thereafter the station was moved to Athens, Georgia.

After operating here as a semicommercial venture for a short while, the station was leased to the Liberty Broadcasting Company, a subsidiary of the Liberty Insurance Company.

In 1935 the station was eventually sold to Mr. Norman K. Winston, of New York City, and moved to Atlanta, Georgia.

While the station was located in Athens considerable educational broadcasting was carried. Every program of impor-

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tance that the University of Georgia had to offer was used. Further, a great many farm programs were broadcast in cooperation with the United States Department of Agriculture. Every Monday evening a thirty-minute program was presented by the Athens city schools. Sunday schedules consisted entirely of religious features, and the station permitted no commercial programs on this day.¹

¹ Data furnished by Mr. A. Lynne Brannen, director of Station WTFI, Athens, Georgia, and files of the Federal Communications Commission.

UNIVERSITY OF TOLEDO

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TOLEDO, OHIO

ON MAY 13, 1925, the University of the City of Toledo was licensed to operate a broadcast transmitter on 1,460 kc, with 100 watts power, for "unlimited" time. The call letters WIBK were assigned.

This station was under the direction of members of the Department of Physics at the University and was an experimental venture. No regularly scheduled broadcasts were ever conducted.

Handicapped by the lack of equipment, the station was never in a position to operate satisfactorily. Consequently, when the license expired on August 12, 1925, no application for renewal was made and the station was deleted by the federal government on October 24, 1925.¹

¹ Data furnished by Mr. F. Arthur McPhillips and files of the Federal Communications Commission.

TRINIDAD HIGH SCHOOL

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TRINIDAD, COLORADO

THE Trinidad High School was first licensed to operate a broadcast transmitter on August 21, 1925, using call letters KFBS. On April 26, 1927, the station was placed on 1,260 kc and permitted to use 15 watts power for "unlimited" time.

The station was operated by students of the School who were particularly interested in radio. It served as a means of instruction and experimentation only. When this interest waned, the project was abandoned and, with the expiration of the license on July 31, 1927, no application for renewal was made and deletion by the federal government followed on August 9, 1927.¹

¹ Data furnished by Mr. William R. Ross, superintendent of the Trinidad public schools, and files of the Federal Communications Commission.

TULANE UNIVERSITY OF LOUISIANA

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NEW ORLEANS, LOUISIANA

THE Tulane University of Louisiana enjoys the distinction of being one of the earliest pioneers in wireless research in this country. In 1896, less than a year after Marconi published his famous experiments in the use of an induction coil to produce Hertzian waves which could be picked up by means of a coherer, Dr. W. M. White, then a student at the University, repeated the experiment so that communication by dots and dashes was secured through the wall separating two rooms in the physics laboratory.

Following this the University, through its Physics and Electrical Engineering departments, conducted elaborate experiments in wireless communication. A receiving set was erected on top of the Engineering Building by Mr. Pendleton E. Lehde.

With the coming of the World War in 1917 the University organized a school for radio operators and trained more than a thousand students for military radio service. Later, when the government organized its military schools for mechanical training, the University contracted to train four thousand men in radio. Of these, 2,600 were radio operators and 1,400 were radio engineers. Thus there existed on the campus the largest radio engineering school in the United States, one regarded by the government as well equipped as any in the country for this specialized branch of training.

Following the war the University installed a new receiving station in the Physics Building. This work was very soon expanded and a license to operate an experimental station secured under the call letters 5YU. This license was known as a "technical and training school license" and gave a broad range of wave-length and power for conducting scientific experiments in the interest of the science and art of radio communication.

Owing to the success of this project and to the rapidly increasing importance of telephonic broadcasting, the University

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decided early in 1921 to expand its activities in the field to include broadcasting of voice. New equipment was purchased and installed.

Radio engineering was given a place in the curriculum of the Department of Electrical Engineering and the work opened to students in arts and sciences who had the prerequisite physics and electricity. Courses were offered in generation, transmission, and detection of radio frequencies, and studies of special types of apparatus used in radio. Considerable laboratory work accompanied the class lectures. The staff for instruction included Dr. D. S. Elliott, professor of physics and formerly in charge of radio in the U.S.A. School of Military Aeronautics at Atlanta, Georgia; Dean Douglas Anderson, professor of electrical engineering; and assistant instructors in the two departments.

On April 24, 1922, the University was licensed to operate a broadcast transmitter on 360 meters (834 kc), with 25 watts power, for "unlimited" time. The call letters WAAC were assigned.

On August 19, 1922, permission was granted to increase the station's power to 400 watts.

In view of the important service which it was believed the University could render through experimentation and research, it was decided to limit the broadcasting of educational and entertainment programs to two or three evenings a week at most. Aside from musical features, the character of broadcasts fell into three types of service: (1) the dissemination of government information, (2) addresses by prominent visitors to the University and city, and (3) lectures by members of the University staff of specialists supplying timely and accurate information along medical, engineering, and other lines.

The station was used also as a means for the instruction of students in engineering.

On January 5, 1925, the station was placed on 1,090 kc and the power reduced to 100 watts.

Interest in experimental work and in the instruction of students in high-frequency currents and their application soon came to overshadow the interest of the University in broad-

casting of entertainment features and educational programs. It was increasingly felt that this latter field could be cared for better by commercial concerns with adequate financial resources. Concerning this matter Dr. Elliott writes:

After three years' experience and observation of the trend in the field of broadcasting, by 1925, it seemed obvious to those in immediate charge of the Tulane station that New Orleans was the logical center in the South for commercial chain stations such as had begun to emerge in the East, with constantly increasing power and improved equipment, enlarged administrative and technical personnel, and better programs, all financed through commercial advertising both local and national.

We felt that our primary educational function prevented us from soliciting the necessary advertising support to keep up in the competition on one hand; and on the other hand it did not seem desirable to divert money from research and other direct educational functions in order to maintain an independent station operated by the University. Rather it seemed wiser to pool our educational contribution in a broadcasting way with the technical and business facilities of one of the commercial stations located in the city and let it go at that.¹

Because of this belief the license was allowed to expire on November 2, 1925, and the station was discontinued.

Following this the University intensified its work in high-frequency currents and its researches in the whole field of radio communication, strengthening its courses offered and adding materially to its laboratory equipment. As a result of this move, there is located at the University today one of the leading laboratories for this field of endeavor in the country, and graduates of the University have taken a prominent part in the development of the science of high- and ultra-high-frequency research.

Dr. Elliott writes: "After ten years we still feel for our local problem that this was the wiser solution. At the present time Tulane University conducts an educational broadcast period three evenings a week in connection with Station WSMB."²

¹ Quoted from a letter by Dr. D. S. Elliott, professor of physics at the Tulane University of Louisiana, dated February 18, 1936.

² *Ibid.* Data obtained from the *Tulane News Bulletin*, II, No. 8 (May, 1922), 141-43; III, No. 2 (November, 1922), 19-20; and XIII, No. 4 (January, 1933), 54-56; Dr. Douglas Anderson, dean of the College of Engineering at the Tulane University of Louisiana; Dr. A. B. Dinwiddie, president of the University; Dr. D. S. Elliott, professor of physics at the University; and files of the Federal Communications Commission.

TYLER COMMERCIAL COLLEGE

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TYLER, TEXAS

ON NOVEMBER 4, 1922, the Tyler Commercial College was licensed to operate a broadcast transmitter on 360 meters (834 kc), with 20 watts power, for "unlimited" time. The call letters WOAF were assigned.

The purpose of the College authorities in establishing this station was to furnish students in the College radio school with equipment for laboratory work in connection with their courses. The station was used for this purpose altogether, no information about the school or educational material being broadcast. The equipment served exclusively as a means of instruction and experimentation in the field of radio communication.

On February 1, 1923, the station power was reduced to 10 watts and on June 26 of that year it was increased to 100 watts. On October 9 it was again placed back at 10 watts.

During the latter part of 1923 and the early part of 1924 interest in radio at the school began to lag. As a result, on October 9, 1924, the license was allowed to expire by default and consequently the station was deleted by the federal government on April 10, 1925.

An interesting bit of comment on the situation is that given by President W. M. Roberts of the College:

In 1931, when Tyler grew to such an extent, on account of the discovery of the East Texas oil field, that we wanted a broadcasting station here, a few of us pooled our assets, and incorporated under the name of "The East Texas Broadcasting Company," and bought a station from Brownwood, Texas. We paid \$25,000 for their equipment.

This station carried the call letters of KGKB in Brownwood and we maintained the same letters for Tyler. We have bought, and will instal, a new RCA transmitter. We will also build a vertical antenna 165 feet high.

Had we retained our old WOAF license, it would not have been necessary, as I understand it, to purchase a new station. In other words . . . we slept on our rights, so to speak, and did not renew our license at the proper time, thereby losing our original WOAF license by default.¹

¹ Quoted from a letter by Dr. W. M. Roberts, president of the Tyler Commercial College, dated January 24, 1936. Data furnished by Dr. Roberts and files of the Federal Communications Commission.

UNION COLLEGE

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SCHENECTADY, NEW YORK

THE beginnings of radio at Union College are dimmed by the lapse of time so that some of the earliest facts can be given with only approximate certainty.

Sometime during 1915 or 1916 the College Radio Club built a spark discharge station. In the summer of 1916 Dr. E. J. Berg, a member of the College faculty, began experimenting with radio in a small laboratory attached to his garage. In the fall of that year Dr. Alex Stevenson joined with him. The two eventually built a radio laboratory on the third floor of Dr. Berg's home, put up an antenna, and started sending and receiving messages.

Shortly after this, these men strung up a large antenna from the roof of the Library Building to the roof of the Electrical Engineering Laboratory on the campus. With a small amount of money that they were able to obtain, they built a room on the back of the Electrical Engineering Laboratory and equipped it with tube-type wireless phone receiving and sending apparatus.

During the winter of 1916-17, probably in January or February of 1917, an antenna was erected on the roof of a private home in Albany, New York, and a wireless phone sending and receiving set was installed by these experimenters.

In December, 1916, Dr. Berg gave a demonstration of the wireless phone for the Fortnightly Club at his home. At this demonstration a program was received from Dr. Alexanderson's laboratory in the General Electric Company's buildings.

Numerous experimental broadcasts were made by Dr. Berg and Dr. Stevenson during this early period. Getting tired of making conversation, counting from one to ten, and the like—methods employed by experimenters in those early days—these men attached an Edison phonograph to their phone broadcasting apparatus and were thereby enabled to send out music and speech to many boys in the community who were keenly inter-

ested in radio experimentation and who had formed the habit of listening for the station and reporting the nature of reception over their receivers.

Interest in this experimental work resulted in the organization of a Radio Club at Union College and the operation of a station under the call letters 2YU.

When the World War broke out and the United States became involved, all such radio apparatus was sealed by the government. Thus Station 2YU was silenced for the duration of the conflict and the Radio Club was disbanded.

In the fall of 1919 the government lifted the ban from amateur radio and the College Radio Club was revived. Twenty-five attended its first meeting. The station was reopened with the Electrical Laboratory as its location. The operator's cabin adjoined the laboratory proper. A fan-type antenna having a maximum height of seventy feet and a spread of ninety feet with seven nearly vertical down-leads was used. The geography of the situation was such as to prohibit the use of a counterpoise, so the old ground system was again used, consisting of ten three-inch pipes driven eight feet into the ground. The effective resistance of the entire system was about 10 ohms at 300 meters.

The regular transmitting set consisted of a General Electric 60-cycle transformer, 110/13, 200 volts, taking an input of 850 watts on full power; Dubiler condenser of .007 microfarad capacity, inclosed non-synchronous rotary gap, and pancake-type oscillation transformer. A six-ampere scale thermocouple ammeter was always in the antenna circuit and read five amperes for normal operation. This set was tuned to a wave-length of 260 meters. There was also a 6-U tube set, with voice and buzzer control operating on 300 meters. Power was furnished from a 1-kw 1,000-volt generator which gave an antenna current of four amperes. The Meissner oscillating circuit and "plate modulation" were characteristic of this set. A third transmitter was installed for the use of those who like to talk with local amateurs during the early hours of the evening.

Someone conceived the idea of transmitting victrola concerts

via radio—at that time an almost unknown practice. Such records had been used for experimental work, but only as units. A concert was tried on October 14, 1920, and proved so successful that a definite schedule was settled upon.

This concert and the programs which followed were broadcast over the College's new equipment and under authority of a license assigning the call letters 2XQ to the station. This was among the first stations to be conducted by college students and to regularly broadcast musical programs. After two months, programs were scheduled for Sunday evenings with members of the College faculty presenting addresses. Reports show that these programs were heard in every state east of the Mississippi River and north of the Carolinas, as well as at numerous points in Canada and by ships several hundred miles at sea.

Among the novelties staged in these early days was the transmission of the music of a dance orchestra. A horn, to which was fastened a telephone transmitter, was hung over the orchestra and wires run to the phone set in the Electrical Laboratory. Dances were held in various places to this music transmitted via radio. The College Radio Club staged several demonstrations of this accomplishment in Schenectady and in neighboring cities.

In 1921 the members of the Radio Club equipped a "wireless baby carriage" which attracted a good deal of attention. This device was equipped so that it would pick up broadcasts from the College station as it was wheeled about the city streets. Much publicity was given this invention.

A series of radio concerts was broadcast each Thursday evening from 8:00 to 8:30 and from 9:00 to 9:30. These met with great success. Letters applauding the concerts were received from twenty-three states, the District of Columbia, four Canadian provinces, steamships on Lake Michigan and on the Atlantic, and ships as far as seven hundred miles out of Ambrose Channel. At this time Union College was among the few educational institutions to broadcast a definite schedule of radio concerts.

A further activity of the College Radio Club was to send out

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by wireless telephony, each Sunday night, a short religious service consisting of a scripture reading, suitable hymns, and a ten-minute sermon by the president of the College.

It was estimated that fully two thousand stations within the 1,200-mile radius reached by the College station listened to these features. The Radio Corporation of America presented the Club with some new equipment of latest design as a reward for these efforts which the Corporation felt were the most enterprising of those undertaken by any college radio club at that time.

On June 14, 1922, at the invitation of the Union College Radio Club, wireless enthusiasts in the vicinity were invited to meet on the campus for discussion of their problems and interests. This was the first convention of amateur radio operators ever held in that part of the state, and more than 250 accepted the Club's invitation.

The success of these experimental ventures was such as to lead to an application for a broadcast license. This license was granted on March 2, 1922, authorizing operation of the College transmitter on 360 meters (834 kc), with 1,000 watts power, for "unlimited" time. The call letters WRL were assigned. Broadcasting of entertainment and educational programs was begun and an attempt made to establish a regular schedule of offerings.

However, it was very soon discovered that the College was unable to meet the competition which commercial stations throughout the country then offered. A careful study of the matter convinced those in charge that the best service of the College lay in research and experimentation. Thus, when the license expired on January 25, 1923, no application for renewal was made and the station was deleted by the federal government on December 18, 1924.

The College and the Radio Club then turned their attention to experimental work in radio communication, especially with frequencies below 120 meters. Station 2XQ was modernized and experiments were begun with regular communication across the Atlantic Ocean. These experiments, begun in the fall of

1925, resulted in broadcasts that were heard in Alaska, New Zealand, England, Holland, France, and Spain.

The Club made a notable advance in radio research when it succeeded in developing an oscillator which would operate at very low frequencies and using relatively high powers. In the past such oscillators had been made to operate on wave-lengths in the order of four to five meters, but, before the work of the Union College Club, it had been necessary to dispense with the tube sockets and also to remove the tube bases.

Using standard equipment, the College was able to make such a set oscillate on the extremely low wave-length of 3.8 meters. This was a new low record for the successful operation of vacuum tubes in an oscillatory circuit, using ordinary apparatus. Hitherto, experimenters had attempted to nullify the internal tube capacity. This new oscillator, on the other hand, used this capacity rather than an external condenser, and, by using very short connections between the tube sockets, it was possible to obtain a very short oscillatory circuit which determined the frequencies.

Between 1929 and 1931 the College presented special programs of addresses by members of its faculty and guests over Station WGY. No further attempts at educational broadcasting have been made by the College.¹

¹ Data furnished by Dr. E. J. Berg, head of the Department of Electrical Engineering at Union College, and files of the Federal Communications Commission.

UNION HIGH SCHOOL

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KELLOGG, IDAHO

ON NOVEMBER 13, 1926, the Bunker Hill and Sullivan Mining and Concentrating Company of Kellogg, Idaho, was licensed to operate a broadcast transmitter, using the call letters KFEY. Then, on April 15, 1927, operation of the station and control of the license was transferred to the Union High School. However, financial support of the project was furnished by the former owners, the one large industry in the district.

A student at the School, Mr. Dorrane Cook, who was particularly interested in radio, took charge of the station and made use of its equipment largely for experimental purposes. Programs were broadcast infrequently and were "amateurish" in nature, the chief interest of the operator being in experimental work.

On April 23, 1927, the station was licensed to operate on 1,290 kc, with 10 watts power, for "unlimited" time. Its call letters at that time were the same as those used under the previous ownership, KFEY.

On October 25, 1928, the station was placed on 1,210 kc.

When Mr. Cook left the School the project was abandoned, since there was no one sufficiently interested to devote the time necessary to make the station a success. The license was allowed to expire and the station was deleted on January 31, 1929.¹

¹ Data furnished by Mr. E. L. Bruns, principal of the Kellogg High School, and files of the Federal Communications Commission.

UNIVERSITY OF UTAH

SALT LAKE CITY, UTAH

ON JANUARY 6, 1925, the University of Utah was licensed to operate a broadcast transmitter on 1,150 kc, with 100 watts power, for "unlimited" time. The call letters KFUT were assigned. When the license expired on July 21 of that year application for renewal was not made and the station was deleted on October 4, 1925.

A new license was issued to the University on November 9, 1925, authorizing operation of its transmitter on 1,050 kc, with 100 watts power, for "unlimited" time. The same call letters as before were assigned, KFUT.

On November 1, 1926, the station was placed on 1,140 kc and on April 22, 1927, the power was reduced to 50 watts.

During 1927 two frequency changes were made: on June 1 to 600 kc and on December 1 to 1,200 kc.

With this equipment the University broadcast entertainment and informational programs and sought to do some educational work. However, with the development of broadcasting chains and the rapid changes being made in radio equipment, it found itself unable financially to instal and keep up to date an adequate station. Further, the services of the National Broadcasting Company and the Columbia Broadcasting System, through their local outlets, gave the University, at little or no cost, a means for doing educational broadcasting without the heavy expense of maintaining a station.

Consequently, when the license expired, no application for renewal was made and the station was deleted by the federal government on August 1, 1928. Since that date the University has made extensive use of commercial facilities, especially those of Stations KDYL and KSL.¹

¹ Data furnished by Dr. George Thomas, president of the University of Utah, and files of the Federal Communications Commission.

UNIVERSITY OF VERMONT

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BURLINGTON, VERMONT

THE University of Vermont was granted its first broadcast license on May 13, 1922. This authorized operation of the University transmitter on 360 meters (834 kc), with 300 watts power, for "unlimited" time. The call letters WCAX were assigned. On December 1 of that year the power was reduced to 50 watts; however, on March 1, 1923, it was increased to 100 watts. On June 1, 1923, the power was again reduced to 50 watts.

During these early years the station was used almost exclusively for experimental purposes. The few broadcasts presented were of an experimental nature and no actual educational work was attempted.

As a result of this work the University developed plans for making the station a unit of its extension teaching and framed a program such as to bring the activities of the campus to the citizens of Vermont.

The license issued on October 9, 1924, placed the station on 834 kc and permitted use of 100 watts power. Under this license the equipment was modernized, the master-oscillator circuit and Heising modulation being installed. Nine vacuum tubes were used. An antenna 160 feet long was stretched from a steel tower 85 feet high. Preliminary tests were made and reports of reception received from points as far west as Michigan and as far south as New Jersey and Pennsylvania. This new equipment was built and installed by Mr. W. M. Hall, a student at the University and president of the University Radio Club.

This new station was officially opened in October, 1924, under the direction of Mr. Thomas Bradlee, director of the University's Agricultural Extension Service. The opening program included a short address by President Guy W. Bailey, of the University; by Deans H. C. Tinkham, J. W. Votey, and J. L. Hills, of the Colleges of Medicine, Engineering, and Agri-

culture, respectively; and by Professor Frederick Tupper of the College of Arts and Sciences. The R.O.T.C. band, under command of Colonel G. J. Holden and direction of Mr. J. F. Lechnyr, leader of the Burlington Military Band, furnished music. Mr. F. W. Kehoe, registrar of the University, announced the program.

The work of the station, as visioned in this first broadcast, is evidenced from an announcement of station policy published at this time:

Instructive and entertaining programs will be given weekly by the Extension Service, in cooperation with the other departments of the University. Each program will carry at least one number dealing with agriculture or home economics and will include concerts, short talks and various other features. . . .

It is expected that such talent as can be secured from the University, the city and throughout the state generally, will be asked to aid in giving Vermonters something worth while from Vermont. From the University will come all manner of talks from the trained experts in the various departments. These will include educational talks, agricultural talks, home economics talks, health talks, literary talks, and entertainment talks. Concerts by the University band, by the Men's and Women's Glee Clubs, and by stringed instrument organizations will likewise be offered. Individual talent from the student body, as well as from the faculty, notable musicians and readers, will add to the programs. Whenever possible, the programs of outside artists who are presenting entertainments in Burlington will be broadcast. College players, reports of games, fraternity stunts, will constitute features. The Agricultural Extension Service will render timely service regularly to its farmer constituency and immediate service in case of emergency.¹

This policy was followed in the years that the station was in operation. In addition, many special programs were presented. Programs of the Agricultural Extension Service were, in general, of thirty-minute duration, presented one night each week.

On January 26, 1925, the station was shifted to 1,200 kc. Three other changes in frequency were made during the seven years of the station's operation: on November 22, 1926, to 1,190 kc; on June 1, 1927, to 1,180 kc; and on October 30, 1928, to 1,200 kc, where time was shared with Station WNBX.

By 1931 the station had become obsolete and difficulty was

¹ *Vermont Alumni Weekly*, IV, No. 2 (October 15, 1924), 21.

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experienced in renewing the license. The University did not have sufficient funds to meet the requirements of the Federal Radio Commission for installation of frequency controls and other modernized equipment.

Consequently, on June 17, 1931, the license was transferred to the Burlington Daily News, Inc., with the provision that the University have as much time as it deemed necessary for broadcasting its features. New equipment was installed by the *News* and an expanded program of broadcasts begun. Under this new arrangement the University was enabled to use "ten times as much broadcasting service as we had been taking out of our own station." A regular fifteen-minute program is now broadcast by the University each week throughout the college year, and frequent use of the station is made for special features.

This arrangement has proved "highly satisfactory" to the University; however, there are those on the faculty who "regret that the institution did not have available the funds to permit the development of radio broadcasting service."²

² Data furnished by F. W. Kehoe, registrar of the University of Vermont, and files of the Federal Communications Commission.

VILLANOVA COLLEGE

VILLANOVA, PENNSYLVANIA

PIONEER work in radio communication was begun at Villanova College under the direction of Professor Jesse Myers Coahran, of the Electrical Engineering Department, in 1908 and continued through 1919.

Later, students in the Electrical Engineering Department set apart a room and equipped it with radio transmission and reception apparatus. This experimental work aroused considerable interest so that on May 8, 1922, a license was obtained for the operation of a broadcast transmitter. This authorized broadcasting on 360 meters (834 kc), with 750 watts power, for "unlimited" time. The call letters WCAM were assigned.

A temporary building was erected on the campus and new equipment installed under the direction of Mr. Frank J. Rafferty.

Although the original plan was to use this station for the broadcasting of educational programs, the work was largely confined to experimentation, attention being given to the use of underground antennae. A few programs were broadcast, but only for experimental purposes.

It very soon became evident that the expense for upkeep of the station was more than the College could bear. Further, the site of the temporary structure in use as a studio was needed for a new classroom building. Consequently, when the license expired on August 1, 1923—a license which permitted use of 750 watts power—no application for renewal was made and the station was deleted by the federal government. The building which housed the station was dismantled and the license and call letters taken over by a broadcasting firm at Camden, New Jersey.

At present interest in radio is fostered at the College by the Villanova Radio Club on an experimental basis. Equipment used by the Club is the property of the College and consists of a 100-watt crystal-controlled radiotelegraph transmitter oper-

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ating on a frequency of approximately 3.6 megacycles. At a later date modulation equipment may be added to adapt the transmitter for use in radiotelephone work. The receiving equipment consists of a National AC SW-3 receiver with special output amplifier and coils which give the receiver a coverage from 19 to 1,000 meters with the exception of the American broadcast channel.¹

¹ Data furnished by M. F. Delaney, secretary of Villanova College, and files of the Federal Communications Commission.

WALLACE RADIO INSTITUTE

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OKLAHOMA CITY, OKLAHOMA

ON AUGUST 19, 1926, the Wallace Radio Institute was licensed to operate a broadcast transmitter on 905.8 kc, with 50 watts power, for "unlimited" time. The call letters KGCB were assigned. On November 27, 1926, the power was increased to 100 watts.

On April 21, 1927, the station was shifted to 940 kc and the power increased to 125 watts. Then, on June 1, 1927, the station was shifted again, this time to 1,390 kc where it was ordered to share time with Station KGFG. At this time the power was reduced to 50 watts.

A further change was made on October 18, 1928, when the station was placed on 1,370 kc where, also, it shared time with Station KGFG, and the power was increased to 100 watts. Then, on October 29 of that year, the power was reduced to 50 watts.

On April 18, 1928, permission was granted to move the station to Enid, Oklahoma. This move was preliminary to selling the station to the Champlin Refining Company of that city. The sale was completed on December 18, 1928, and the license transferred on January 2, 1929.¹

¹ Data secured from files of the Federal Communications Commission.

WARD-BELMONT SCHOOL

NASHVILLE, TENNESSEE

ON MAY 15, 1922, the Ward-Belmont School was granted a license to operate a broadcast transmitter on 360 meters (834 kc), with 10 watts power, for "unlimited" time. The call letters WDAA were assigned.

The first broadcast was presented on the evening of April 18, 1922, and consisted largely of a concert by Mr. Phillip Gordon, demonstrating the use of the Ampico-Chickering piano. Associate President C. E. Crosland was the announcer and Mr. Jack De Witt was the radio engineer in charge. After Mr. Gordon's concert other numbers were presented by Miss Katherine Kirkham, soloist, accompanied by Mr. Lawrence Goodman, Miss Mildred King, pianist, and Miss Anna May McLain, organist. This program was received enthusiastically at several places within a radius of from 150 to 200 miles, it being the first attempt ever made to broadcast a musical program in Nashville.

The equipment consisted of two small telephone receivers serving as microphones, a roller-top desk on which was mounted the lighted vacuum tubes and other equipment of the sending station, and a crude antenna attached to the transmitter by wires run through an open window.

Success of this first venture was such that the School made plans to continue broadcasting and to enlarge the equipment to better serve the interests of the institution.

However, since the School soon found that it was unable to broadcast programs consonant with the educational and cultural ideals which it held, and since the financial burden was greater than it was felt wise to carry, the license was permitted to expire on November 10, 1922, a license which had permitted use of 850 watts power. Soon thereafter the station was deleted by the federal government and no further attempt at educational broadcasting was made.¹

¹ Data furnished by Dr. John W. Barton, president of the Ward-Belmont School; Dr. A. B. Benedict, vice-president of the School; and files of the Federal Communications Commission.

STATE COLLEGE OF WASHINGTON

PULLMAN, WASHINGTON

ON JUNE 21, 1922, the State College of Washington was licensed to operate a broadcast station on 360 meters (834 kc), with 500 watts power, for "unlimited" time. The call letters KFAE were assigned.

This first station was established through contributions from a number of citizens of Washington and alumni of the College. It managed to exist through the generosity and work of the Pullman Chamber of Commerce, the Associated Students of the State College, the General Extension Division, and the College of Engineering.

On March 25, 1924, the station was shifted to 908.6 kc and on April 8, 1925, it was placed on 860 kc. On August 26 of that year Station KWSC was placed on this same frequency and the two stations ordered to share time under some mutually satisfactory agreement.

On June 1, 1927, the station was placed on 760 kc where it was ordered to share time with Stations KTW and KOB. Then, on March 1, 1928, Station KOB was moved to another frequency, leaving only two stations on 760 kc.

On October 30, 1928, the station was shifted to 1,390 kc where it shared time with Station KFPY.

Until 1929 the station was operated on a 4½-hour weekly schedule, using Monday, Wednesday, and Friday evenings.

On December 14, 1929, the station was placed on 1,220 kc and on October 31, 1930, the power was increased to 1,000 watts at night and 2,000 watts until "local sunset." On June 17, 1931, the station was ordered to share time on this frequency with Station KTW.

The hours of broadcasting have been steadily increased until at present 71½ hours are used each week.

Among the men who have made the educational work of the station possible are Dean Hubert V. Carpenter of the College of

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Mechanic Arts and Engineering, the late Dr. B. C. Steele of the College Department of Physics, other members of both departments, and a number of advanced students. These individuals and the present director, Dr. Frank F. Nalder, backed by Dr. Ernest O. Holland, president of the College, have worked diligently to make this project a success.

Further, innumerable students have discovered that radio furnishes an ideal means of earning one's way through College and have gained from this work much highly profitable experience for later years.

From the day that the station presented its first program (December 10, 1922) to the present, singers, playwrights, radio technicians, and program directors have been trained in its studios. Indeed, it has become "the most fertile ground on the campus for the creation of new talent." At present approximately 150 students contribute to broadcasting over the station and either receive credit for special courses related to radio or just do the work for "love of the mike." These include twenty-five music students especially selected for talent and proficiency by the dean of the School of Music, thirty-five students of public speaking and dramatics who are enrolled in a class in the Speech Department and receive regular credit for their work, four young women in the College of Home Economics who broadcast informational material through a homemakers' program, and a great many other students in the Colleges of Engineering, Pharmacy, Veterinary Medicine, Dairying, Journalism, English, and other scientific fields.

Several informal musical and literary organizations that broadcast regularly add to the number of students who gain experience in microphone appearance. Seven student technicians and seven student announcers are regularly employed, and the practical education they acquire makes them capable of assuming positions in the field of radio immediately upon graduation.

In the operation of Station KWSC the essential fact is always kept in mind that the institution is "first and always a school." According to Dr. Frank F. Nalder, director of radio:

Our station, now recognized here as an essential feature of the modern college, appears to us to have four chief functions:

1. To give informing, interesting, educative and timely broadcasts to people in our vast coverage area.
2. To facilitate research, invention, and technical progress in the vital modern activity of aerial communication, and to strengthen and enrich courses in electrical engineering.
3. To convey to the Northwest, which we cover, the knowledge and intellectual service of a faculty whose literary, scientific, technical, and philosophical interests comprehend the entire field of learning.
4. To train young people in the use, operation, and human service of the radio.¹

The Radio Guild at the College is a notable illustration of spontaneous student interest in and response to the opportunities which the station presents. The Guild is a student organization, having as its purpose the stimulation of interest and proficiency in radio broadcasting on the campus. Mr. Sam Whitlow, instructor in journalism, is faculty advisor of this group.

Since July 17, 1935, the College has been in the process of constructing a 5-kw transmitter and, though a fire in the transmitter on July 17, 1935, set back the work somewhat, the construction is nearly complete. The engineering staff has just finished the work complying with the new requirement of the Commission for a vertical radiator, and KWSC expects to be able to operate with five kilowatts within a very short time.²

¹ Quoted from a report prepared especially for this study by Dr. Nalder.

² Data obtained from Dr. Frank F. Nalder, director of radio at the State College of Washington, and files of the Federal Communications Commission.

WEST VIRGINIA UNIVERSITY

MORGANTOWN, WEST VIRGINIA

ON MARCH 16, 1922, West Virginia University was licensed to operate a broadcast transmitter on 360 meters (834 kc), with 250 watts power, for "unlimited" time. The call letters WHD were assigned. Dr. C. W. Waggoner, professor of physics at the University, was responsible for obtaining this license and conducting experimental work in radio communication via these facilities.

At this time requirements were not high and a radio station could be operated with a minimum of equipment and as intermittently as the owner desired. Thus few programs were actually broadcast over the University's facilities, their use being confined almost altogether to experimentation.

However, as requirements became more stringent, authorities of the University realized that the maintenance and operation of a broadcast station, together with the initial outlay for suitable equipment, would require far more money than was thought advisable to expend in that manner. Further, a survey of the practices of other universities revealed that they were of the same general opinion and were "withdrawing from rather than plunging into the work of broadcasting."

Consequently the license was allowed to expire on August 17, 1923, no application for renewal being made, and the station was deleted by the federal government on November 19, 1923.

Those in charge of broadcasting at the University at this time believed that the field should be left to others more in a position to develop radio as an instrument of mass appeal and that the University should devote its funds and energies to the more established functions of an institution of learning. They pointed out that the educational possibilities of radio had not been worked out and were not at all well understood. Broadcasting appealed to them as a concern of commercial interests and not of educational institutions.

Soon after surrendering its broadcast license the University was granted an experimental license under which work in the field of radio communication as part of courses in physics has been carried on, the equipment being used wholly as laboratory material. Later unsuccessful attempts were made to secure another broadcast license.

For some years prior to 1933 the University made use of time donated by Station WMMN, of Fairmont, West Virginia, for the broadcasting of educational programs, particularly the West Virginia School of the Air. The commercial station established a studio in Morgantown and gave the University twenty minutes daily for its programs.

The schedule of this School of the Air included addresses dealing with agriculture, agricultural extension, home economics, music, English, journalism, public speaking, law, engineering, history, economics, education, sociology, German, medicine, physical education, psychology, philosophy, physics, chemistry, botany, zoölogy, and geology. Numerous programs dealing with general University activities were broadcast. This work was well received by listeners in the service area of the station and considerable study-guide material was circulated.

Such programs were conducted for approximately three years and were made possible through the courtesy of the publishers of the two daily papers in Morgantown. When this courtesy was withdrawn, for financial reasons, the programs automatically ceased and no further work was done in this direction.¹

¹ Data furnished by Dr. Richard Aspinall, university agent at the West Virginia University; Dr. R. C. Colwell, head of the Physics Department at the University; Dr. F. A. Molby, professor of physics; and files of the Federal Communications Commission.

WESTERN STATE COLLEGE OF COLORADO

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GUNNISON, COLORADO

ON MARCH 8, 1923, the Colorado State Normal School was licensed to operate a broadcast station on 360 meters (834 kc), with 50 watts power, for "unlimited" time. The call letters KFHA were assigned. On October 17 of that year the station was shifted to 1,190 kc and the name of the institution changed to the Western State College of Colorado.

This station, located within a few miles of the continental divide, enjoyed the distinction of broadcasting from an elevation higher than that of any other station in the world at that time. Taking advantage of this fact, Mr. E. Russell Wightman, operator of Station KFHA, conducted during 1923-26 many valuable and interesting experiments in high-altitude broadcasting in conjunction with Stations W9XD, a special experimental transmitter, and W9YAH, a technical and training school transmitter, both operated by Mr. Wightman. This work contributed greatly to the understanding of "sky waves," "half-wave oscillation," and "100 per cent modulation."

Some of these experiments and their results were discussed in a paper, "Freak Broadcasting in the Rocky Mountains," read by Mr. Wightman before the American Association for the Advancement of Science meeting at Phoenix, Arizona, in February, 1925. "The Radio Violin," presented the following year to the Association at Santa Fe, New Mexico, was also a product of work done in the laboratory of Station KFHA.

The strictly educational work of the station consisted of musical programs and lectures on economics, history, and science given by members of the College faculty.

No direct advertising was ever allowed over the station and "canned" music was at all times prohibited.

On June 1, 1927, the station was shifted to 1,180 kc and on March 1, 1928, it was placed on 1,200 kc where it shared time

with Station KFKA. Then, on October 25, 1928, the sharing station was removed and Station KFHA given "unlimited" time on its assigned frequency.

On August 26, 1930, the station license was assigned to the Hawkins-Craig Syndicate.¹

¹ Data furnished by E. Russell Wightman, former operator of Station KFHA, and files of the Federal Communications Commission.

WESTERN UNION COLLEGE

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LE MARS, IOWA

WESTERN Union College began broadcasting early in 1922 with a small 50-watt transmitter. On February 6, 1923, this transmitter was licensed to operate on 360 meters (834 kc), with 100 watts power, for "unlimited" time. The call letters KFCY were assigned.

On October 11, 1923, the station was shifted to 1,190 kc and the power reduced to 50 watts. The license was allowed to expire on July 13, 1924, and the station was deleted.

Then, on October 17, 1924, the transmitter was relicensed on the same terms as formerly. However, when the license expired on January 22, 1926—a license under which the station was permitted to change its call letters to KWUC—no application for renewal was made and the station was again deleted.

On August 19, 1926, the station was reinstated under the same terms as formerly and on November 17, 1926, permission was granted to increase the power to 1,500 watts.

During the time the College was on the air, programs of an educational character were broadcast on an average of two and one-half hours per day. As regulations became more stringent the College was repeatedly ordered to increase this time. However, realizing that it would be impossible to meet these demands, since programs of the type consonant with the dignity of the College were hard to secure in the amount demanded, and that the financial burden of employing sufficient talent was far more than the College could bear, the authorities finally found it necessary to abandon the effort.

Added to this situation, and contributing to the final loss of the station by the College, was the fact that certain commercial interests were desirous of the channel occupied by the station. These interests appealed to the Federal Radio Commission on the ground that the College was not using enough time on the air to render adequate service to the listening public. The Com-

mission issued an order for the College to appear and show cause why its frequency should not be turned over to the commercial interests. Says President D. O. Kime: "Rather than meet this opposition our College authorities felt the best thing to do should be to dispose of the transmitter."¹

Consequently, when the Commission, after calling the hearing, refused to renew the station's license (September 1, 1928), the transmitter was sold to the Sioux Falls broadcasting station. Under the new ownership a license was obtained and a commercial station established.

As a result of this experience President Kime is convinced that "it would be necessary to set over a certain exclusive wave-band for college and university broadcasting before it will ever be successful."²

¹ Quoted from a letter by Dr. Kime dated January 29, 1936.

² Quoted from a letter by Dr. Kime dated April 26, 1933. Data furnished by Dr. Kime and files of the Federal Communications Commission.

WILLIAM HOOD DUNWOODY INDUSTRIAL INSTITUTE

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MINNEAPOLIS, MINNESOTA

THE William Hood Dunwoody Industrial Institute entered the field of experimental radio early in the history of the development of wireless communication. During the World War the Institute trained several thousand radio operators for the navy and hundreds of signal corps men for the army. This work was done in code, as speech broadcasting had not been developed to any considerable extent at the time.

With growth of the Institute's interest in the field of broadcasting, a 100-watt transmitter was constructed and application made for a broadcast license. This license was granted on May 9, 1922, authorizing operation on 360 meters (834 kc), with 200 watts power, for "unlimited" time. The call letters WCAS were assigned.

On August 10, 1922, permission was granted to increase the power to 500 watts, though, on February 5, 1923, this power was reduced to 100 watts to conform with the power actually used by the transmitter. Three changes of frequency followed: on August 14, 1923, to 1,220 kc; on February 12, 1924, to 1,070 kc; and on January 15, 1925, to 1,080 kc.

It was the plan of the Institute, at the time of building the station, to enter upon a very thorough program of educational broadcasting. Those in charge felt that radio offered an ideal medium through which great numbers who were unable to attend classes at the Institute in Minneapolis could receive instruction in the trades and professions in their homes or in suitable meeting places to be selected throughout the state and the Northwest.

The original idea was to place radio receivers in communities where groups could be assembled and, through the use of leaders, bring together classes to receive definite instruction on specific subjects taught from the studios of the Institute.

Mr. M. R. Bass, assistant director of the Institute, outlined the plan as follows:

Our idea was to bring before the microphone at the station a competent teacher who had made special preparation to broadcast information. We expected to have charts, diagrams and the like before the instructor in the studio, and similar charts and diagrams before the groups in each of the meeting places selected. The teacher could then refer to his chart in the studio, pointing out Figures 1, 2, and the like, the same as he would otherwise do before a class in a room in which he and others were present, carrying on the instruction for a period of thirty minutes to one hour.

We further planned to supplement lectures with written material, check-up questions and examinations. We intended to have class leaders report on the number of students present who had enrolled for the work in the centers of training, and turn in any papers and examinations required of the class.¹

Before this plan of instruction could be put into effective operation the radio "craze" hit the country, and it became evident that the chief concern of listeners at the time was long-distance reception and entertainment of any kind, but not education. This seemed to indicate to the authorities of the Institute that a large percentage of listeners were not as yet ready for an educational program such as that planned. Consequently the radio broadcasting objective had to be altered and musical programs presented in connection with certain general educational features.

On March 10, 1925, new equipment having been installed and many improvements made, the station was licensed to use 500 watts power and its call letters were changed to WHDI. The same general type of programs were continued as formerly, it still being felt that the listening audience was not ready for intensive educational broadcasting.

On June 1, 1927, the station was placed on 1,220 kc and ordered to share time with Station WLB. At this time the Federal Radio Commission was taking charge of broadcasting and establishing regulations and requirements for different classes of stations. Its evaluating of stations was apparently guided in terms of the number of hours such stations remained on the air, and demands were made that stations use all the hours assigned

¹ Quoted from a letter by Mr. Bass dated August 18, 1933.

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to them. Furthermore, standards for control equipment, monitor sets, and the like were made such that only stations with considerable financial resources could qualify.

Mr. Bass feels that this new setup resulted in many hardships for educational stations. Regarding this he states:

I think it only fair to state that it was then that "politics" entered into the assignment of wave lengths and the like. From that time on, in our opinion, the rights and privileges of stations were considerably curtailed. Institutions that had a sufficient amount of money to keep representatives in Washington fussing with the Commission could, in a number of cases, secure favorable consideration. . . .

In referring to the Federal Radio Commission, I do not wish to leave the impression that I am in any way attacking them. In all probability they were acting in what they believed to be the best interests of the listening public, but it is reasonable to believe that these men were influenced not only by pressure brought to bear upon them, but by money interests which controlled the large stations. On numerous occasions, which are on record at the Federal Radio Commission,² we made application to be placed on a wave length with the other educational stations in the community, the University of Minnesota, St. Olaf College and Carleton College of Northfield, Minnesota, but were unable to secure this assignment. Could this have been done, we guaranteed that we would make suitable use of the wave length to meet the requirements of the Commission, but instead we were assigned here and there to fight our own problems with commercial stations.³

On October 31, 1928, the station was shifted to 1,410 kc and ordered to share time with Stations WDGY, KFLV, and WHBL. On February 20, 1929, the station was moved to 560 kc where it shared time with Station WDGY "and another station to be assigned later." Then, on April 22, 1929, both Station WHDI and Station WDBY were placed on 1,180 kc.

These time-sharing restrictions resulted in Station WHDI's being forced to use only the daytime hours for broadcasting, the evening hours being given to commercial stations. Limiting broadcasting to these hours automatically removed the possibility of the Institute's carrying on the educational program originally planned, inasmuch as the program was conceived for working people who could take advantage of the instruction

² These documents are now in the files of the Federal Communications Commission.

³ Quoted from a letter by Mr. Bass dated April 16, 1933.

offered only during evening hours when they were free from their jobs.

In an effort to have a few hours on the air when other local stations were not broadcasting, Station WHDI inaugurated a Breakfast Time Service program, beginning at 6:30 A.M. and continuing for three consecutive hours. During this program the correct time was broadcast approximately every three minutes. This program included news of the day, weather reports, and health exercises also. This idea, according to the records, had not been employed by any other station previously. It was not long, however, until other stations throughout the country, including several large commercials, began using this type of program and, very soon, the feature became a common offering.

However, says Mr. Bass:

The handwriting on the wall indicated that there was no way out of this predicament, that the Federal Radio Commission could not be influenced to provide evening hours for educational purposes, and that eventually the station would be compelled to either put large sums of money into alterations to meet Federal requirements, or to pass out of the picture entirely.⁴

The first of these alternatives being more or less impossible under the circumstances, the Institute was forced to choose the latter. Consequently, on June 24, 1931, the station was sold and the license transferred to Dr. George W. Young, owner and operator of Station WDGY with which Station WHDI had been sharing time. These two stations were then consolidated under the call letters WDGY, and WHDI was deleted by the federal government on September 4, 1931.⁵

⁴ *Ibid.*

⁵ Data furnished by Mr. M. R. Bass, assistant director of the William Hood Dunwoody Industrial Institute, and files of the Federal Communications Commission.

UNIVERSITY OF WISCONSIN

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MADISON, WISCONSIN

RADIO at the University of Wisconsin grew out of early experiments by professors and students with wireless telegraphy. Wireless communication in code with spark transmitters was begun as early as 1909. By 1915 daily weather reports were being broadcast. About June, 1915, the University was granted an experimental license to broadcast.

Work went on in the laboratories and in 1917 music was successfully broadcast through these facilities. For a considerable period work in wireless telegraphy and telephony were done at the same time. In the University laboratories circuits were worked out, equipment designed, plans made, and the actual building of transmitters and receivers carried on. In 1918, when all wireless transmitters were ordered dismantled as a wartime precautionary measure, the embryonic station, then known as 9XM, was ordered by the United States Navy Department to continue its operation.

By February, 1919, clear telephonic broadcasts were scheduled. Many "hams" listening for telegraphic signals were astounded to hear music coming through their headphones. Regular programs were broadcast for the Great Lakes Naval Training Station and two-way communication was maintained with that point.

By the time other experimenters were permitted to resume their activities the University station had gone far in finding answers to the perplexing problems of this strange new force. The development of wireless telephony had come during the interim.

On January 13, 1922, some four years after the first successful telephonic broadcast, the University was granted a license to operate a broadcast transmitter on 360 meters (834 kc), with 4,000 watts power, for "unlimited" time. The call letters WHA were assigned.

Credit for the beginning and growth of the station is due to the perseverance of students and faculty members who worked with little or no compensation to develop the thing which fascinated them. Because funds were low and because many of the instruments and parts needed were not manufactured commercially, these individuals built their own equipment, even the tubes. Other parts were borrowed from the Electrical Engineering and other University departments.

Among the early workers in this new science was Professor Edward Bennett. He began his work with wireless telegraphy at the University in 1909. Professor E. M. Terry became greatly interested in radio and, with a group of undergraduate students, constructed a new transmitter and receiver. This was a 5-kw spark station and was operated under the 9XM call letters on wave-lengths of 475 and 750 meters.

Tube-making presented real difficulties to the experimenters. The construction, glass blowing, and evacuation were real problems because the technique had not been developed. The first ones were poor and unsuited for broadcasting. Their life was often short and they frequently had to be replaced. Often the station was forced off the air because of burned-out tubes. Many times these early radio engineers worked all through the night to get a tube ready for the next day's broadcast. They built these tubes in various styles, each a step in the direction of that perfection reached in modern, efficient tubes.

The progress of the early broadcasting station, in its experimental days, was due to the efforts and ambitions of many workers. With Professor Terry, before the war, were Mr. Malcolm P. Hanson, later chief radio engineer with Admiral Byrd at the South Pole; Mr. C. M. Jansky, Jr., radio engineer; and Mr. G. R. Greenslade. These men made radio history. Though hampered by the lack of funds and the skepticism of the more "staid" University people, they went ahead in developing the science. Ultimately its success was recognized.

Several University and state departments were quick to see the possibilities of this new instrument for extending their services to the people throughout the state. In 1921 the Wisconsin

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Department of Agriculture and Markets arranged broadcasts of market quotations. The same year basketball games and concerts were broadcast by remote control from the University gymnasium.

Many were the problems which Professor W.H. Lighty, the first program director of the station, and Mr. Malcolm P. Hanson, who was then devoting a major portion of his time to radio, had to face. Not least among these was the refusal on the part of many professors to speak over the radio because they deemed it "undignified." They did, however, write out their messages to be read by the announcer. By the spring of 1922 this attitude had changed and faculty members were appearing in person before the microphone.

On October 20, 1922, the power was reduced to 500 watts and on January 10, 1923, there was a further reduction to 250 watts. Other changes in power followed: on April 6, 1923, to 800 watts; on July 16, 1923, to 500 watts; on October 9, 1923, to 100 watts; and on January 8, 1924, to 500 watts.

The station license expired on July 6, 1924, and deletion followed on September 8, 1924.

On October 14, 1924, the University was granted a new broadcast license, authorizing operation of its transmitter on 1,090 kc, with 500 watts power, for "unlimited" time. The same call letters as before, WHA, were assigned. On January 29, 1925, the station was shifted to 560 kc and on April 18 of that year was permitted to increase its power to 750 watts.

On June 1, 1927, the station was shifted to 940 kc where it was ordered to share time with Station WLBL. Then, on November 1 of that year, both stations were placed on 900 kc. On November 8, 1928, the station was shifted to 570 kc and ordered to share time with Stations WNAX, WPCC, and WIBO.

On April 26, 1929, the station was placed on 940 kc and allowed to broadcast during specified hours, all during the day-time.

The College of Agriculture was one of the staunchest supporters of radio after the technical phase had been developed. After 1926 a radio committee was set up to arrange daily broad-

casts for rural listeners. A daily "homemakers' " program was also instituted. These features are still regarded by listeners as vitally important and valuable to them.

Radio was not set up as a separate agency but instead was fostered by other University departments. When Professor Terry was active in the work—up to the time of his death in 1929—the Physics Department sponsored the station. Then the Electrical Engineering Department took it over. Professor Edward Bennett and Professor Glenn Koehler engaged in the work in addition to their university assignments, supervising the technical aspects of broadcasting as well.

In 1929, under Governor Walter Kohler, a movement was started to secure for the state adequate facilities to enable its educational, agricultural, and governmental service agencies to reach the people directly. Under Governor A. G. Schmedeman and Governor Philip F. La Follette this program has expanded materially. Thus, under Republican, Democratic, and Progressive administration the state radio plan has found favor.

The second period of radio development at the University of Wisconsin, that of the greater use of the instrument in the public interest, began in 1930. Under the guidance of a faculty committee consisting of Professors H. L. Ewbank, Edward Bennett, and A. W. Hopkins, the station set about to experiment in ways of adapting radio to educational needs. Later development of the station rests to a great extent upon the vision and understanding of this committee.

A major need at the time was greater leadership and vision in program-building. To meet this need the University employed Mr. H. B. McCarty, then of the Department of Speech, as full-time program director. He assumed these duties in February, 1931. A background in music and dramatics, as well as several years' experience as announcer over the University station, made him uniquely qualified for the task of building up the program schedule from one and one-half hours per day to a broadcast period that would adequately serve the listening public.

Student help and faculty assistance was enlisted in building

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this program schedule. Mr. Harold A. Engel, then a member of Professor Ewbank's course in speech and a graduate student in advertising and marketing, was employed on a part-time basis to assist Mr. McCarty, starting that summer.

In 1930 the state controlled two stations: WHA, authorized to broadcast on 940 kc with 750 watts power during specified daytime hours, and WLBL, operated by the State Department of Agriculture and Markets on 900 kc with 2,000 watts power during daylight hours. In April of that year the state sought to better its radio service by combining the stations at a new location. When, in June, 1931, the application to consolidate the stations was denied, the state set about to develop both stations to the utmost.

Station WHA secured a new transmitter site and antenna masts outside the city of Madison in 1932. It installed a new and more efficient transmitter which went on the air in July, 1932. On January 13, 1933, the station was permitted to increase its power to 1,000 watts and on April 23, 1935, a further increase to 2,500 watts was granted. On March 27, 1936, permission was granted for an additional increase to 5,000 watts and the station began using that power on September 22, 1936.

Station WLBL, in Stevens Point, moved its transmitter to a location outside the city where new masts were erected. A new 2,000-watt transmitter was built and installed. Authorization to increase the power to 5,000 watts and to erect a vertical radiator at a new location was secured late in 1936.

Wisconsin has developed its facilities as much as possible. Station WHA serves the southern part of the state, and Station WLBL, the northern areas. Both feature special programs for their respective sections. For a time a wire connection made it possible for each station to broadcast programs of the other when desired. Later a direct pickup, using a ground antenna, was substituted for the wire connection.

This arrangement greatly extended the state's radio service. It is estimated that more than 80 per cent of the people of the state live in the areas where one or both of the stations can be heard satisfactorily. While the broadcasts are intended prima-

rily for Wisconsin citizens, there is evidence of an appreciative audience in parts of Iowa, Minnesota, Michigan, and Illinois.

Stations WHA and WLBL are strictly noncommercial. They have never sold time and so do not compete for a share of the available advertising revenue.

The objective of the state in developing its own radio system is expressed by Dr. Glenn Frank, former president of the University of Wisconsin, in the following:

In WLBL and WHA stations, Wisconsin is perfecting agencies through which her departments of state can maintain intimate contact with and seek to serve the people of Wisconsin in the following half-dozen ways:

1. To serve the agricultural interests of the state by furnishing technical and market information, and sound guidance in economic organization.
2. To serve the households of the state by furnishing technical counsel on the construction, care and conduct of the efficient home.
3. To serve the adult citizenry of the state by furnishing continuous educational opportunities.
4. To serve the rural schools of the state by supplementing their educational methods and materials, by sending over the air the best teaching genius we can muster.
5. To serve public interest and public enterprise by providing them with as good radio facilities as the commercial stations have placed at the disposal of private interests and private enterprise.
6. To serve the interests of an informed public opinion by providing a state-wide forum for the pro and con discussion of the problems of public policy.

The state of Wisconsin, by long tradition, is interested in the safeguarding and promotion of a free and full discussion of the problems of the common life of the commonwealth. And these state-controlled radio stations may enable Wisconsin to re-create in this machine age, the sort of unhampered and intimate and sustained discussion of public issues that marked the New England town meeting and the Lincoln-Douglas debates. If Wisconsin could demonstrate the practicability of recreating the New England town meeting with the state for a stage, it would render a national service. It is our eager hope to realize through these two stations a state-wide forum in which issues of public policy may be threshed out.¹

The Wisconsin School of the Air is recognized as an outstanding example of the use of radio by a state to give additional educational opportunities to its schools. These supplementary programs are used in the classroom under the direction of the

¹ Glenn Frank, *Education by Radio* (June 23, 1932).

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teacher. They enrich the experience of the children by making available to all schools, talent which might otherwise be denied them.

In the fall of 1931, the Wisconsin School of the Air began its broadcasting with ten weekly programs for grade-school use, under the supervision of Mr. McCarty who organized the project. The broadcasts were heard each day during the school week. The same plan is still followed, although there have been changes in courses from semester to semester. Subjects included in a typical semester are:

Afield with Ranger Mac (for children from 4 to 8 years of age)
Little Stories of Great Lives (for children from 4 to 7 years of age)
Story Time for Little Folks (for children from the kindergarten to 3 years of age)
State Capitol Visits (for children from 6 to 9 years of age)
Nature Tales (for children from the kindergarten to 3 years of age)
Journeys in Music Land (for children from 4 to 8 years of age)
Creative Art (for children from 6 to 9 years of age)
Exploring Distant Lands (for children from 5 to 8 years of age)
Rhythm and Dramatic Games (for children from the kindergarten to 3 years of age)
Dial News (for children from 6 to 9 years of age)

In addition to these, three weekly high-school programs are offered: Gems of Literature, heard twice each week; and American Problems, on the air once each week.

Educators have been quick to see the advantages of using these supplementary broadcasts in the schoolrooms. Teachers in the area served by the station reported more than 23,000 student listeners each week during the first semester of 1932-33. In 1934-35 the number was in excess of 40,000 known listeners per week.

The Wisconsin College of the Air is an immediate step in providing educational opportunities for the vast numbers of boys and girls of high-school age (14-20) who are out of school and unable to find employment. Hundreds of adults and many high-school classes listen also. Ten carefully organized courses are offered weekly in agriculture, general science, social science, home economics, and the cultural subjects of art, music, and

literature. This project was started in the fall of 1933 under the direction of Mr. Engel and is presented through the co-operation of the State Board of Vocational Education, the State Department of Public Instruction, the Wisconsin Teachers Association, the State Board of Normal School Regents, the University of Wisconsin (many departments including the College of Agriculture, School of Education, Extension Division, Department of Economics, Department of Physics, Department of Political Science, Department of Speech, and Department of Comparative Literature), Wisconsin Press Association, and the state-owned radio stations WHA and WLBL.

The importance of radio as a state service agency was demonstrated during the election campaigns of 1932, 1934, and 1936. A schedule was arranged whereby free time on the air was equitably divided among all qualified parties and candidates welcomed this opportunity of being heard by the people. It helped in reducing expenditures for campaigns. During these campaigns one and one-half hours per day were donated free of charge. There was no censorship of programs but it was understood that each speaker was liable for his utterances.

Station WHA is close to state governmental activities at all times. Messages by the governor to the legislature are broadcast. During the past two sessions of the legislature, each afternoon while these lawmakers were in session, addresses by those most prominent in legislative activities were broadcast direct from a studio in the capitol. Time was made available to all solons without cost or obligation. By using the state stations these men talked to their constituents at home. This went far to develop on the part of listeners a better understanding of their attitudes on matters of public concern.

Agricultural interests are served in several ways by Station WHA. The daily farm programs arranged by the College of Agriculture are timely and meet the particular needs of Wisconsin farmers. Agricultural institutes are conducted by radio and important conferences are broadcast for those who cannot attend in person. Youth organizations hold regular radio rallies.

For many years the farm programs were the backbone of the

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state's radio activities. It may safely be said that agricultural workers sensed the potentialities of radio and used this instrument effectively before any other department in the University. Mr. A. W. Hopkins, agricultural extension editor, has been a proponent of public radio and encouraged its development to a point where the Wisconsin farm program is nationally recognized as a standard for service.

The Homemakers' Hour each day keeps housewives in touch with the findings of the University Department of Home Economics. The information broadcast is not designed to create a market for any particular product, but rather to help women to run their homes economically and properly.

Fields in which courses of instruction have been given over the air for adults are: letter-writing, typewriting, public speaking, Spanish, music composition, music appreciation, American literature, economics, and aeronautics. Public acceptance and reaction warranted the extension of educational features on the adult level. This has been hampered by the inability of the station to operate during evening hours, however.

Programs of an entertaining nature are provided to supplement the purely educational features. Among these are: concerts by the University band, orchestra, glee clubs, and other musical groups, organ music, athletic contests, community programs, childrens' story periods, Wisconsin history stories, and other features of a similar type. Station WHA's programs do not duplicate those of other stations. They are unique in character. Little or no popular jazz is heard from the station. There is evidence that a growing audience enjoys classical and semiclassical music, old favorite melodies, and music of a better type.

Radio Hall is the home of Station WHA. It is a much finer broadcasting center than that owned by four out of five broadcasting stations in the United States today. It consists of studios clustered around a central control room, a separate dramatics studio, a large reception lounge from which broadcasting activities in the studio can be watched, workrooms, and ten offices. Room for future expansion is at hand.

In the equipment at Radio Hall is a fine pipe organ. It embodies about a thousand pipes and was installed exclusively for broadcasting. This provides exceptionally fine pickups.

Recording equipment is also constantly in use at Station WHA. Special programs are preserved in that way. Records are made at the studio and are distributed to other stations in the state to be broadcast at other hours.

Aside from its utility as a broadcasting center, Radio Hall is one of the show places of the University campus. An Indian motif in the visitors' lounge is supported by a combination of tan, cream, and brown coloring in the studio and office decorations. Indian petroglyphs from Wisconsin caves are representative of the oldest remnants of communications of primitive dwellers in the state. Modernistic natural Wisconsin oak furniture upholstered in rich Navajo weavings is featured.

In five years the staff of the station has grown from five part-time workers to a total of nine full-time and four part-time workers. In addition, many students under the National Youth Administration program have part-time assignments. This does not include the numerous students, faculty members, and state employees who devote time to the radio without monetary compensation.

It is doubtful if anywhere in the United States there is a greater opportunity for the development of a comprehensive program of radio education than Wisconsin now has. It has the facilities for reaching the great majority of the people of the state during daylight hours. It has an abundance of talent at the University and in the state departments from which to draw program material. It is unhampered by ulterior motives in carrying on its educational work. Such a combination weighs in favor of success.

After visiting and inspecting the station and its work, Mr. H. V. Kaltenborn, nationally known radio news-commentator, said regarding its accomplishments:

There's another thing that I like about this station! It does not have to always think of appealing to the great mass of listeners. Several of the programs that I've heard I know appeal to only a small selected group of listeners.

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Well, why not? Why shouldn't there be what you might call a quality program as opposed to a mass program? Why must we always, in appealing over the air, appeal to the lowest common denominator of intelligence? Why can't we have certain programs that appeal only to a relatively few people? I see no reason why we need to interest *all* the listeners *all* of the time. I think it's much more essential to keenly interest different groups of listeners part of the time. And, that's the value of an educational station like this. It can seek out and can even develop special listener groups that will be very keenly, closely concerned with the particular subjects to which they listen in. Educators, after all, are experts in educating and when you seek to use radio for educational purposes, you cannot do it effectively without consultation and cooperation with educators.

In these words Mr. Kaltenborn has placed a telling finger on the place in the broadcasting system where Station WHA is making its contribution. The station is free to experiment in the true public-service phases of broadcasting.

Station WHA is truly the radio voice of Wisconsin. Its programs, with the aid of Station WLBL, can be heard by a greater portion of the people of the state than those of any other station. The growth of the state's radio communication system, from the experimental days during the World War to the present, has been gradual. Many hardships have been overcome. Spurred on by the accomplishments and traditions of the past the station looks up to the promise of a future in which it can better serve the citizenry of Wisconsin.²

² Data furnished by Mr. Harold A. Engel, promotion manager of Station WHA, and files of the Federal Communications Commission.

WITTENBERG COLLEGE

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SPRINGFIELD, OHIO

AS EARLY as 1896 the Physics Department of Wittenberg College began experimenting with Hertzian waves. An oscillator, reflectors, and loop receiver with micrometer spark gap were set up at that time.

Experiment continued and soon signals were transmitted across the laboratory and through solid masonry walls. Work progressed and in a short time signals were being sent from the College to the business district of Springfield.

With the completion of Carnegie Science Hall in 1906 it became possible for Wittenberg College to lay a real foundation for radio experimental work. Students who had become expert with the telegraph key and knew the code formed a Radio Club and, to pick up foreign transmissions, constructed a long-wave receiving set with antenna of approximately a thousand feet in length which extended from the dome of Myers Hall to the tower of Recitation Hall and on into the Physics Laboratory in Carnegie Hall. Then, with a Westinghouse receiver designed for broadcast reception, interest turned from code signals to those of language and music.

It was proposed that the College should build a powerful spark transmitter to send out radio signals, but later this plan was rejected with the perfection of continuous-wave transmitters using silent oscillating tubes. It was planned to develop a 100-watt C.W. transmitter. After the old antenna was torn down, a large cage swung into place in the form of an inverted L, and a radiating fan constructed to take the place of the ground system, the station received its first experimental license with call letters 8XAK. This license was issued on January 28, 1922, permitting use of 100 watts power within the limiting ranges of 200–275 meters.

On October 13, 1922, the College was granted its first broadcast license, authorizing operation of its transmitter on 360

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meters (834 kc), with 100 watts power, for "unlimited" time. The call letters WNAP were assigned.

General programs, educational lectures, music under the direction of the Wittenberg School of Music, and athletic games were broadcast.

The frequency assignment was soon changed to 231 meters. This, however, was the same frequency upon which a large number of stations were operating, thus resulting in considerable interference and confusion. Consequently a new assignment of 275 meters was made. This place was held for one year and another division of the wave-band resulted in the assignment of 220 meters which, on protest, was changed to 248 meters.

At this time (March 6, 1925) a change in the designation was requested from WNAP to WCSO—Wittenberg College, Springfield, Ohio. This request was soon granted and the station began operating under these new call letters.

Because of interference it was decided that the power of the station should be increased to 1,000 watts. Work was begun immediately on the design for a new transmitter, erecting a steel mast 120 feet high, construction of a new T-type antenna, and the installation of an efficient ground system. A $7\frac{1}{2}$ horse-power, three-phase motor was directly coupled to a low-voltage generator for filament supply and to a high-voltage generator for plate supply to the five modulators and three oscillators. All circuits were installed in conduit and the high circuits in 2,400-volt lead-covered cable.

The transmitter unit was a back-connected bakelite panel, mounted on a channel iron framework, containing the high-frequency and direct-current meters and rheostats for filament and generator control and field and remote-control starting-switches. Both the pickup and station amplifiers were provided with grained steel cases which shielded the delicate circuits from the radio-frequency disturbances of the transmitter.

A waiting room was constructed adjacent to the studio proper. A booth with glass sides and door, as well as window front, which commanded a full view of the studio, occupied a portion

of this room. Within was the "pickup amplifier" with microphone mixing equipment and volume control. The signal lines and telephone circuits also connected this booth and the operator's table.

A new studio proper, 20 by 25 feet, was built on the south end of Carnegie Science Hall, making the appearance of an attractive sun parlor. The walls and subfloor of concrete were damp-proofed and furred out to give an insulating air space two inches in depth. Instead of plaster, the ceiling and side walls were covered with "insulite," a spruce-pulp laminated sheathing which was especially adapted for heat and sound insulation. All windows and doors were constructed double for the same purpose.

License for this new station was granted on April 22, 1927, placing the station on 1,210 kc and permitting use of 750 watts power for "unlimited" time. Formal opening of the station followed on May 25, 1927. In addition to a very elaborate musical program, addresses were given by President Tulloss, faculty members, and representative citizens of Springfield.

On June 1, 1927, the station was placed on 1,170 kc and its power reduced to 500 watts. On October 30, 1928, the station was assigned 1,380 kc, sharing time with Station KQV of Pittsburgh, Pennsylvania. Then, on June 15, 1929, the broadcast frequency was again shifted to 1,450 kc, sharing time with Station WFJC of Akron, Ohio.

Throughout its history the purpose of the station was not only that of entertaining but included the offering of educational and inspirational materials. Its program offerings included lectures in the fields of religion, science, business, psychology, and education. It was the desire of the staff to obtain the best musical talent possible at all times. Such programs included serenades, ensembles, choirs, trios, soloists, orchestras, novelty skits, and the like.

For a number of years the station successfully broadcast its College athletic games. In co-operation with a local theater, organ programs were broadcast three times weekly. Important public occasions, especially those of local significance, were

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broadcast by the station. During 1928 and 1929 additional hours were added to the regular schedule. Regularly scheduled features, many sponsored by commercial concerns, were presented daily and weekly.

On September 26, 1930, the license was assigned to the WGAR Broadcasting Company of Cleveland, Ohio, and the station was taken over by the new owners on November 1, 1930. This move amounted to a consolidation of Stations WCSO and WFJC to form the new station at Cleveland and was made necessary by the rapid development of broadcasting. In order to meet competition in the field it was found necessary to spend large sums of money in development. At the time it was not practical for the College, as an educational institution, to do this. The sharing of time with Station WFJC, resulting in double overhead charges, was not economical.

Consequently the consolidation was effected and the two sharing stations were discontinued.¹

¹ Data furnished by Mr. E. A. Jensen, business manager of Wittenberg College, and files of the Federal Communications Commission.

COLLEGE OF WOOSTER

WOOSTER, OHIO

ON DECEMBER 14, 1923, the College of Wooster was licensed to operate a broadcasting transmitter on 1,280 kc, with 20 watts power, for "unlimited" time. The call letters WABW were assigned. However, actual broadcasting from the station did not begin until late in the following year.

On December 5, 1924, the station was placed on 1,450 kc and on March 20, 1925, permission was granted to increase the power to 50 watts.

On June 1, 1927, the station was placed on 1,210 kc.

Though owned and operated by an educational institution, the station was never used strictly for educational broadcasting. Its programs consisted of lectures, musical and entertainment features, and athletic events.

Considerable difficulty was experienced in securing a licensed operator for the station. Further, the expense required to keep the equipment in order and to modernize it in accord with federal requirements was more than the College could meet.

Consequently, when the Federal Radio Commission challenged the College's application for renewal of its license and called a hearing to determine whether or not such renewal would be in "public interest, convenience, or necessity," the applicant did not appear and the license was refused. The station was deleted on August 1, 1928.¹

¹ Data furnished by Dr. W. R. Westhafer, dean of the College of Wooster, and files of the Federal Communications Commission.

YANKTON COLLEGE

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YANKTON, SOUTH DAKOTA

YANKTON College was licensed to operate a broadcast transmitter on August 8, 1922. This license permitted transmission on 360 meters (834 kc), with 250 watts power, for "unlimited" time. The call letters WJAU were assigned.

Though holding a license, the College never attempted to broadcast. The station apparatus was improvised by the students and it was hoped that out of it a station could be developed. However, due to poor construction and unsatisfactory performance in tests, the facilities were junked and the project dropped. When the license expired on November 7, 1922, no application for renewal was made and the station was deleted by the federal government on January 2, 1923.

At this time the College did not feel that it had sufficient funds to develop the station as a worth-while enterprise. Further, the signals from the transmitter were found to interfere with telephone connections as well as with regular programs of the College instructional service.

At one time the College owned an experimental transmitter which was licensed with call letters 9YAK. After some time this became a CW station. It was never a phone station nor was aural broadcasting ever attempted over these facilities.¹

¹ Data furnished by Dr. E. H. Myers, secretary-treasurer of Yankton College, and files of the Federal Communications Commission.

YOUNG MEN'S CHRISTIAN ASSOCIATION

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WASHINGTON, D.C.

IN THE early days of broadcasting Mr. L. A. Snead, interested in the Young Men's Christian Association, donated radio equipment to the Washington, D.C., branch. License to operate this transmitter was granted by the federal government on May 4, 1923. Under this license authorization was granted to use, 1,060 kc, with 50 watts power, for "unlimited" time. The call letters WABE were assigned.

This equipment was used in a limited way by the Association, phonograph records forming the bulk of the program content. Though the intention was to broadcast religious and educational features, it was very soon discovered that maintenance of the station on a basis adequate to meet the needs of the institution would be far more expensive than could be afforded since there was no endowment for support of the project and other funds available were not adequate for the purpose.

On November 30, 1923, permission was granted to increase the power to 100 watts.

However, in view of the many difficulties experienced in attempting to keep the equipment in satisfactory condition, it was decided to abandon the project. Consequently, when the license expired on September 23, 1924, the equipment was donated to a local broadcasting organization and the station was deleted by the federal government on October 20, 1924.

In 1932 the Educational Department of the Association broadcast over a local commercial station a series of addresses dealing with law. These were later gathered into a book and approximately five thousand copies distributed. Through the Religious Work Department weekly Sunday School lessons have been broadcast with considerable success.¹

¹ Data furnished by Mr. L. W. De Gast, general secretary of the Washington, D.C., Young Men's Christian Association, and files of the Federal Communications Commission.

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