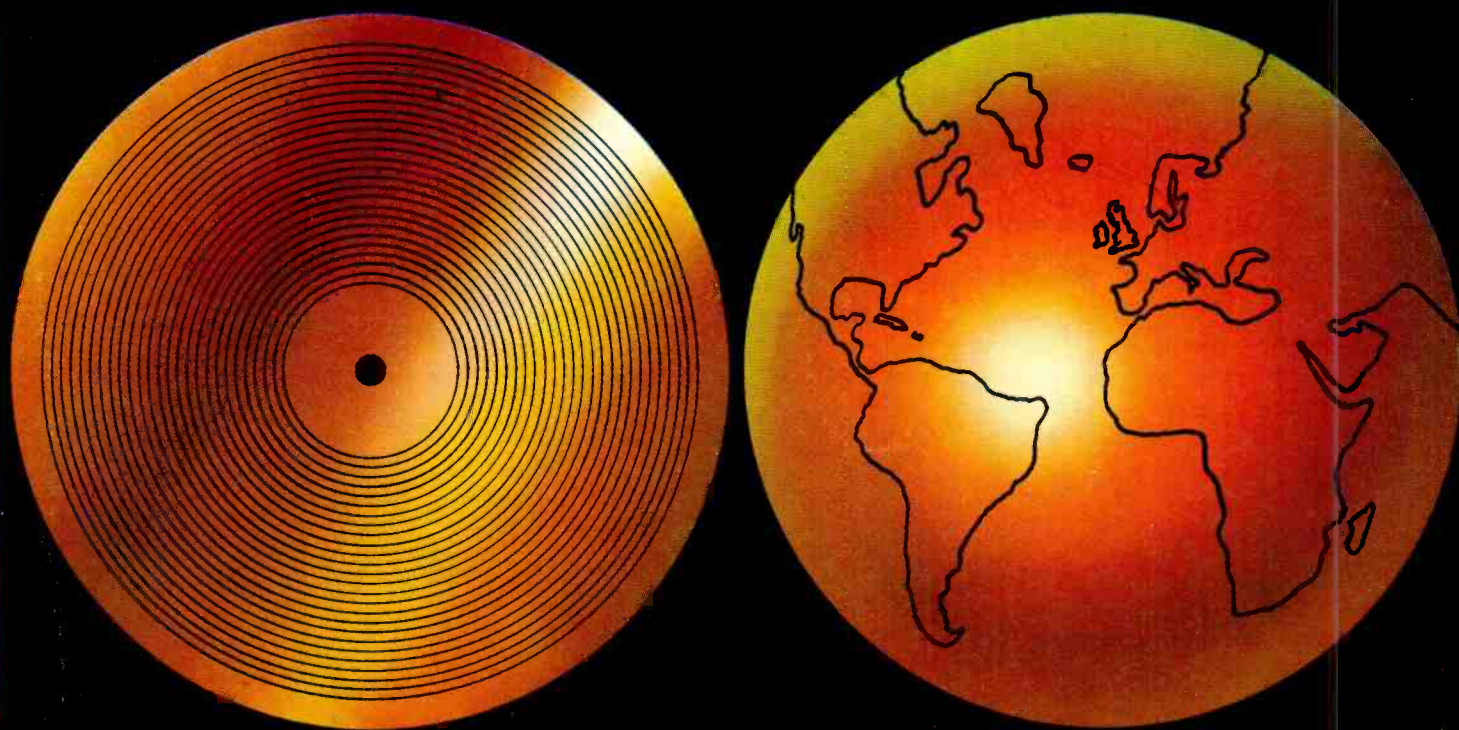


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studio sound

AND BROADCAST ENGINEERING

Keep it up!

This year we've dedicated our 'International' issue to the Centenary of Recording Sound (even though it would appear that the celebration is a little late). With some centenaries—composers, writers and suchlike—one can trace a complete historical phenomenon with a beginning and an end; but, thankfully, this centenary doesn't contain the same sense of finality. We are celebrating an on-going phenomenon. Consequently, our approach to recent years is more in line with the usual *STUDIO SOUND* involvement . . . and, hopefully, coverage of the early period offers an unexpected assessment of the good/bad old days.

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Centenary Perspectives

by Tony Palmer and Warren Rex Isom

THERE can be little doubt that the recording of sound has had the most profound influence on the development of popular music. At its lowest, pop music is recorded sound. But, equally, without this remarkable invention, all music, and not just popular music, might have been very different today. What has become the common language of youth around the world might have remained the private aspirations of a few blacks in post-Emancipation America. There remains the question of whether this influence has been beneficial. Because it has been so widespread, the grand assumption that its effect must perforce be for the good, ignores both the delicacy of the question and the heart-searching complications of the answer. It is a question, therefore, which should and must be continually before us.

We should acknowledge the startling achievements which the recording of sound has inspired. As I drive to and from numerous film locations, usually early in the morning or late at night, I am able by means of the indifferent cassette machine in my car to hear music recorded 50 years ago in Bristol, Tennessee—for instance, the first music which singer and guitarist Jimmie Rodgers ever committed to wax. Or I might choose to listen to the 128-member Berlin Philharmonic Orchestra, pounding away as Alberich stands guard over the goldmine wherein rests the Rhinegold. Or I can hear the voice of Stravinsky, talking about those extraordinary moments when *Le Sacre du Printemps* came into his imagination. These examples may seem a banal justification for the power of recorded sound, but they illustrate the magic of this invention, the wonder which its use should engender. We are in danger of taking this magic and this wonder for granted, simply because they appear to be so accessible. Not for the first time, the manifold advantages of technology are accepted as if by right, rather than celebrated for what they are. Can you imagine what it might be like to hear Mozart playing his own piano concertos, or hear Wagner telling us about the difficulties he encountered staging *The Ring*? One's mind is truly dazzled by these possibilities. Yet, for the last 80 years, more contemporary equivalents of these situations have existed; and here I am, late at night, driving down the motorway, and at the touch of a button recreating these events at will.

Until comparatively recently, the musicians themselves have not been involved in the processes by which sound is recorded. For

them, the recording machine—whether cylinder or wax disc—has been a mysterious device that allowed their music to be heard by an ever-growing audience. For hundreds of black musicians in the Delta or in the ghettos of Chicago, moreover, a good blow into the recording horn represented an easy bottle of gin. At least payment was prompt. White hillbilly fiddle-players and itinerant banjo-pickers from the Ozark and Appalachian mountains found they could make a modest living by cutting a few discs instead of constantly roaming around Saturday night get-togethers, hoping to scrape up or beg a few dollars by which to survive during the following week. Music, for both black and white, was a voice of the people, an unconscious outpouring of how a man felt about the world he lived in. He sang about his troubles, and he sang to tell others about those troubles. If some white entrepreneurs wanted to pay him for what came naturally, well, who was he to refuse? American popular music, true American popular music and not that manufactured by a self-protectionist clique who hid in New York and became known with unwitting appropriateness as Tin Pan Alley, was unaware of what a recording industry might entail.

It is true that before Tin Pan Alley—entirely an American location, variously between 14th and 52nd Street in New York—American popular music had had its hit songs. Stephen Foster's melodies were known throughout the United States, and formed a substantial part of the repertoire of any touring Minstrel Show. According to musicologist Rudi Blesh, the *Maple Leaf Rag* by Scott Joplin was the first million-seller. Chas K Harris, author of the song *After the Ball*, even wrote a book explaining how to write a popular song. These songs were propagated through the music hall and vaudeville circuits, and by 1910 the need for such material had grown to such proportions that it became necessary for songwriters and music publishers to get organised, if only to capitalise on this burgeoning demand. And so they did. Their product blossomed forth as never before. Songs were written to order, in any key or instrumental combination that was required. Armies of song-pluggers and arrangers were martialled to scour the land. Obviously, any method by which their task could be made more efficient was seized immediately. And such a method was embodied in the invention of the gramophone record. Edison had first patented his *Phonograph* as long ago as 1877, whereas Tin Pan Alley had not organised itself until the 1910s.

Hitherto, Edison's cylinder had been used primarily to record poets, such as

Tennyson, and large-opera singers, such as Adelina Patti. Even the invention of the more convenient flat discs had not aroused great enthusiasm among the merchants of 14th Street. It was still believed that the proper place to promote your song was the vaudeville house. Phonograph records were for the middle class or the rich, or for those who liked opera singers. But it was only a matter of time. When the recording of popular music began, around 1916, it began with a vengeance.

Before long, the demands of this proliferating industry were so colossal that Tin Pan Alley could no longer supply its needs. Scouts were despatched to all corners of the United States to record anything and everyone they thought might sell. One finished up in New Orleans where he heard a sound that was to reverberate around the world. It was called 'jass'. What has not been widely understood until recently, however, was that the scout made an almost unbelievable contribution to this sound called 'jass'. The tunes, or arrangements, played by these 'jass' bands were too lengthy for the wax discs. The solution was simple, argued the scout—the music must be speeded up. And so it was. Almost every band which learned to play Dixieland from these earliest recordings, learned a fast tempo quite at odds with the stately manner of the French quadrilles now called *Tiger Rag* and *Muskrat Ramble*. Elsewhere two other recording scouts, one white and one black, heard a new style of music being played in a dosshouse in Chicago. They signed up the pianist and copyrighted the name he had given the music. Both scouts made millions of dollars out of this first recording, and millions more out of royalties from the protected name. The music was called by its pianist the boogie-woogie. His name was Pinetop Smith, and for his trouble he received one dollar. To this day, every time the phrase boogie-woogie is used in a song-title, a royalty is paid to the estates of those two scouts. Pinetop, however, was shot to death, mysteriously, just three months after the initial recording.

These two examples underline the early relationship between this new recording industry and the music on which that industry fed. Lessons were learned on both sides which were never forgotten or, in some cases, forgiven. Nonetheless, the recording industry and popular music were peculiarly well suited to each other's needs—the one made the other profitable. But what do we mean by the phrase 'popular music'? It cannot be simply that which most people like; the 'Hallelujah Chorus' must be one of the most popular pieces of music ever written, yet

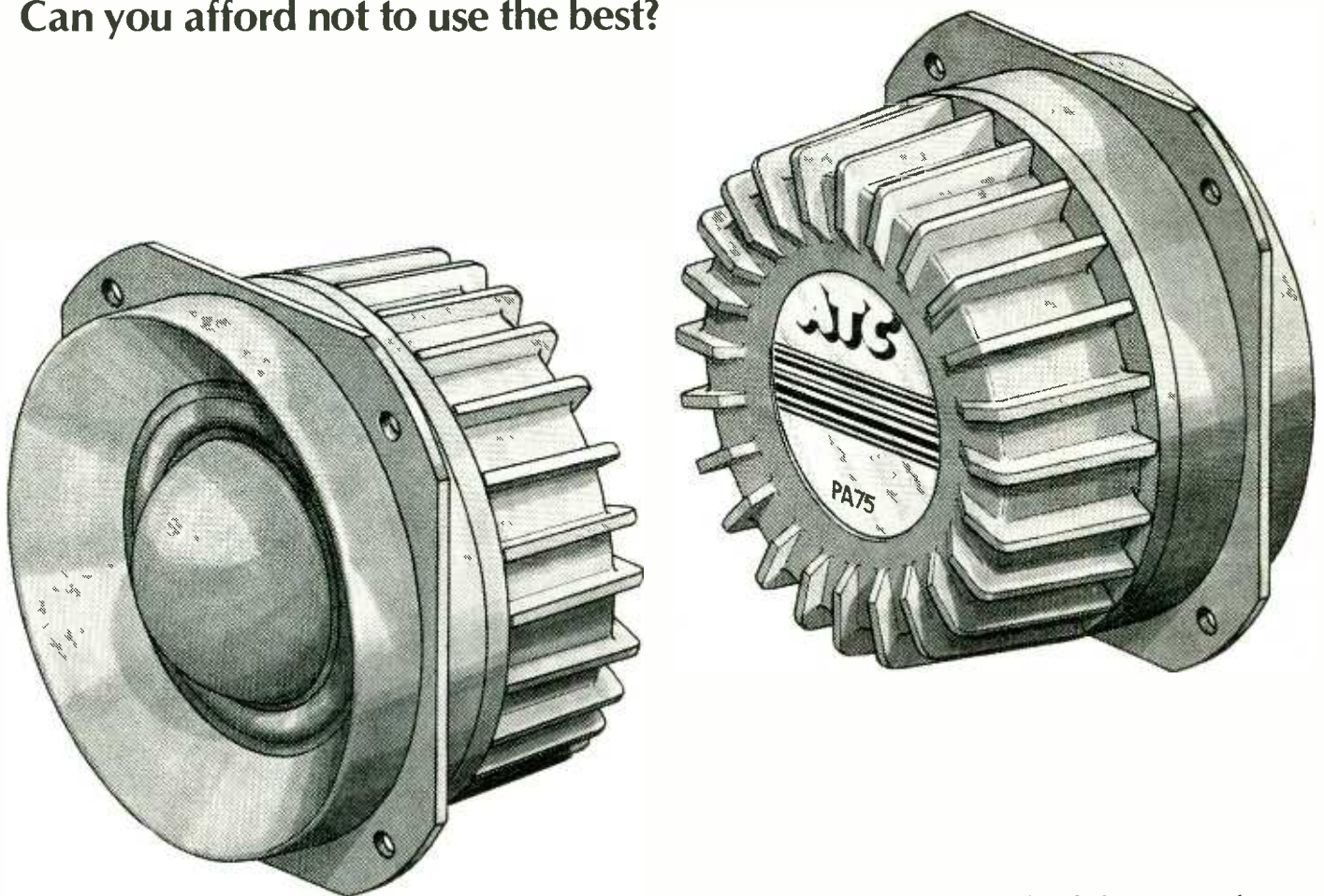
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CENTENARY PERSPECTIVES

the 'Hallelujah Chorus' is not popular music in the sense that Bing Crosby or Led Zeppelin is popular music. The phrase 'popular music' has to involve something more substantial than mere numbers. Perhaps it is music by the people, for the people; a composer or performer pours out what he or she feels about a particular place and time, telling us about that environment, that society, in a way which no other, more self-conscious, art can or does. When future generations want to know what it was to be alive and kicking in the mid-Sixties, composer Aaron Copland told me, it will be the sound of the Beatles that they turn to for their surest clue. In some intangible, unrealised way, the optimism, vigour and sense of anticipation that was central to the social and philosophical mood of the mid-Sixties, is expressed in the Beatles' music. This is what makes their songs 'popular music'. In the same manner, ragtime tells us about the aspirations of post-Emancipation blacks; jazz

was an indication of conditions in the Chicago ghettos of the early 1920s; swing had its finger on the pulse of the bustle and unease of the late Thirties; rock 'n' roll measured the social upheaval of the mid-Fifties.

The problem became such that an identification with social change was economically disruptive, and no industry can tolerate economic disruption. Thus, as the record industry developed, it was necessary to find a means by which to tame this popular music, to make it less an expression of social unrest, and more an acceptable source of light entertainment and revenue. Repeatedly, the guts were torn out of popular music by an industry which demanded, indeed depended upon, the product. The medium was the message. It was not simply that the technological requirements of a booming industry imposed limitations on the expressive capabilities of the music. Its wealth enabled it to insist on the shape and content and intention of that music. The criterion of goodness was—did it sell? Thus, the traditions of popular music were abandoned

in favour of the traditions of Tin Pan Alley. Individual creativity has frequently been sublimated in favour of packaging and promotion. Yet, it may be that the recently available Beatles' Hamburg tapes are more important historically than any of the official early Beatles' records. One can deplore the dubious commercialism which encouraged their release, but to attempt, legally, to suppress that release on the grounds that the music is 'unrepresentative' is a profound misunderstanding of the value of recorded sound.

The story of popular music has always been a saga involving a relatively small but remarkable collection of individuals, struggling to survive the wants of an industry. You can always make a Ford look like a Cadillac. But you cannot make a composer or performer be like Paul McCartney or Eric Clapton. The recording business and its medium, recorded sound, has attempted to do with popular music what Ford achieved with the motor car. It works better with cars.

Tony Palmer

THE RECORDED music industry has grown like Topsy, with few exceptions, from the day 100 years ago when Edison recited 'Mary had a little lamb'. All of us have heard Topsy's growth referenced as the standard of rapidity all our lives, but none of us has ever heard an explanation of Topsy's remarkable growth. Maybe on the *millenium* of her birth, someone will do that for her, since the centenaries are being missed.

This centenary year of the recorded music industry provides an opportunity to review what has happened, some thoughts on why it happened, and a justification of it all.

What has happened is easily recited in terms of money and, even though this is probably its least important aspect, it's a good place to start. A little more than a third of the record business is in the United States where the total figure is given as 2.5 billion American dollars. Worldwide, this becomes 6.5 billion dollars. When the equipment and instrument sales are included, the total figure becomes at least 10 billion. The significance of these figures is an indication of the relative importance of the recorded music business in present-day life style.

In money, the recorded music industry ranks rather low on the scale of human activity. In human interest, it ranks very high. It comes close behind only the basic interests in life. If the basic interests are food, shelter, communications, transportation, war, religion and education, then recorded music ranks ninth. This ranking is supported by the fact that the record is the most universally recognised commercial product and the dog-and-horn the best-known of all the trademarks in the world.

Why this has happened is a more speculative question. The desire of people to have their voices recorded could be explained, partially, in terms of biology. All living organisms have a highly developed instinct of self-preservation, so perhaps it is gratifying to find that the transient and fleeting voice can be recorded.

The great interest in having one's voice recorded can also be partially explained in terms of ego, ambition, and religion. Perhaps one of the greatest driving forces for the individual is for recognition: this is the ego part. The ultimate in recognition is to be remembered after death, and the promise of eternal life is the religious element in the explanation. However, to enjoy a bit of immortality on Earth is the height of personal ambition. To record one's voice is a means by which this can be done. As Edison said '... to reproduce sound at any future time...' makes a recording a living monument suitable to be stored along with the family Bible. This explanation reaches its zenith with the great artist whose driving force is to be known throughout the ages for his virtuosity. There is no doubt that this consideration was present in the minds of Caruso and many of the first recording artists. Maybe today's artists would not admit to such considerations because they are blotted out by more immediate ones; namely, royalties. Royalties are a more positive and meaningful

measure of success than the hope of immortality.

In practice, royalties are a substitute for immortality and, in a sense, create what might be regarded as a bit of heaven on earth for the successful artist for as long as he lives. This certainly accounts for the large numbers of would-be immortals who are willing to dedicate their lives to their art. This is not to say, however, that there are no longer those who enjoy their art as a labour of love without reference to remuneration, or the lack of it.

The other side of the coin is of equal importance, and as great in its ramifications. Why do people enjoy recordings? One reason might be empathy, the listener substituting the emotional experiences and personal involvement of the artist in the rendition for his own, living a different life during the performance. This is not only satisfying but it gives one a mastery over a portion of one's fate; that portion that can be represented by the playing of records. With this approach to enjoying recorded music, the kaleidoscope of life is presented cafeteria style and at discount prices in most record racks throughout the world. By the choice of artist, and the selection of the album or single, the listener can choose his mood, he can choose his involvement, he can choose his life for the playing time of the record. A very high percentage of all records are suitable for empathetic listening, including instrumentals. In this type of enjoyment, the listener often fully identifies himself with the artist and is unaware of his own surroundings. It is important that the listening environment on reproduction supports his identification by having an air of presence.

Another reason for the playing of records is simply the enjoyment of sweet music and wonderful sounds. This is the same as that for the enjoyment of bird songs. Such listeners may or may not know music; knowing or not knowing seems to be of little or no consequence. Certainly few, if any, people know the language of birds, and that seems to make little difference. Associating the bird with the song adds questionably little to the enjoyment of the sound. Knowledge, however, makes one aware of that which is available for enjoyment. These listeners seem to identify their presence with the place that the sound is being produced, and it is important that the reproduction have a full measure of ambience. This group of listeners is a large part of the hard core that has supported the industry throughout the years, and will continue to do so.

The presence and number of those who simply enjoy recorded music raise the question as to what constitutes sweet music and wonderful sounds. Seriously, any definition of music must be, to a large extent, empirical. It might read: Music is a sound or sounds, organised or not, related or not, that different groups of people enjoy to varying degrees. So since a weed is an unwanted plant, in the same sense music is a wanted sound. This means, then, that no music can be termed bad; it can only be said to be unappreciated by the audience.

Warren Rex Isom



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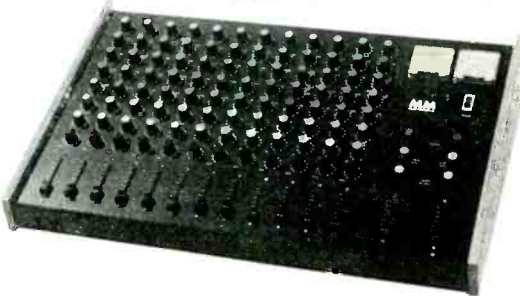
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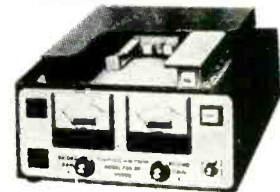
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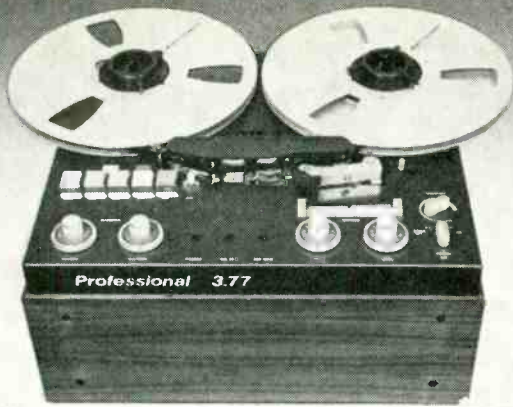
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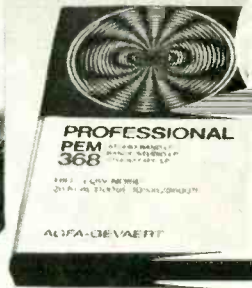
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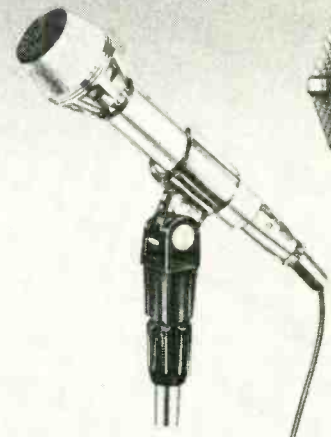
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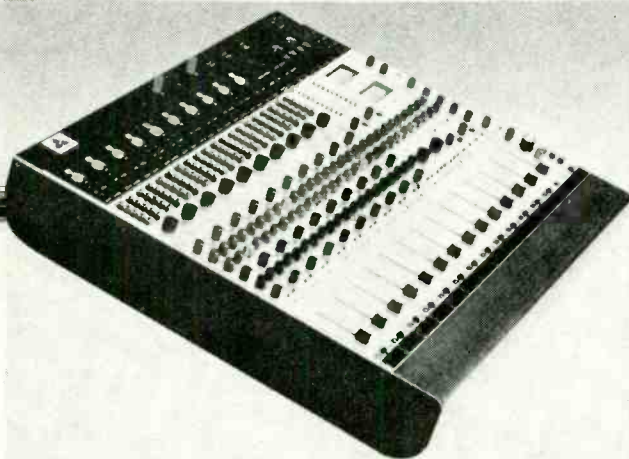
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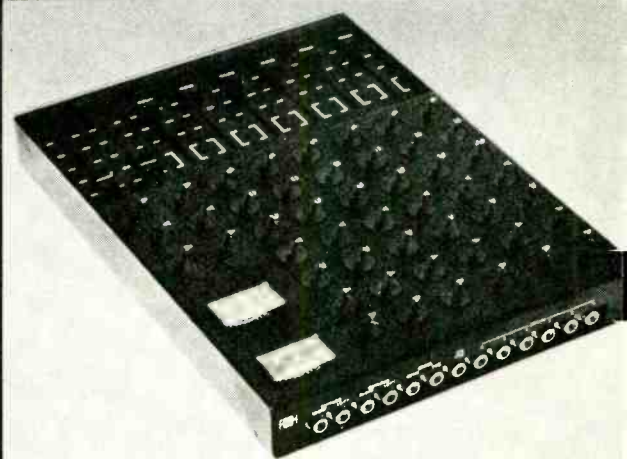
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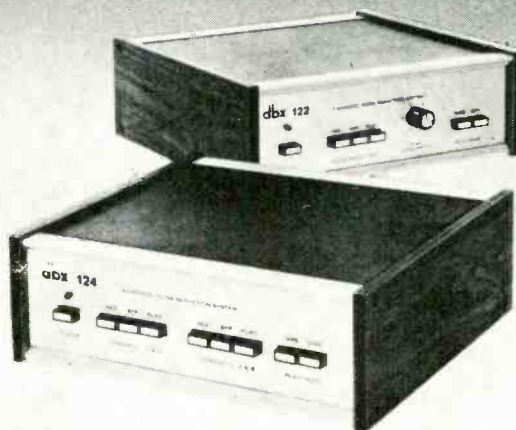
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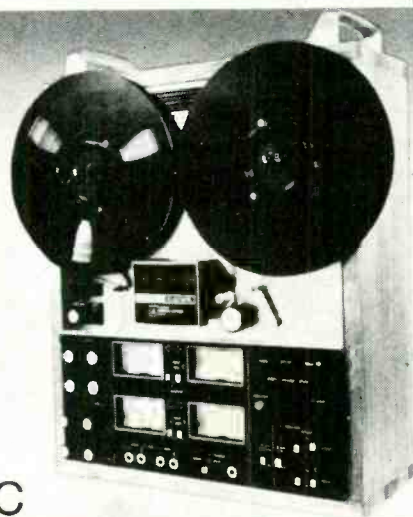
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2	DON'T GO BREAKING MY HEART	Elton John & Kiki Dee	✓	Rocket ROKN512	Big Pig Music	Gus Dudgeon
3	MISSISSIPPI	Pussycat	✓	Sonet SON 2077	Noon/Britico	Eddie Hilberts
4	DANCING QUEEN	Abba	✓	Epic EPC 4499	Bocu Music	B. Andersson/B. Ulvaeus
5	A LITTLE BIT MORE	Dr. Hook	✓	Capitol CL 15871	Sunbury	Ron Haffkine
6	IF YOU LEAVE ME NOW	Chicago	✓	CBS 4603	Island	James William Guerico
7	FERNANDO	Abba	✓	Epic EPC 4036	Bocu Music	B. Anderson/B. Ulvaeus
8	I LOVE TO LOVE	Tina Charles	✓	CBS 3937	Mautoglade	Biddu
9	THE ROUSSOS PHENOMENON	Demis Roussos	✓	Philips DEMIS 001	Mam/Britico	Demis Roussos
10	DECEMBER '63	Four Seasons	✓	Warner Brothers K 16688	Jobete London	Bob Gaudio
11	UNDER THE MOON OF LOVE	Showaddywaddy	✓	Bell 1495	Carlin	Mike Hurst
12	YOU TO ME ARE EVERYTHING	Real Thing	✓	Pye 7N 25709	Screen Gems	Ken Gold
13	FOREVER AND EVER	Slik	✓	Bell 1464	Martin Coulter	Bill Martin/Phil Coulter
14	No noise reduction used					
15	YOUNG HEARTS RUN FREE	Candi Staton	✓	Warner Brothers K 16730	Warner Bros.	Dave Crawford
16	COMBINE HARVESTER	Wurzels	✓	EMI 2450	KPM	Bob Barrett
17	WHENEVER FOREVER HAS GONE	Demis Roussos	✓	Philips 6042 186	Barry Mason Music	Peter Sullivan
18	Pre-Dolby					
19	CAN'T GET BY WITHOUT YOU	Real Thing	✓	Pye 7N 45618	Screen Gems/Columbia	Ken Gold
20	No noise reduction used					

Compiled by the BRMB. Based on UK sales between January 5 and December 10 1976.
Reproduced from Music Week Industry Year-book.

✓ = Dolby system used

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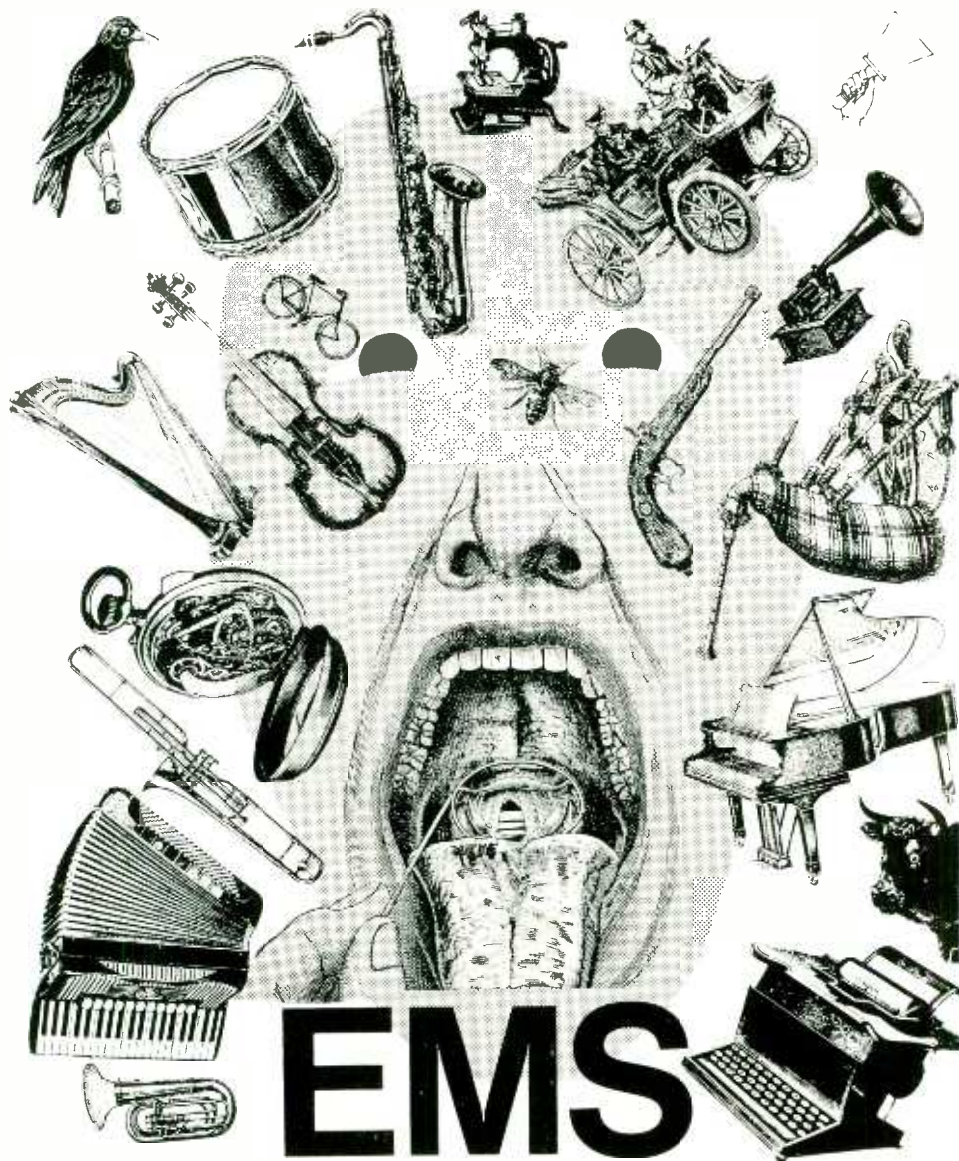
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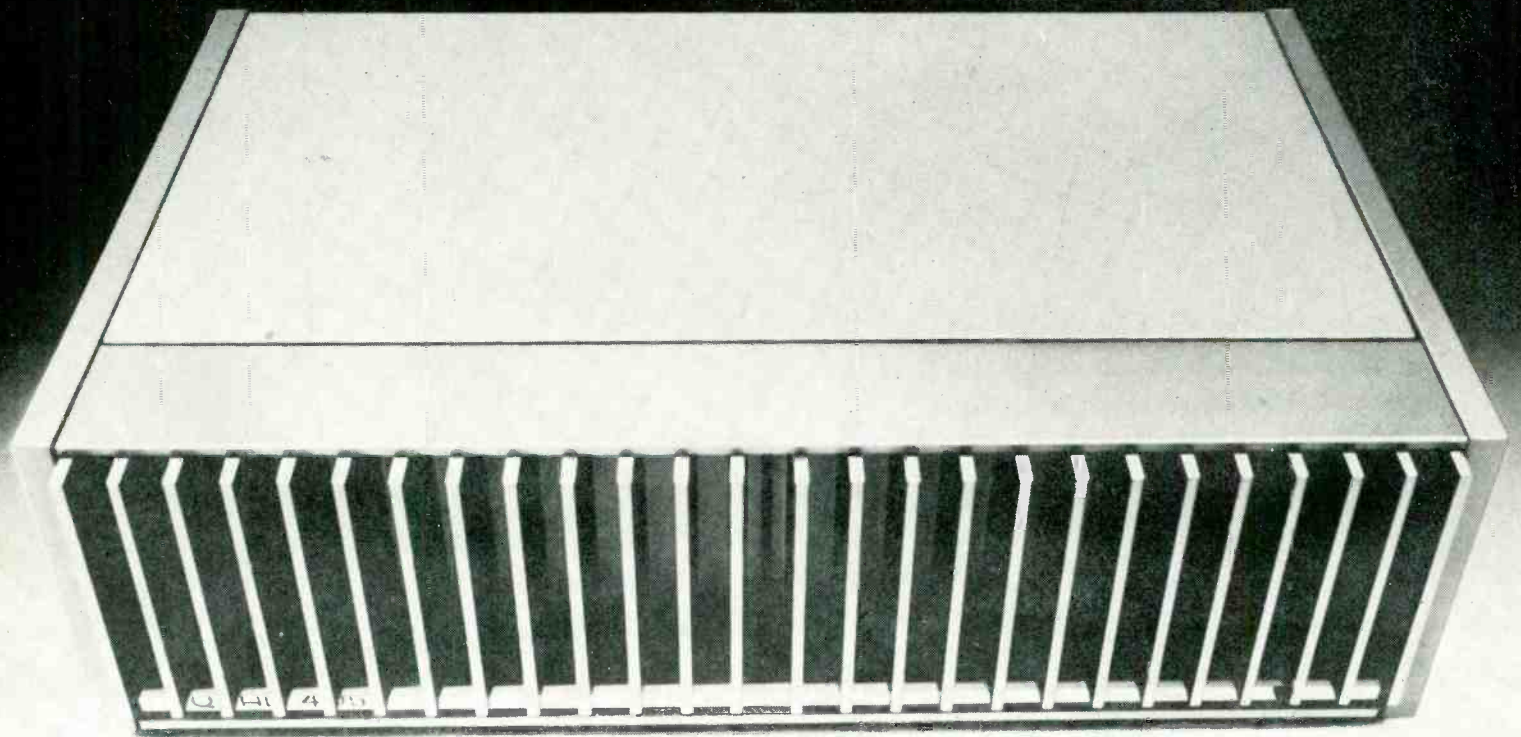
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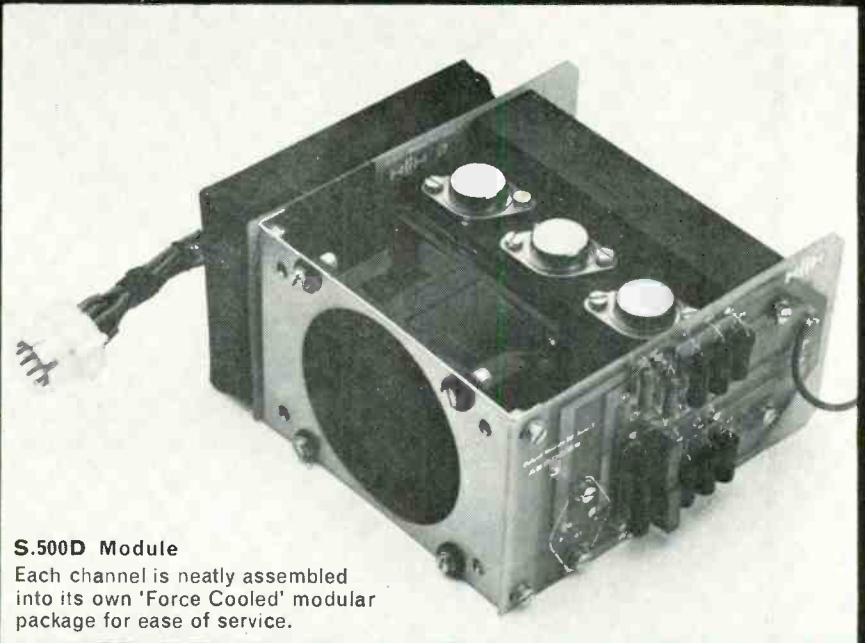
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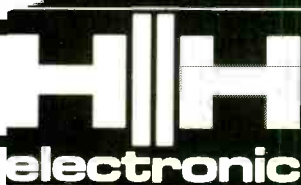
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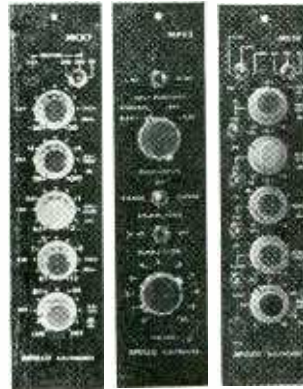
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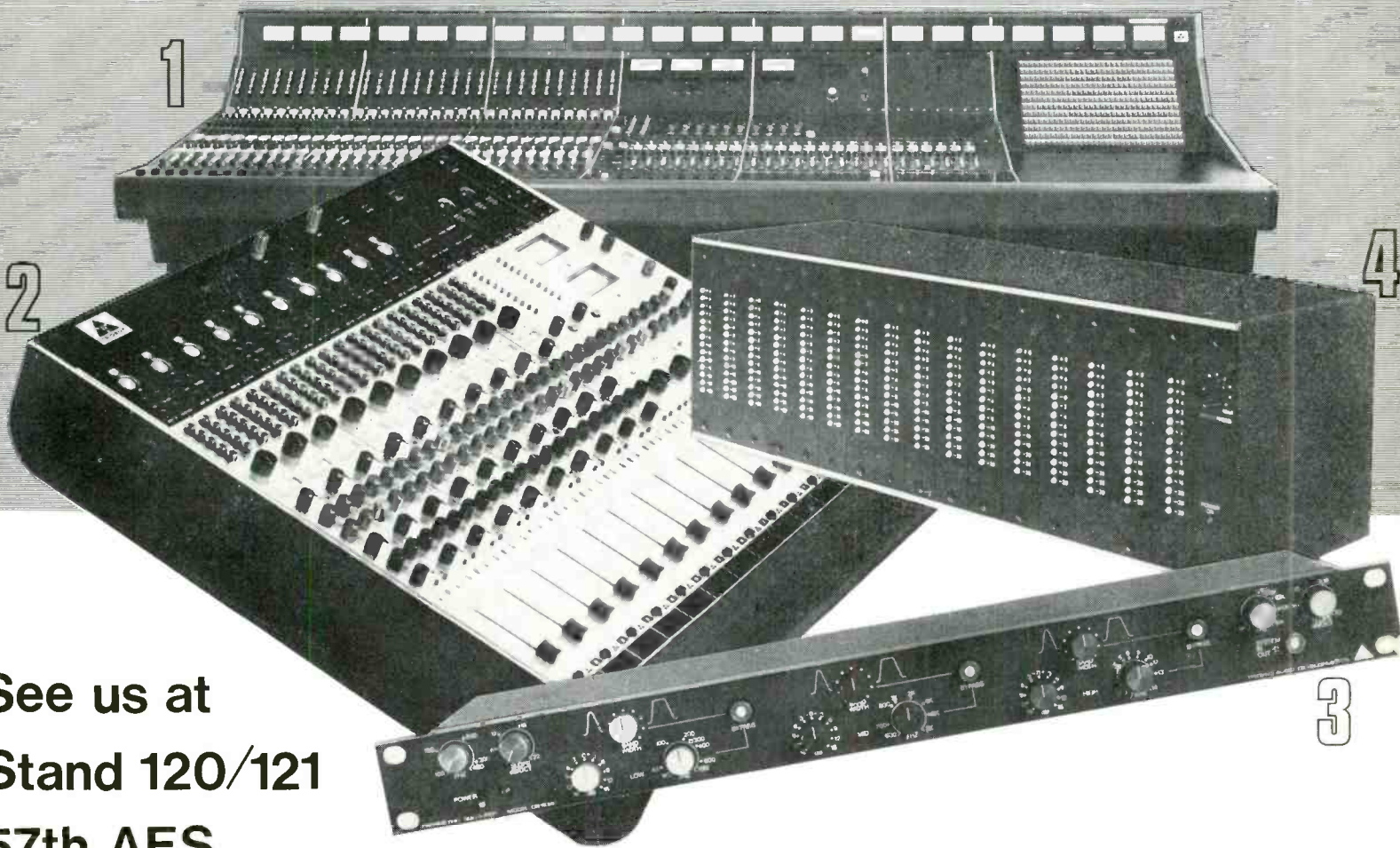
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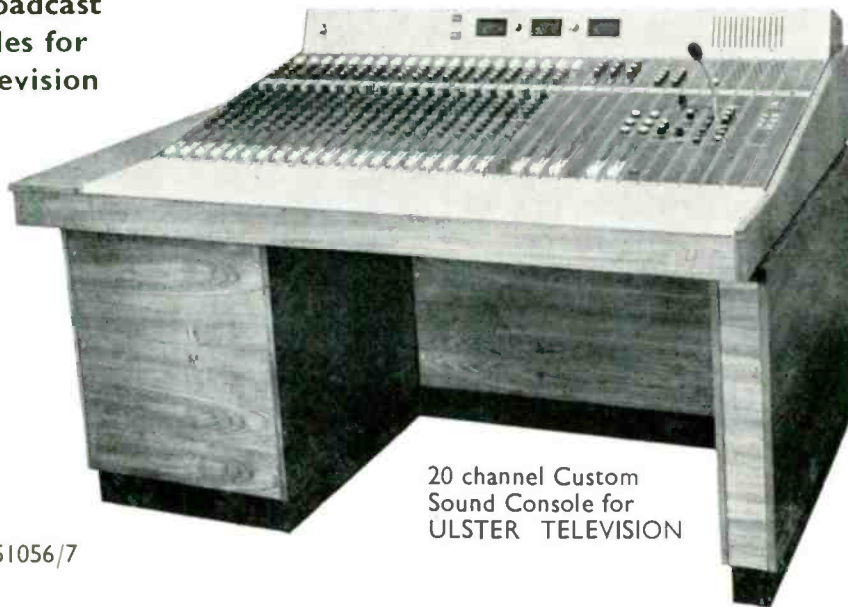
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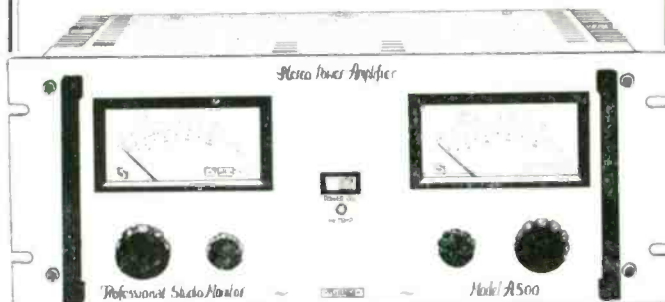
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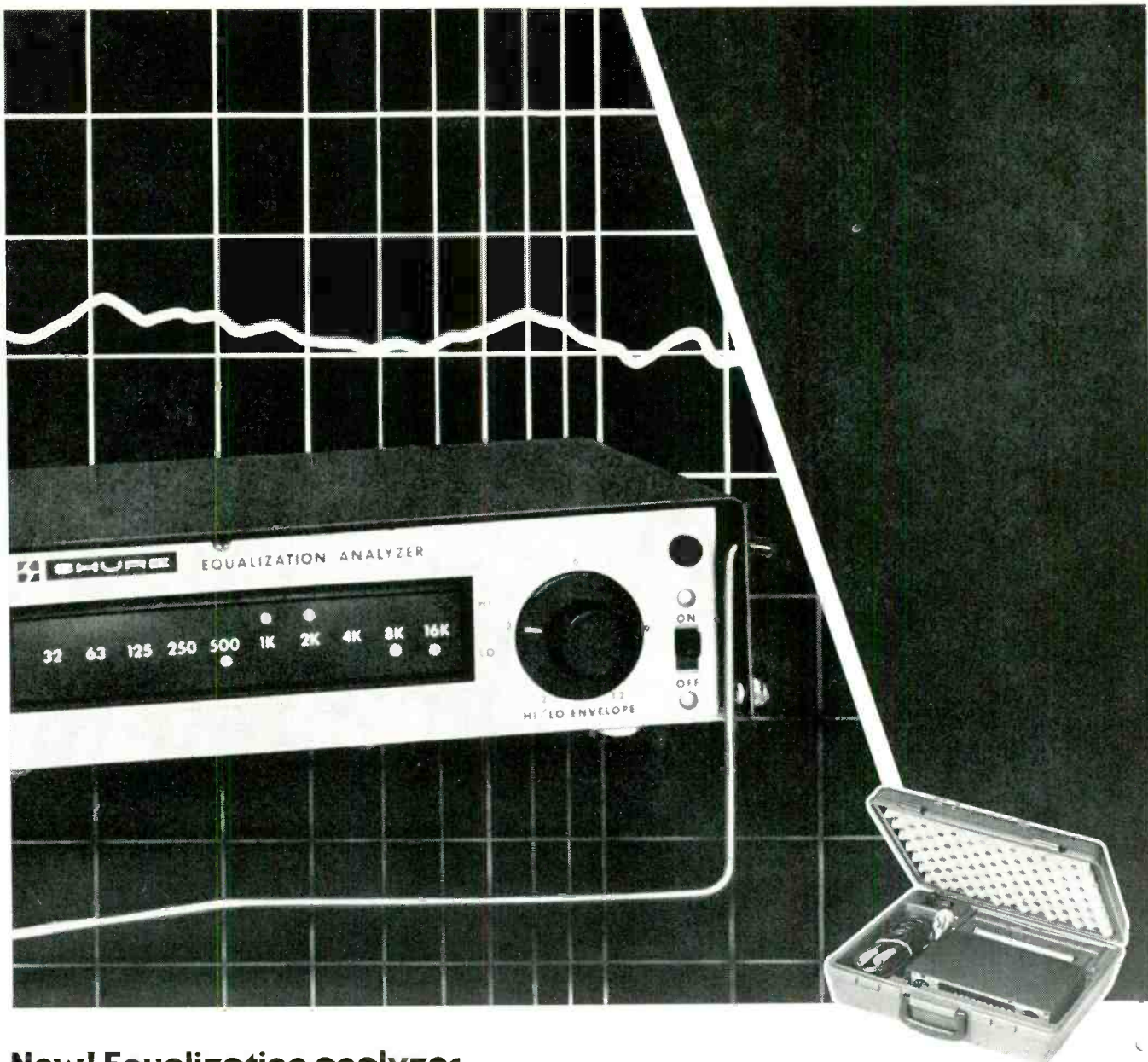
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The M615 Analyzer's display contains 20 LEDs that indicate frequency response level in each of 10 octave bands from 32 Hz to 16,000 Hz.

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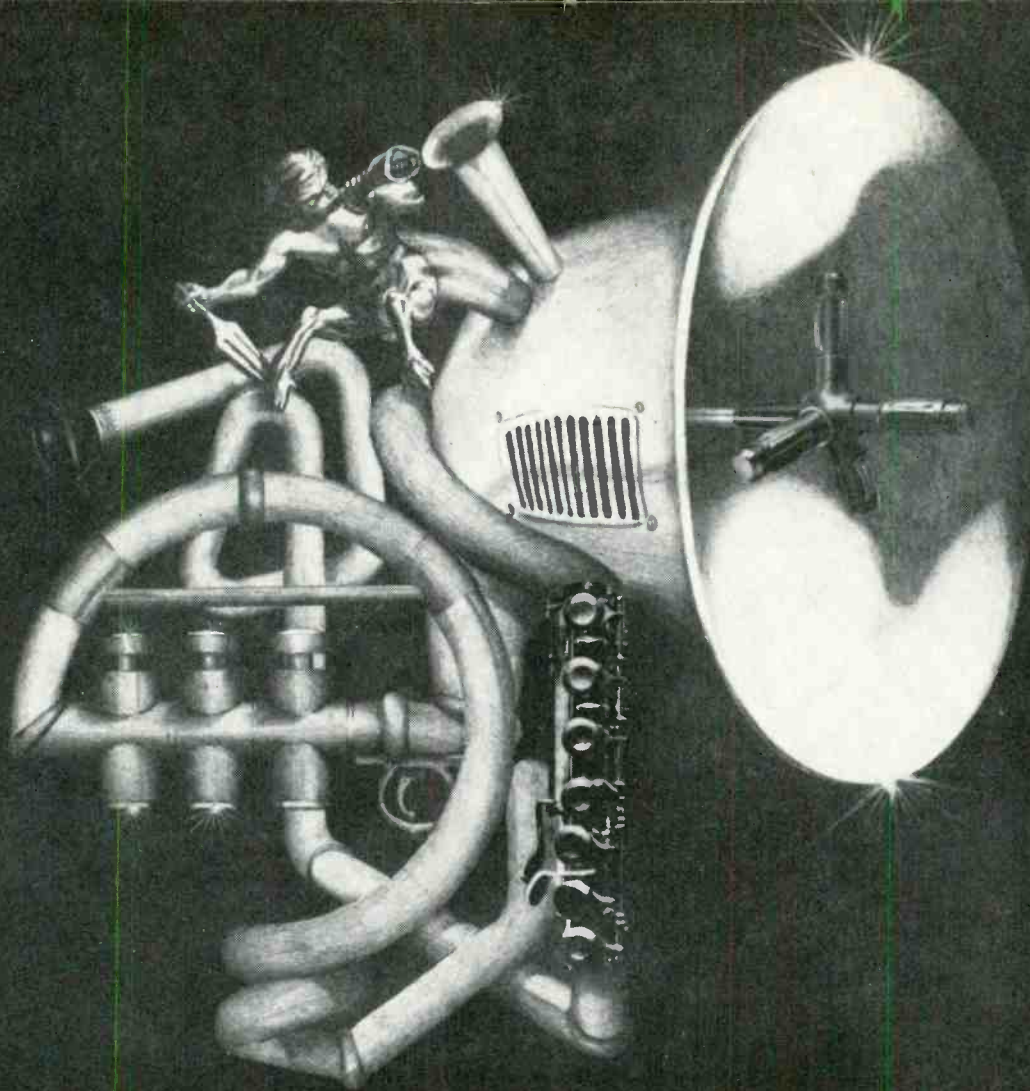


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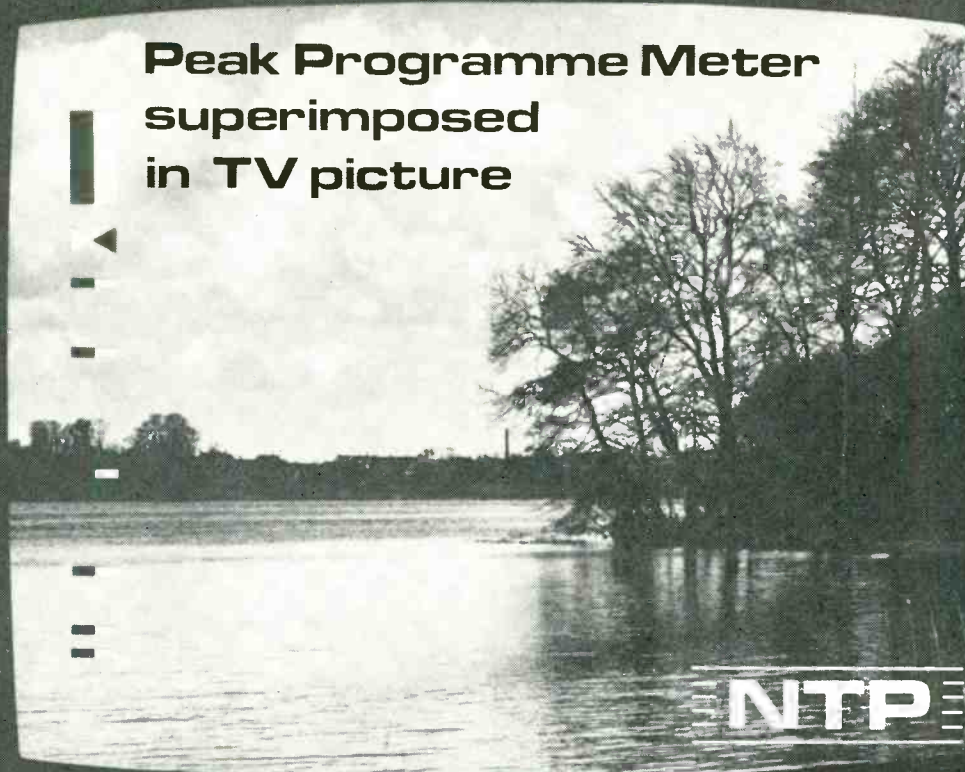
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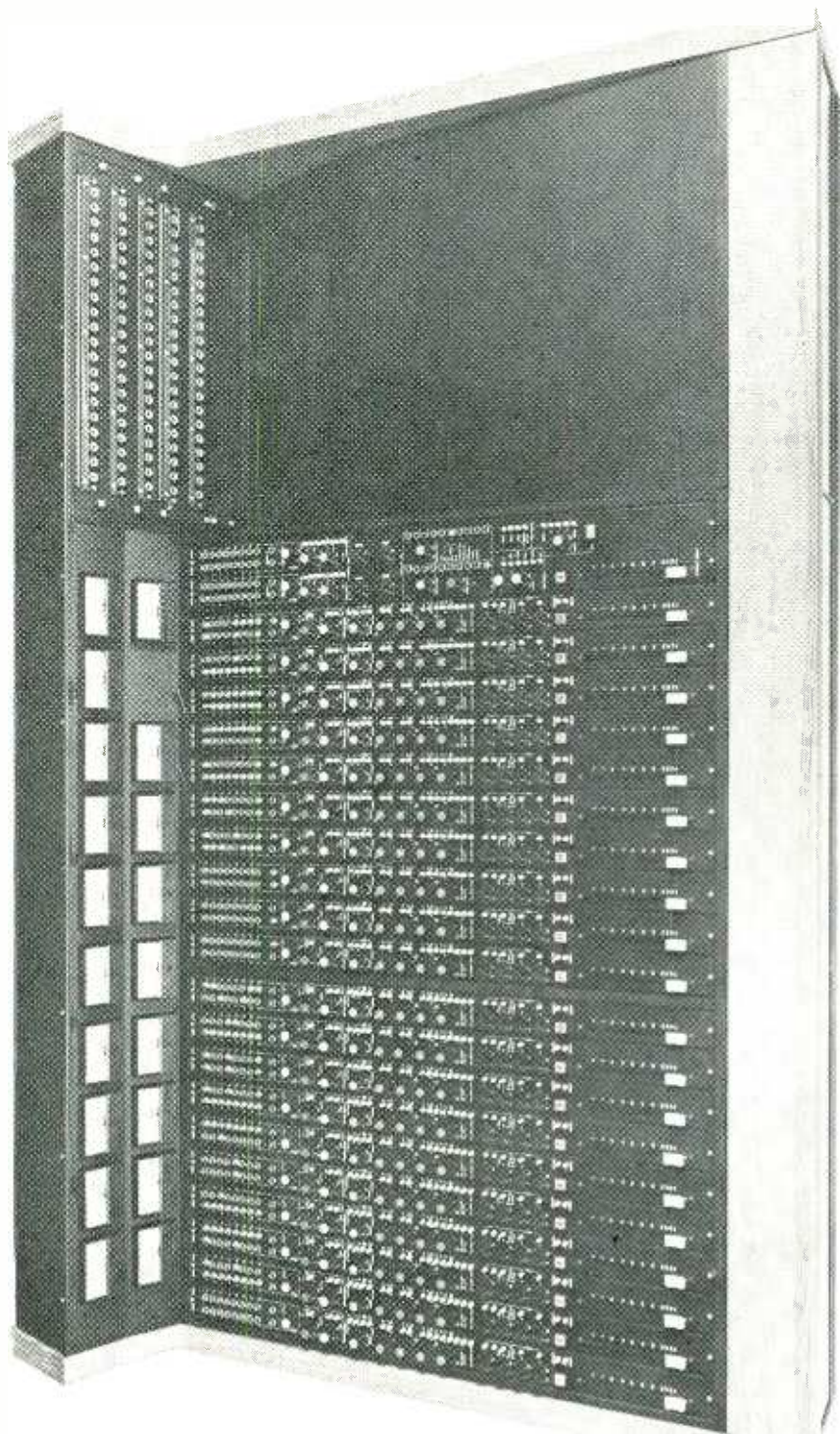
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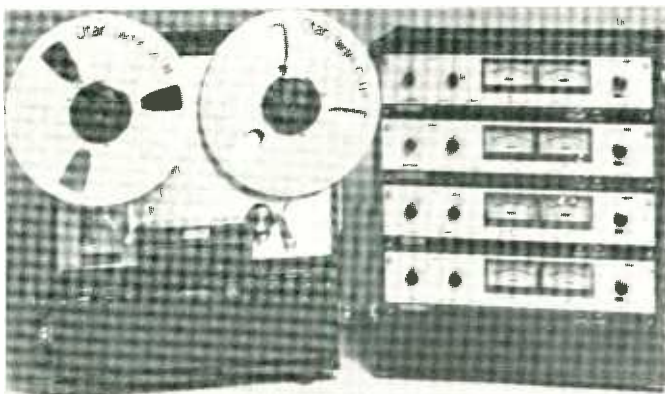
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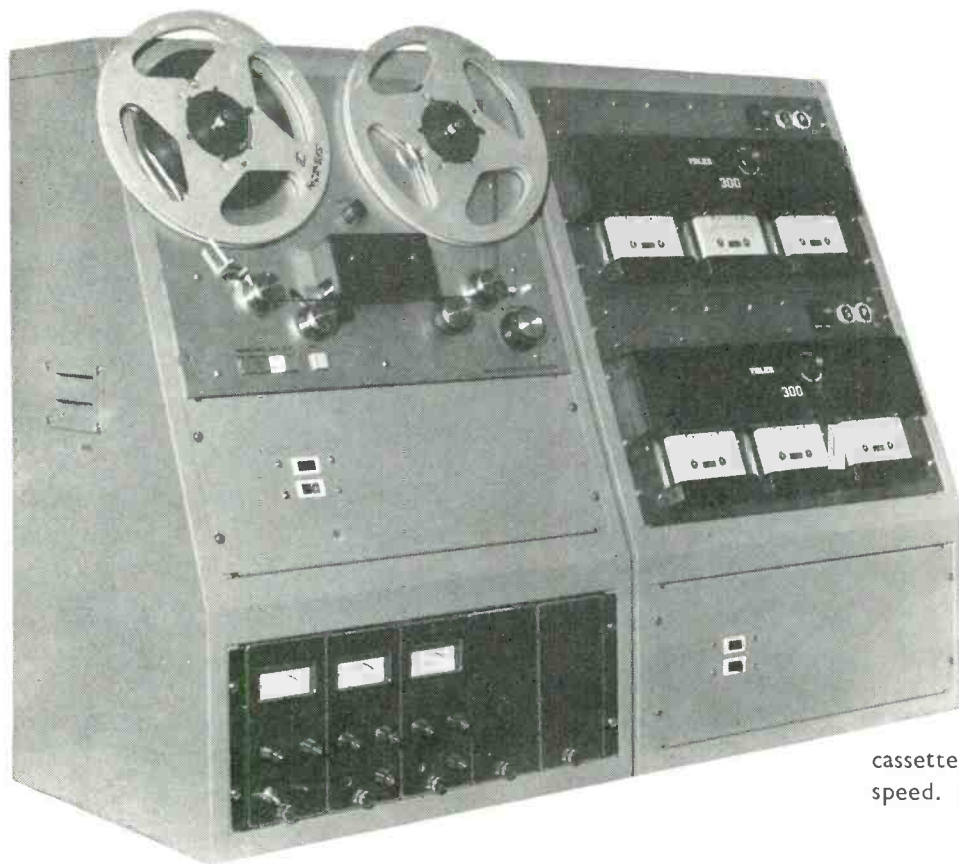
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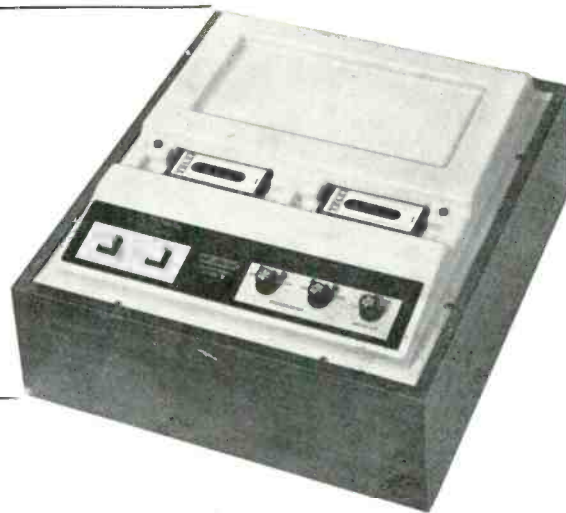
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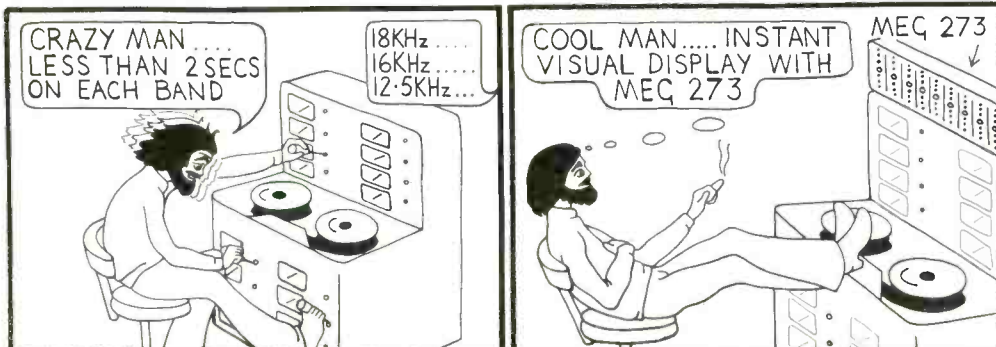
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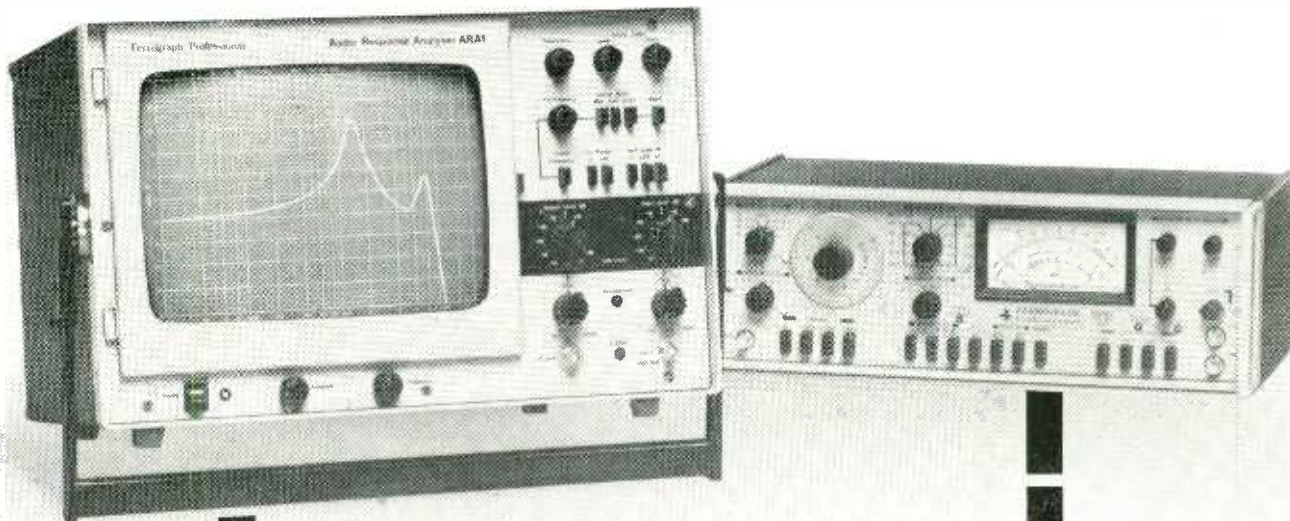
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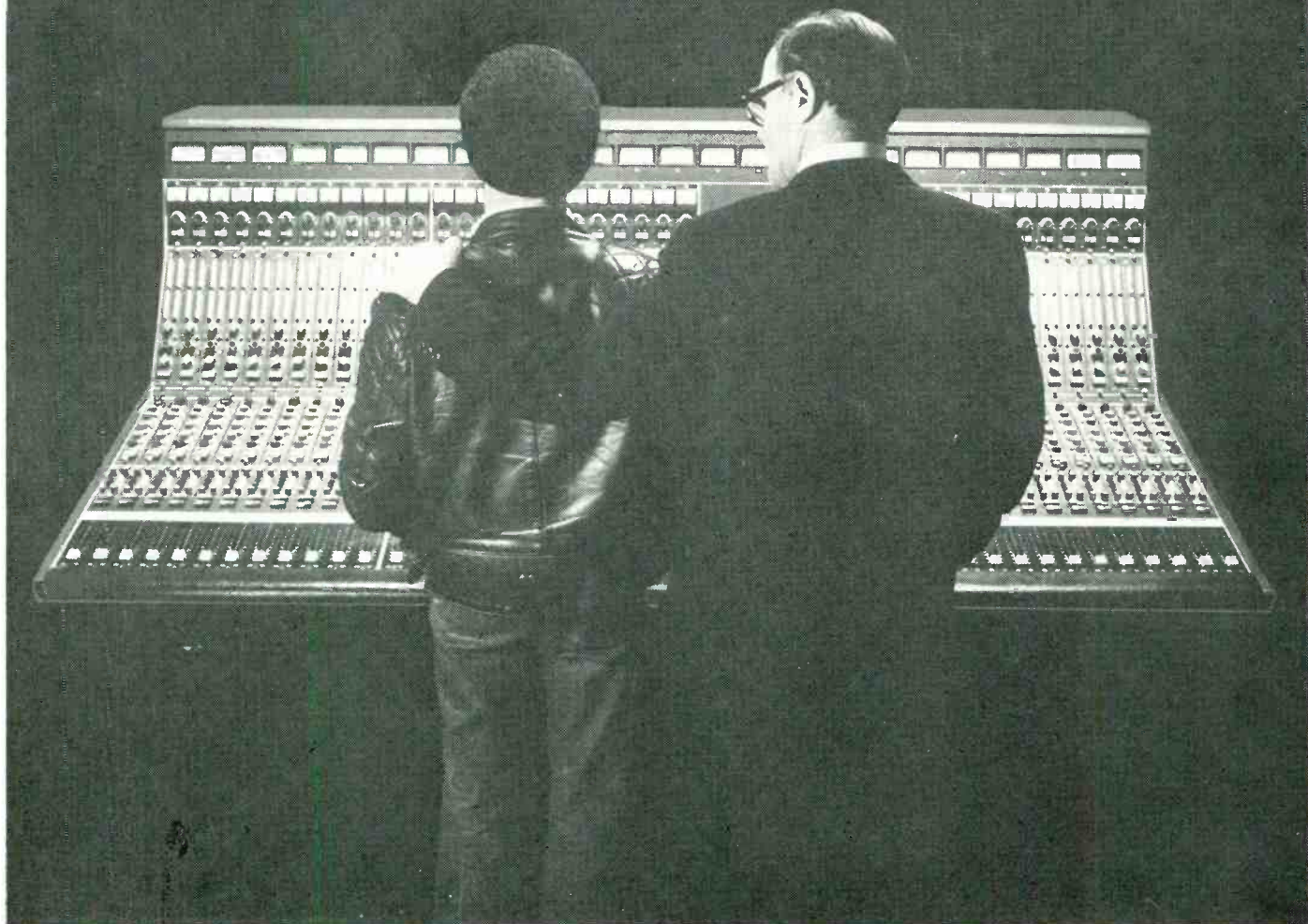
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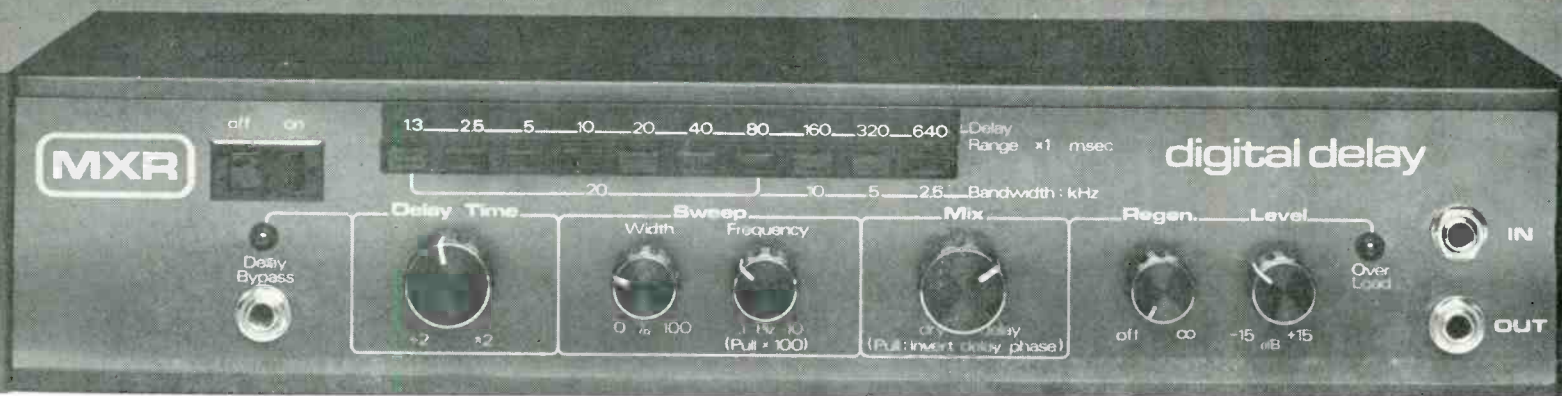
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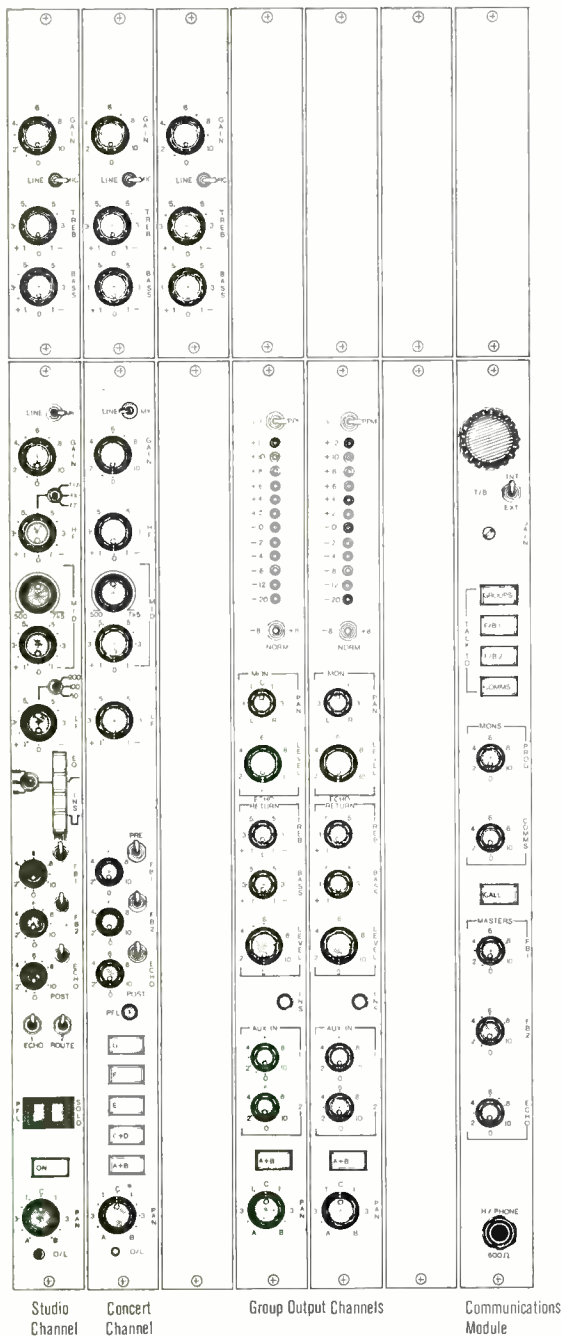
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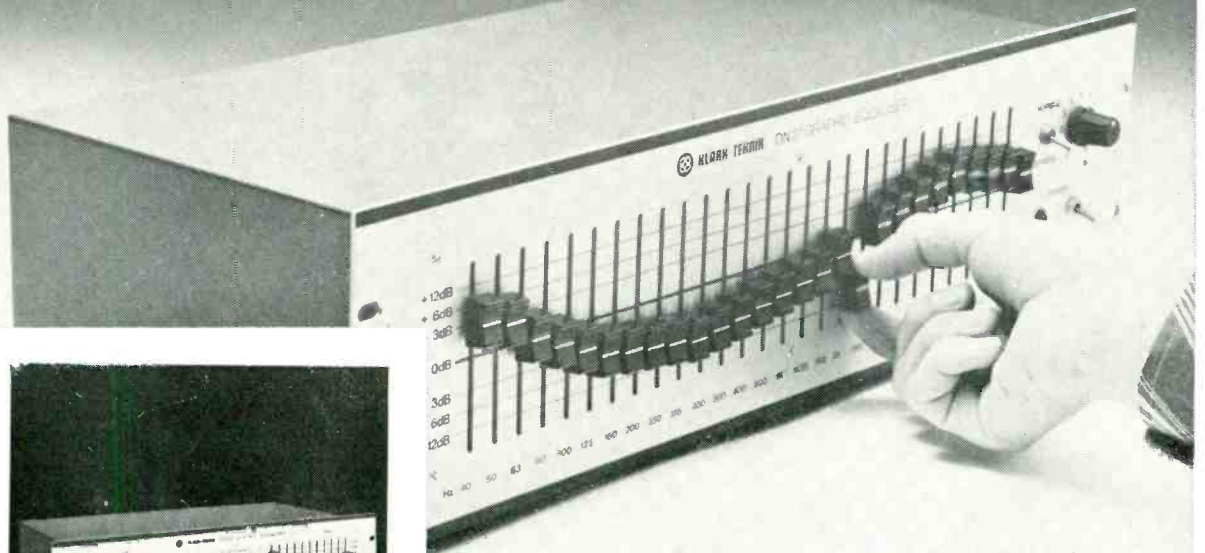
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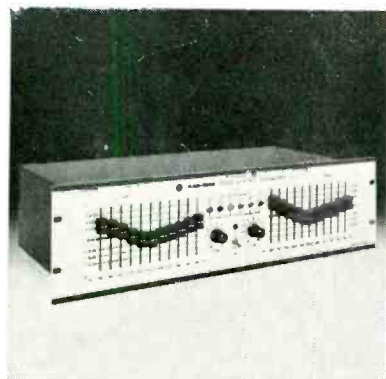
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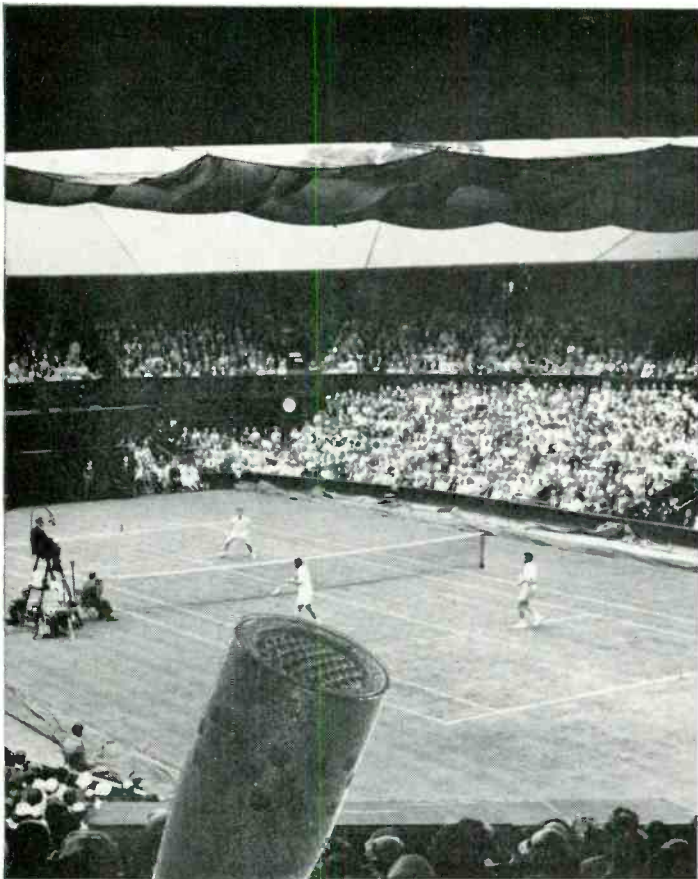
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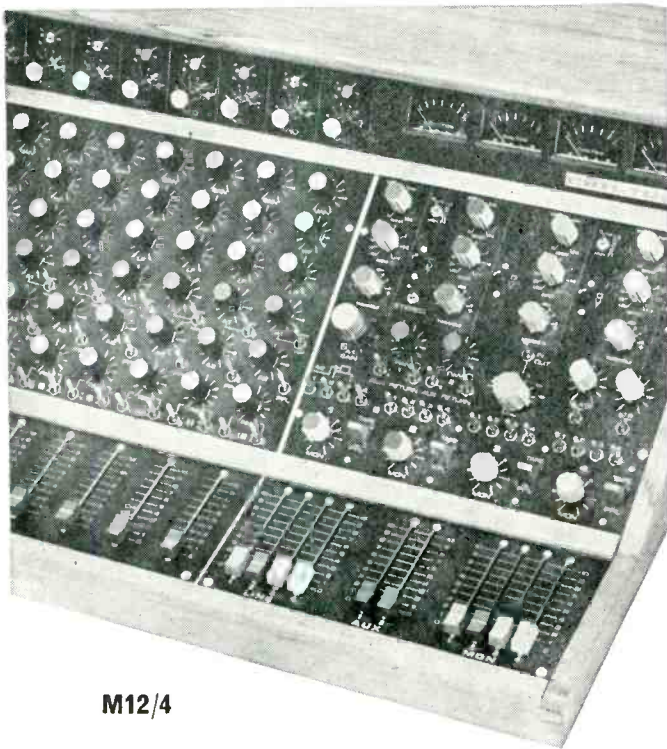
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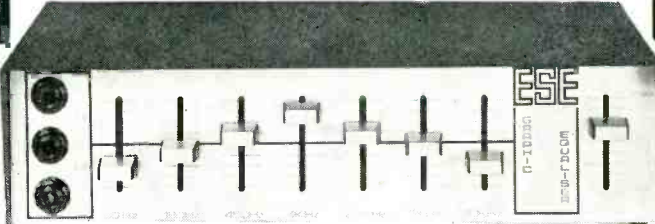
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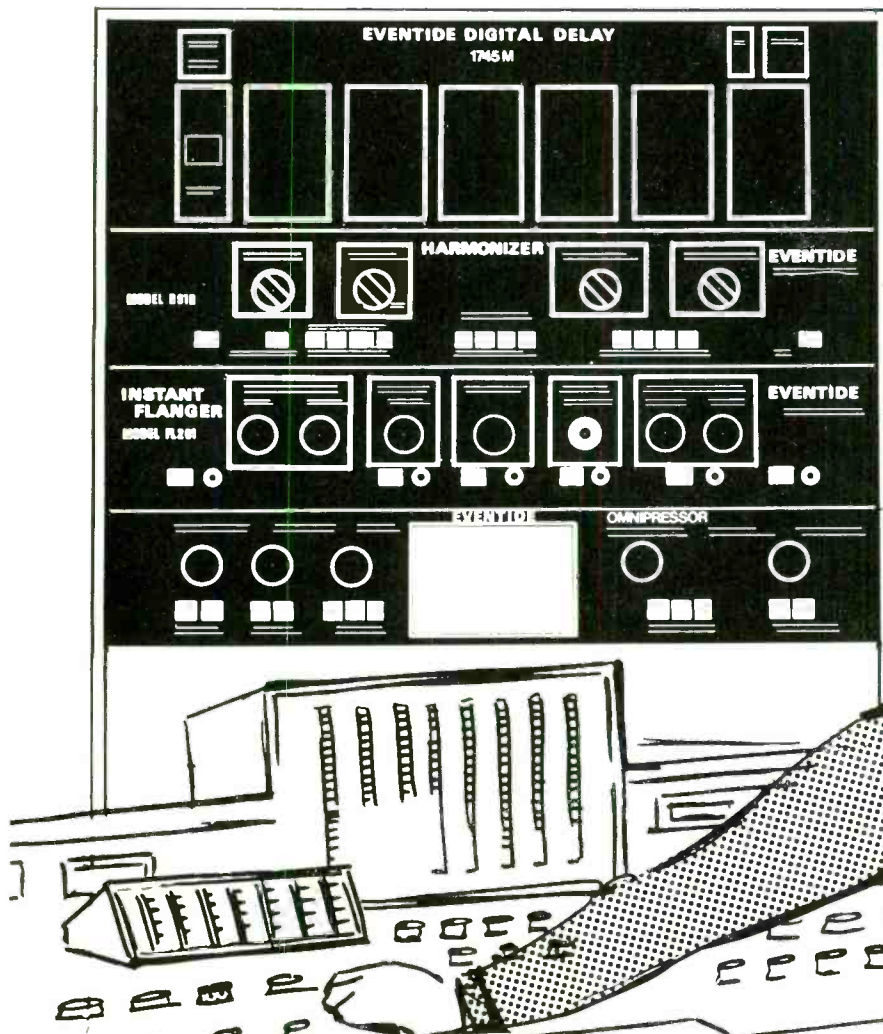
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2000 years of recording music

Arthur Ord-Hume

Music was 'recorded' Before Christ. Although techniques were by definition primitive, the concept of 'playback' was firmly established.

ANY fool can make a recording. (Do I hear howls of horror?) But wait a minute; think about what I said—and, indeed, what I *didn't* say. My point is that it doesn't take skill, knowledge or experience in order to record sound. The clever bit comes in when you start finding out how *not* to record the things you don't want. You would be amazed (or maybe not!) at the number of 'noises off' heard on amateur efforts by well-meaning recordists. The difficult part is to put on tape the selected sound which the human ear/brain, in its infinite discretion, filters from the buzzing confusion all around us.

Now, this problem did not exist in the early days of sound recording as such, since to begin with you had to shout quite loudly into the recording horn in order to be heard above the surface noise: it began to materialise with the further developments of the 1930s. The major advance of electrical recording (making possible the magic 'frrr') paved the way for the present-day state-of-the-art where multimiked studio productions, played back on domestic systems that cost a year's wages, can practically tell the home listener whether or not the conductor shaved on the morning of a session.

Of course, the ancients didn't have this problem at all. They, in their wisdom, were more practical in their solutions. Today, if we want to listen to an organ, we have to rely on a recording of it in the form of a strip of tape or, for the majority, a strip of tape converted into a black disc looking as much like an organ as a bowl of rice pudding looks like the Eiffel Tower.

But, in the distant past, all you did was to invite the organ to play for you while you sat and listened. Later, a lot later in fact, the same could be said of the carillon of bells, the pianoforte and, indeed, just about every instrument of the band or orchestra. I refer, of course, to automatic or self-playing musical instruments that date reliably from several hundred years before Christ. This fact is based on written evidence, but if we choose to look back a lot earlier, there is some further evidence, albeit a little vague, to push back their origin maybe another thousand years. To be on the safe side, though, I will confine myself to just the last two thousand years.

The connection between self-playing musical instruments and recording is not quite as tenuous as may at first appear. In its simplest form, a recording is a programme of sounds preserved in a pre-ordained pattern of pitch, duration and mixture that can be retrieved (replayed) at a later date without recourse to the operations by which it was first established. This was indeed the principle used by the makers of self-playing instruments.

The earliest musical instrument of man was probably the flute, from whence came the panpipe and the basis of the pipe-organ. And here we find our first somewhat unusual feature. When instructions were written down for making these instruments, it was invariably considered that there should be an alternative means shown for playing them. In other words, the pipe-organ would be provided with an automatic player and such a feature was by no means considered out of the ordinary. Indeed, Apollonius of Perga, who lived from 247 to 205 BC, describes in detail how to make a wind instrument and a device to play it automatically.

From then onwards, there appear several manuscripts in the Latin or Arabic-group languages giving instructions on how to make instruments and players for them. But the first really detailed



descriptions which have come down to us are from a group of 9th Century Arabic wise men called the Banu Musa. Here, and set out in simple language, are full instructions for making an organ which will play by itself. Each note of the small pipe-organ described was provided with a wheel, these being arranged on a shaft so that they rotated together as one. The whole assembly was so positioned that projections on the periphery of each wheel could open a pallet and admit wind to the pipes in a sequence that depended on where the projections were placed. In truth, what the Banu Musa described was a primitive barrel organ, the 'barrel' being nothing more than a section for each note.

The barrel organ was thus well defined in its component parts by the 9th Century but in the Middle Ages it seemed to suffer, if not exactly a decline, then certainly nothing outstanding in the way of improvement. True, the earliest organs were blown with air compressed in cisterns by allowing water to flow in, and true, a measure of air-pressure stabilisation was perfected very early on

(sometime in the 3rd Century BC), but little more happened for a very long time.

During the 17th Century a number of writers devoted attention to describing what they took to be the state-of-the-art as far as automatic organs were concerned. Men like Robert Fludd and Caspar Schott produced wonderful engravings of how they believed the things worked. Sadly, although they clearly demonstrated that the instruments existed, both men lacked the practical experience which would have enabled them to produce accurate representations of working instruments. Caspar Schott not only copied many of Fludd's illustrations, but his total lack of perception of operational principles resulted in bad copies of the earlier impractical ideas. The outcome was confusing, to say the least.

It was Athanasius Kircher, in his book 'Musurgia Universalis' (Rome, 1650) who gave us for the first time a fairly accurate chronicle of the ruling techniques of mechanical organ-building. His beautifully illustrated work showed all sorts of water-turned and blown organs which were based on the famous water organs in the

to survive in playing order can be found. This instrument, high up in the walls of Salzburg Castle, was first built in the year 1502 and, after many restorations over the centuries, is still in playing order today. It was known to the Mozart family, and in fact the barrels that it has now (these are modern, having been made not more than 200 years ago) play music by Leopold Mozart, Wolfgang Amadeus Mozart, Eberlin and Haydn.

These so-called *Hornwerk* organs are rare indeed today. Engl ('Das Hornwerk auf Höhensalzburg', Salzburg, 1909) believes the type to date back to the 14th Century. Significantly, this is a century after the first manuscripts describing the use of the bell as an instrument of automatic music. Here again, as well as showing a manual way of playing a tuned set of bells—a carillon—the authors set about describing how to make an automaton player in the shape of a man.

While the automatic organ was celebrating at least 15 centuries of development, the first self-playing sets of musical bells were not set up until the 14th and 15th Centuries in Holland. These were operated by means of a rotating iron drum in which were set iron pegs to engage a system of levers, which in turn moved the bell hammers and sounded the bells.

In about 1480, the mechanical carillon was supplemented by the addition of a keyboard, so that now the instrument could either be played manually or left to its own self-playing devices. The set of mechanically-operated bells played by a pinned cylinder was called *voorslag* (pronounced 'fore-slagh'), although it has come to be known by the name given to the later and improved mechanism: carillon. The person who plays a set of bells manually is properly termed *klokkerist* in Holland, *beiaadler* in Flanders, and *carillonneur* in France, which name we also use.

The first tower bells to be equipped with a self-playing device appear to have been the ones installed in the Sint Nicolaas-kerk in Brussels sometime before the year 1381. Within half a century many other towers had similar mechanisms, all capable of replaying music painstakingly recorded by using a musical score, a set of forged iron pegs—and a spanner.

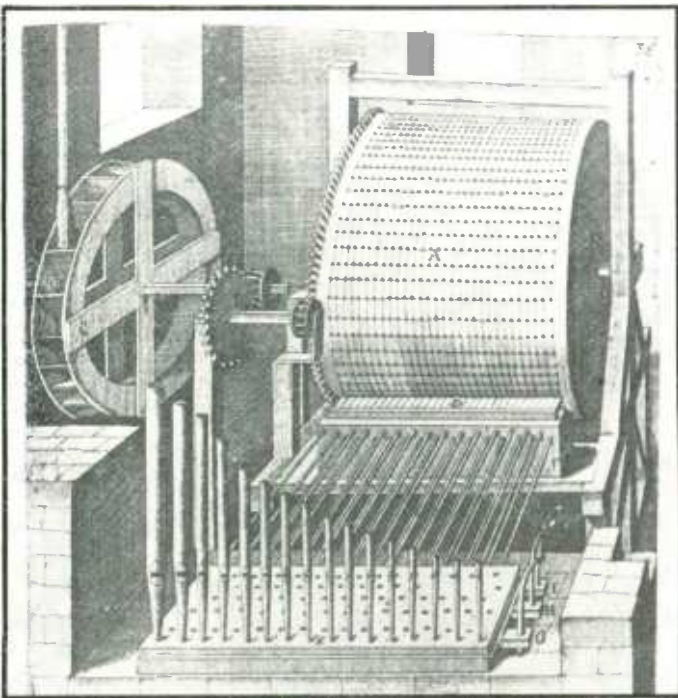
The first mechanical spinets appeared around 1530. These were made in Augsburg, which at that time was the world centre for clockmaking, automaton-building and the making of automatic musical mechanisms. The Bidermann family, father and son, built a number of small table-top spinets which were capable of being played by hand or from a pinned wooden barrel driven by a fusee-wound clockwork motor. King Henry VIII possessed one of these, which is very accurately described in the inventory of his many musical instruments prepared upon his death in 1547. As described, it bears a very strong resemblance to one of these spinets preserved at Dean Castle in Kilmarnock, Scotland.

During this time, the mechanical organ developed along three different lines at once. First, there was the organ-playing clock, essentially a product of the Black Forest area of Southern Germany, later spreading to Amsterdam. Mozart, Haydn and Cherubini were among the many who wrote music specially for these timepieces.

Next came the so-called 'orchestration' organ, in which tonal variety was overtly encouraged with the provision of imitatively-toned pipework which could represent brass, woodwind and percussion accompaniment of the orchestra. With later development, these became veritable doyens of mimickry and were truly mechanical orchestras. As well as becoming respectable concert performers, they also blossomed into the dance organ, the show organ and the fair organ.

The third variety was the gradual development of the small chamber barrel organ operated by turning a handle. This also moved in several directions, on the one hand becoming a most popular instrument for use in the less-well-off country churches where human organists were, if not exactly plentiful, almost certainly musically unreliable. It also became a domestic instrument suitable for entertainment, with interchangeable barrels offering an assortment of dances and minuets for light-hearted occasions, some marches, voluntaries and less frivolous popular songs for after-dinner use, and a barrel of hymns for family worship on the Sabbath. And finally it moved out into the streets and became the street organ.

Street music as dispensed by the street organ and, later, its more penetrating stablemate the street piano, has been much maligned in recent times. Admittedly *Punch* and Gilbert and Sullivan were among the many contemporaries who helped its ridicule. Yet a conservative estimate concerning the musical awareness



Left: Disc-playing musical box made in Leipzig by Polyphon Musikwerke in 1892

Above: A 17th Century interpretation of the way in which a water driven barrel organ operates.

gardens of the Villa d'Este at Tivoli which were said to date from 1549. However, Kircher's drawings of these instruments (also subsequently copied by the plagiarist Schott 14 years later) were themselves taken from a much earlier drawing attributed to the Neapolitan physician and polymath Giovanni Battista della Porta, who published a book called 'Magia Naturalis' in 1569.

These water-powered organs were immensely popular and extremely fashionable in their time. Among the most celebrated was the instrument in the grounds of the house of Cardinal Pietro Aldobrandini, near Frascati. It functioned by having water spill continuously on to a water-wheel 'with great force', as related by Montaigne in his 'Journal de Voyage' (written in 1580-81 but not published until 1774). As this wheel turned, connecting rods from a crank pumped air using bellows in order to provide wind pressure to sound the pipes. Music was arranged in the form of pins projecting from a wooden cylinder, also turned from the wheel. Each pin as it rotated past a fixed point lifted a lever which in turn opened a pallet valve to a pipe in the windchest. One such water organ survives today in the famous mechanical theatre at Hellbrunn, 8 km from Salzburg. But this is not more than a few hundred years old.

It is at Salzburg that the oldest mechanical organ in the world

2000 YEARS OF RECORDING MUSIC

of London in the 1870s was that the barrel organ and barrel piano were responsible for disseminating over 85 per cent of the music the average person heard. That, surely, must count for something. Even more when it is remembered that the staple diet of these organs (an 'in' joke; for the music was represented as a series of pins and staples in the barrel) was contemporary opera. How many, one wonders, received their first taste of Mascagni, Verdi and Bellini courtesy of an Italian organ grinder?

As regards the barrel organ in church, this was almost entirely an English prerogative and, apart from one or two isolated examples in Germany and France, was found only in the English country church scene. From their inception in the late 18th Century to their final supersession towards the end of the 19th, many small chapels and churches across the land relied solely upon psalmody provided by such an instrument, sometimes picturesquely termed a 'singing engine'. Those churches still fortunate enough to possess old barrel organs are now having them restored and put back into occasional 'service'; there are already quite a few.

The world's biggest chamber barrel organ deserves special mention, even if only because so much has been written about it over the century and more since last it was heard—much of it very inaccurate! Not only was this giant a mechanical triumph, it was the only concert organ available for public recitals in London for more than a quarter of a century. It was housed in the Great Room of its builder's premises—Flight & Robson—at 101 St Martin's Lane, and was first unveiled in 1817. Called the *Apollonicon*, it measured 7m wide and was capable of being played manually by no fewer than five organists at once, seated in a row across the front. When these masters were not available, or while they went out for tea and biscuits, it could be operated automatically by the simultaneous slow revolution of three huge wooden barrels which together acted on no fewer than 250 keys for mechanical performance. Organ stop selection was accomplished from the barrels and the entire thing was driven by the muscle-power of three men heaving on a vast crank at the back. Later this was replaced by a water-motor, but because London's water supply even then was not all that plentiful, a steam engine subsequently provided rotary power.

The barrel as a basis for pre-programmed music was all very well, but it tended to be a cumbersome device for use in these giant organs. When, in the early 1890s, an Italian building fair-organs in Paris discovered a way of applying the perforated cardboard system of the Jacquard loom to serve as an organ-music programme, the organ-building business was revolutionised. His name was Gavioli, and thanks to him it became possible to provide more portable and robust musical programmes for mechanical instruments.

What happened then was that the whole world of mechanical musical instruments exploded into a flurry of inventiveness. Between the mid-1890s and the final days of self-playing instruments—around 1930—they reached such a peak of perfection that today there is a thriving industry preserving them, collecting them, selling them and, yes, even recording them!

The first halting attempts at playing a piano mechanically gave way to pneumatic systems and, in the 1890s, along came the first of a strange kind of mechanical multidigit monster called a piano-player. This device was a cabinet, into the top of which was threaded a roll of perforated paper. The cabinet was then pushed up to the keyboard of an ordinary piano so that the row of felt-covered fingers which protruded from the back of the cabinet aligned with the keys, and then pedalled at foot treadles at the bottom of the cabinet. The result, depending on the artistry of the operator and the mechanics of the piano-player cabinet, was tolerable.

Next came the building of the piano-player's component parts into the piano itself. So was born the player-piano, an instrument which did more to popularise music of the classical idiom than any other before or since. People from one end of the country to the other who couldn't read a note of music suddenly found that they could 'peddle' passable interpretations of McDowell, Chopin, Beethoven and Schumann. Those who were non-musical spent hours learning sensitivity with ears and feet while seated with their hands under their bottoms.

From the foot-operated player-piano, which incidentally is now back in vogue and an object once more to be cherished, the principle was developed into the extremely sophisticated reproducing

piano, whereby a famous pianist could actually *record* his performance on to a special piano-roll. This registered not just the notes, but the dynamics of each note, the soft and sustaining pedal operation; in fact the pianist's every nuance. When played back on a piano equipped with the necessary pneumatic hardware, the result is an actual performance by the recording artist. Pachmann and Hofmann, Paderewski and other famed pianists of the past available at the flick of a switch—on your own piano!

Along with the player-piano was developed the player reed-organ. Of these, the Aeolian Orchestrelle is my own particular favourite. Its tonal capabilities, just from a roll of hole-punched paper, are almost endless. Then came the player pipe-organ and, finally, the reproducing pipe-organ which could perform as the reproducing piano and capture the performance of an accredited master organist.

I said earlier that just about all musical instruments had at one time or another seen mechanical variants. These include violin, banjo, accordion, harp, trumpet, mouth organ, drum, triangle, saxophone, viola—and even the mute master of them all, the conductor who stands jerkily on the front of a fair-organ.

All these instruments had recognisable sounds. The Mills *Violano-Virtuoso* is undoubtedly a talented fiddle-player fiddling away, and the Wurlitzer *Harp* is a harpist solemnly plucking a sad melody. But one instrument of mechanical music did not have a manual counterpart, and hence had a sound which was unmistakably the trademark of the machine. This was the musical box, which made its music from the interaction of a pinned brass cylinder with a comb-like line of carefully-tuned tempered steel teeth.

The first musical boxes were produced in the Vallee de Joux, Switzerland, as the 18th Century came to a close. It was not, though, until around 1815 that the instrument took on its accepted form and entered the realm of marketable musical instruments. Not until after the Great Exhibition of 1851 did the musical box begin to enter production, and even at this late stage it was only made in small numbers by craftsmen working mainly in the Geneva area, and in France—where a thriving musical box industry opened up close to the Swiss frontier.

These early musical boxes were, musically speaking, extremely fine interpreters of music as regards both style and arrangement.

In the mid-1880s, the disc-playing musical box entered the scene from the direction of Germany and soon Leipzig was producing them in large numbers for export all over the world. They scored over the costly cylinder musical box with its limited repertoire of perhaps six or eight tunes in that, like the later gramophone, it was possible to add extra tunes by the simple expedient of buying a (perforated metal) disc.

Faced with competition on such a scale, the Swiss increased production—with a consequent lowering of quality—until finally they decided to try to compete on equal ground. The Swiss began making disc musical boxes alongside their traditional cylinder machines.

But times were changing and, as the present century completed its first decade, it became obvious that the public no longer found the musical box in any shape or form attractive. The gramophone, with its unique ability to reproduce that most elusive sound of all—the human voice—had captured the imagination of everybody. By the end of the First World War, the industry was dead.

How should one rate this sort of recorded music? The wise old men of music have been accustomed to smile tolerantly at the mention of mechanical music, and then go on to other things. Recently, though, they have begun to discover what I have known for many years—that the very early instruments are superb interpreters and can perform today as well as they did when they were first made. Much music, long lost to the repertoire, is here with us today. In March this year, Verdi's opera *I Masnadieri* received its first performance for 130 years. I have long admired the music, for I have it on a musical box made the same year as its premiere in 1847. And an organ has been found in Holland, its barrel pinned with a piece of Mozart which nobody had ever previously heard of.

There is, though, one curious thought on a purely technological level. These instruments seem more jealous of their special characteristics of recording than more modern techniques. Is it a question of 'never shall the twain meet'? It remains a fact that the modern recording engineer is seldom able to capture faithfully the sound of a mechanical musical instrument. ■

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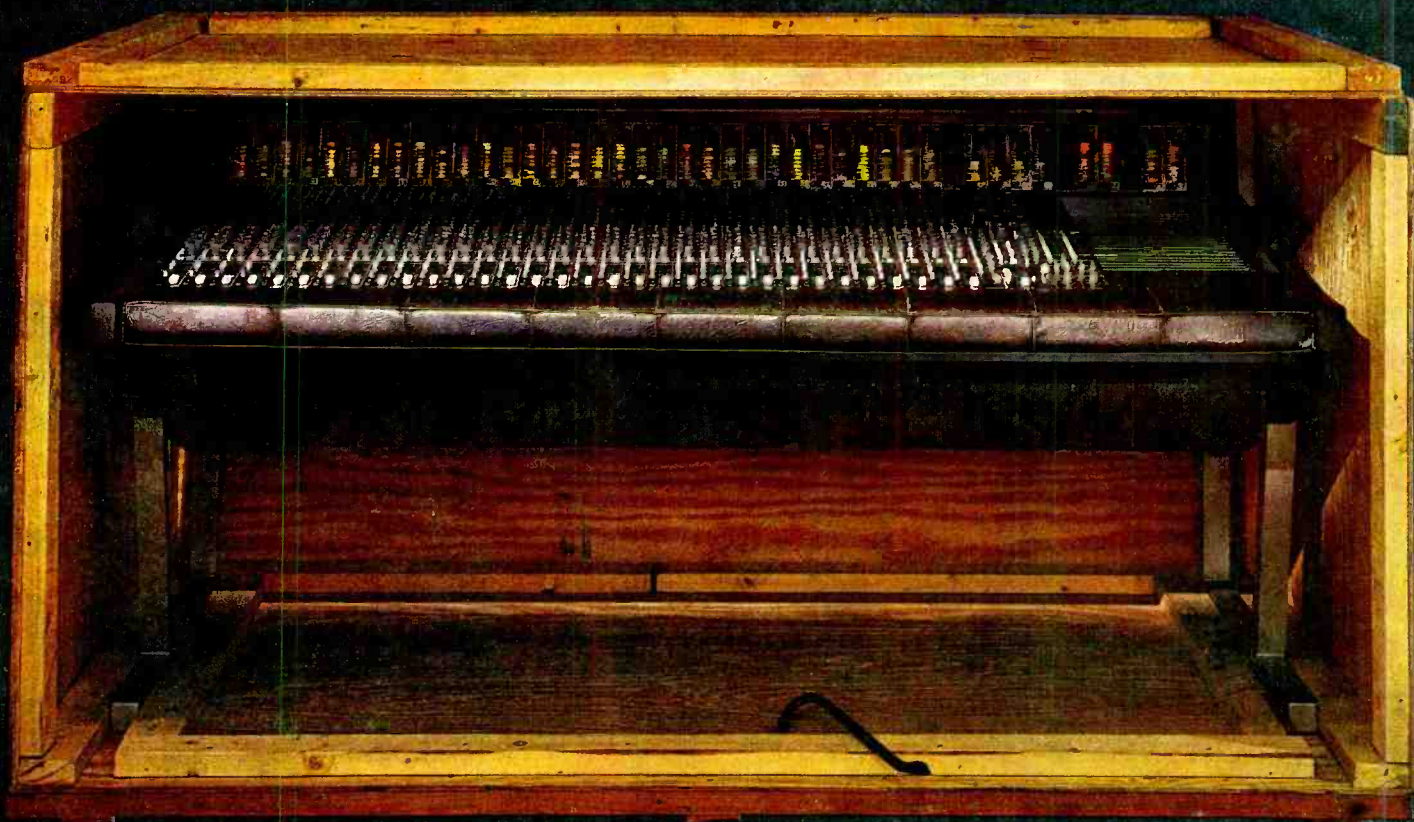
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When dogs could sing

Melvin Harris

Was it easy recording in those old acoustic days? Not on your life! The equipment may have looked simple, but it took vast amounts of knowledge and experience to make a worthwhile recording. That's why early engineers locked their recording heads away in steel cabinets; partly for safety, but mainly to keep them away from prying eyes. Their precious knowledge was very hard won.

The original concepts

SOUND recording started long before 'talking machines' were invented. It began with the *Phonautograph* of Edouard-Léon Scott de Martinville. The standard references to Scott credit him only with the invention of a device meant solely for use in physics laboratories—but this is a misunderstanding. Scott had far grander ideas, as his statement to the French Academy of Sciences shows. His little-known paper of 1857 says:

'May we hope that the day is near when musical phrases flowing from the lips of a singer will record themselves . . . upon an obedient sheet of paper, thus leaving an imperishable record of those fleeting melodies? Will it be possible to place between two men in a sound-proof room, an automatic stenographer which will preserve an interview down to the tiniest details . . . ? Will it be possible to preserve . . . the speeches of our eminent men and our great actors, who now die without leaving behind the slightest trace of their genius? It is my belief that the principle has been found. There still remains the difficulties of its application. These are no doubt great, but not insurmountable—thanks to the present state of our physics and our mechanical arts.'

His paper then went on to describe a machine capable of recording air-borne sounds, though not of replaying them.

This theoretical paper was soon followed by a practical prototype. It was a beautifully simple affair, but efficient for all that. At the narrow end of a megaphone Scott had stretched a tough

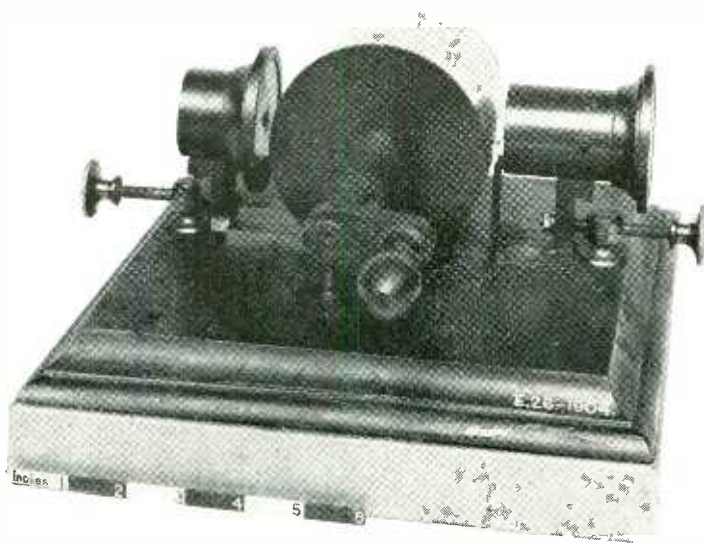
membrane of skin used by goldbeaters. Fixed to the centre of the membrane was a light rod that lay parallel to it and rested on a pivot at the edge of the diaphragm. At the end of this rod, and fastened to it at a right-angle, was a stiff hog's bristle. This megaphonic recording head—for that's what it was—rested between supports on a baseboard. In front of the membrane was a brass drum mounted on an iron axle, cut with a screw thread. The axle was supported in bearings carried on angle-brackets, and when it was cranked the drum revolved and the lead-screw moved it from right to left.

To record, Scott fixed a sheet of paper around the drum and blackened its surface in the flame of a wax taper. The megaphone was then adjusted so that its bristle just lightly touched the sooty paper. While the handle was turned, speech or music was directed into the horn, and as the diaphragm vibrated the bristle left behind white wavy lines that were, in fact, the world's first sound tracks. But they were only microscopic in depth and quite unable to guide a playback stylus. Yet, despite that, they rank as the first sound recordings. And it's intriguing to realise that it's possible, by using modern techniques, to hear sounds recorded *before* 1877. For in a number of museums and institutes there are phonautographic records made well before the birth of the *Phonograph*. Whether it would be worth the effort though, is open to question, since Scott's machine was only used by physicists who wished to study the nature of sound waves, using visual techniques. Their paper records may be of little else than repeated vowel sounds or consonants.

Despite Scott's failure to take the next step and create a playback machine, his *Phonautograph* was of major importance. It was used by Alexander Graham Bell in the researches that led up to the telephone—and in that way it led indirectly to the *Phonograph*. It then served as an inspiration to Charles Cros, who finally saw how Scott's device could be converted into the *Gramophone*.

Cros was a French poet and noted as an irrepressible reciter of comic monologues. He was every inch a typical Bohemian, so in the eyes of the business world he was hardly the type to be taken seriously. Yet Cros had an astonishingly fertile and original scientific outlook. As early as 1869, he described a method of 3-colour photography; and it was his later researches in that field that led him to see how photography could give life to those mute *Phonautograph* tracings. Once he hit on the solution he wrote his ideas down and tried to find backers for his invention—but hardly anyone would listen. And no-one was prepared to even advance the small sum necessary for a provisional patent. The one man who did take him seriously was the renowned Parisian clockmaker Bréguet, who studied Cros' manuscript and offered to make the prototype—but not on credit; it was 3000 francs in advance please. Since Cros had hardly a few cents to spare, that was the end of his dream of the *Paléophone*, as he called it. So he simply sealed his papers in an envelope and deposited this with the French Academy of Sciences. This was on April 30 1877, six months *before* Edison made his first *Phonograph*.

Edison Phonograph



His solution to the problem first posed by Scott was brilliant: the recordings should be made on glass discs and photo-engraved onto metal. But let Cros speak for himself:

'My process involves obtaining the tracing of the to-and-fro movements of a vibrating membrane, and afterwards using this tracing for the purpose of reproducing the same vibrations with their intrinsic relations of time and intensity, either by means of the same membrane or another equally adapted to reproduce the sounds and noises which result from this series of movements.

'We are, therefore, concerned with the transformation of an extremely delicate tracing, such as that obtained with a delicate stylus grazing a surface coated with lampblack—to transform such a tracing, I say, into . . . indentations sufficiently rigid to serve as a guide for a flexible spring that will transfer its movements to a sonorous membrane.

'A light stylus is connected to the centre of a vibrating membrane; it terminates in a point . . . which rests upon a glass plate blackened by a flame. This plate is attached to a disc capable of the double movement of rotation and rectilinear progression. If the membrane is in a state of rest the point will trace a simple spiral; if the membrane vibrates, the spiral traced by the stylus will undulate, and these undulations will exactly represent all the vibrations of the membrane, with their relative duration and intensity. This undulating spiral, traced upon the transparent plate, must now be reproduced by means of the photographic process which, in fact, is well known. It is converted into a line of similar dimensions in depth . . . in some rigid material, tempered steel for instance.

'This done, the rigid record is placed in the machine, which sets it turning and moving forward with the same speed and movement as that previously given to the recording surface. A metal point is held by a spring in the furrow. The opposite end of the rod which holds this point . . . is fastened to the middle of the membrane adapted for reproducing the sounds. Under these conditions the membrane will be set in motion . . .

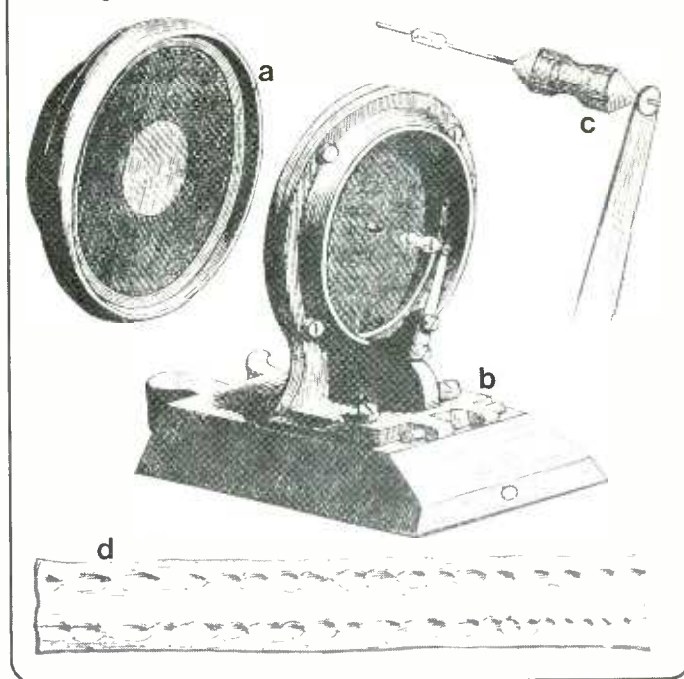
by the tracing, controlling the pointed stylus. The membrane then receives impulses exactly similar in duration and intensity to those to which the membrane was subjected in recording.'

Cros had many other things to say on the subject of sound recording, including a forecast of recording on tapes. His ambition was to see the finest music reproduced without breaks—as in the concert hall—for Cros envisaged that his machine be used as an entertainment device. (Incidentally his idea of a fixed recording head and a turntable that both rotates and passes *under* it, may seem rather clumsy. But it was just this arrangement that was used by Berliner in 1877, and it was later used on all the HMV and Columbia recording lathes for over 40 years.)

Cros never realised any of his plans, but they were of supreme importance, as we'll see later. However, while our poet dreamed, Edison acted—though his reasoning and practice owed nothing to Scott or photography; Edison's inspiration came from telegraphic experiments. In his search for a way to record Morse messages he made a machine that allowed a 'sounder' to impress its movements onto a revolving and grooved paper disc. Then it struck him that a similar machine might be able to record the movements of a telephone diaphragm and in that way store speech. His first attempts to record speech date from July 1877. But it wasn't until November 17 of that year that the first details of this work were released. It was then revealed that sounds had been recorded on strips of paper coated with paraffin wax. These strips had been drawn beneath a stylus fitted to a telephone diaphragm, and as the diaphragm vibrated, so the stylus moved in and out and indented the wax. When the strips were drawn under a second diaphragm, fitted with a blunt stylus, crude sounds were heard. These could be regarded as faint caricatures of the originals—provided a great deal of imagination was used. They did show, though, that some basic principles had been uncovered.

Out of those rough experiments came the tin-foil *Phonograph*, the world's first 'talking machine'. It was a recording and reproducing machine in one, with separate heads used for each function. The recordings were made on sheets of stout tin-foil wrapped around a 4-inch diameter brass drum. The drum was cut with a thread of ten-to-the-inch and was mounted on a lead screw, threaded to the same standard. A crank handle at one end served to rotate the drum and advance it at the same time.

a Diaphragm (Stroh)
b Complete recording/playback head (Stroh)
c Details of stylus (spring mounted and rubber dampened)
d Enlargement of tinfoil Hill and Dale recorder



The recording head was so adjusted that the stylus depressed the tin-foil into the groove underneath it. When speech or music was directed against the diaphragm, the stylus moved in and out, indenting the soft foil with a hill-and-dale soundtrack. It was an indentation method pure and simple: no material was removed by the recording act. But as you can imagine, this was a grossly insensitive process, full of distortions. My own experiments with a tin-foil recorder show that it needs great power and ultra-clear articulation to make an understandable record. This was admitted by Edison himself in his later years, when he wrote: 'It was a very imperfect machine and only reproduced a caricature of the human voice . . . no-one but an expert could get anything intelligible back from it.'

Because of these difficulties even the experts had to be cunning at their public demonstrations. They wisely recorded only simple, well-known phrases or verses. Then even if the results were outlandishly faulty, the listeners would still imagine that they'd understood the machine's utterances! In doing this the demonstrators were true to tradition—after all, Edison's first recorded words were nothing more weighty than '*Mary had a little lamb . . .*'.

Despite all their shortcomings the tin-foil machines were lovingly modified and perfected. In Britain, Augustus Stroh fitted a tin-foil recorder with a weight-driven clockwork motor controlled by a fan-style speed governor, which eliminated the erratic speeds inseparable from hand-cranking. Edison himself used clockwork driving mechanisms at one time; and he even applied these to tin-foil *disc* recorders.

The whole tin-foil period, though, was very short-lived. Such machines had a passing novelty vogue that was over in two years, and Edison had better things to do with his time; as a result he virtually abandoned his invention. In fact, he's on record as saying: 'I myself doubted whether I should ever see a perfect *Phonograph* ready to record any kind of ordinary speech, and to give it out again intelligibly.' But if Edison had doubts, others hadn't, for by February 1880 Alexander Graham Bell and Sumner Tainter had sent details of their new researches in recording sound to the Smithsonian. By October 1881 they were able to deposit a new type of recording machine with the Smithsonian. It

WHEN DOGS COULD SING

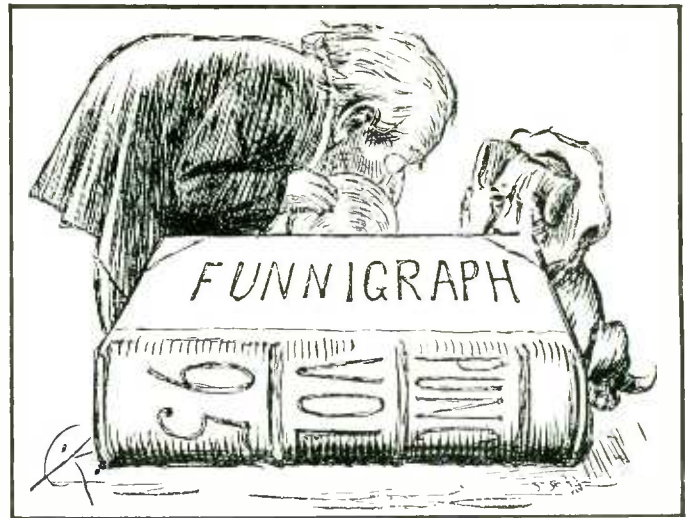
was in a sealed box that wasn't opened until 1937, but it showed that they were the first to *engrave* sound tracks in wax. These first trials were made on a tin-foil recorder with its grooves filled with beeswax, which worked well and gave encouraging results. By 1886, Bell and Tainter were ready to patent machines that recorded on discs, cylinders or wax-coated paper bands; they called their inventions *Graphophones*. The *Graphophones* discarded the heavy metal diaphragms initially used for recording. Instead they used mica diaphragms from 6-12 thousandths-of-an-inch in thickness. Their recording styli were made from 16-gauge wire, shaped, 'at the operating end like an ordinary round-pointed turning tool, with the cutting edge preferably shaped to cut a groove of curved rather than of a V-shaped section'. This curved section was preferable because the *Graphophones* stayed with the original hill-and-dale idea. Of these patented machines only the cylinder version was ever manufactured commercially, production beginning in 1887. The recordings were made on wax-coated cardboard tubes, 6in long and 1 $\frac{3}{4}$ in diameter. The coating was made by mixing 40% beeswax with 60% paraffin wax, and this mixture was able to take 160 grooves-to-the-inch. These were cut by a recording head that was carried *across* the cylinder by a lead screw.

Those commercial *Graphophones* weren't around for long, though, because Edison soon met their challenge with a new *Phonograph*. His 'Perfected' machine engraved a hill-and-dale track on wax, just like the rival machines. But it was a bolder cut, gained by only cutting 100 grooves-to-the-inch. The wax masters were cylinders of *solid* wax, 4in long and 2 $\frac{1}{4}$ in diameter (wax coatings on cardboard had proved to be very susceptible to cracking). The composition of Edison's wax resulted from his usual empirical researches. He mixed the softish paraffin wax and beeswax with from 10% to 50% of the very hard Carnauba wax, which improved the articulation and loudness of the recording and gave results that were well in advance of Bell and Tainter's. Edison's recording heads were also superior. They used mica diaphragms (later thin glass)

Development into entertainment

After 1888, Bell's Volta Laboratories retired from talking machine research—most of the subsequent bright ideas now came from Edison. But there were some independent thinkers, including Professor Edwin Huston, one of the founders of the Thomson-Huston Company, who had many interesting suggestions to make. For one, he advocated using the movements of a silvered telephone diaphragm to make a recording *photographically*, 'since a pencil of light . . . is destitute of weight and therefore offers no resistance to the free movements of the telephone diaphragm'. He also suggested recording on solid discs of wax that were heat-softened at the time of recording and observed further that 'instead of heating the record . . . a local source of heat may be used to heat the stylus. This heat may be ordinary heat or of electrical origin.' So there we have the solid wax disc and 'hot-stylus' concepts clearly put forward as early as July 1888, *and* in connection with the *Gramophone*. For by then Emile Berliner had demonstrated his disc recording and reproducing machines, but they were only his in the sense that he'd had them made and nursed them through their teething troubles. The ideas behind them were those of Charles Cros. All the vital details of Berliner's patent are found in Cros' writings—the making of recordings on smoke-blackened glass discs is the Cros method, as is the use of a fixed recording head and a traversing turntable, plus acid etching of the zinc plate that forms the playback disc. And again, so is the lateral trace; as Cros had pointed out in 1878, this method was superior to the hill-and-dale track, because resistance was minimised and distortions were to a greater extent avoided. Yet, despite the inherent advantages of lateral recording, Berliner's first efforts caused little distress in the phonograph camp—for almost ten years the cylinders were supreme.

In many ways, though, cylinders made recordings very inflexible, for the design of the machines could not be altered easily. This meant that it wasn't possible to increase playing times *without*



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$\frac{3}{4}$ in diameter and three thousandths-of-an-inch thick, which were gripped at the edges between soft rubber rings, and fitted with ground and polished sapphire points.

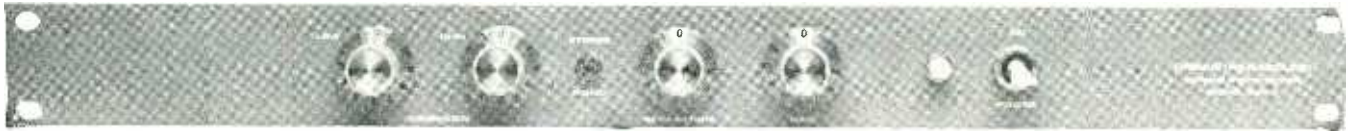
That Edison's machine *was* the finer of the two was conceded when the *Graphophone* and *Phonograph* interests decided to end competition and litigation and adopt the 'Perfected Phonograph' as the sole machine on the market. Though to save face the Bell people had the machine styled as the *Phonograph-Graphophone*—Bell and his associates had always seen their machine as a dictating device and little else. At first Edison was tempted to think the same way, but he soon realised that it did have a future as an entertainment machine and his music cylinders began with 14 flute solos cut by Eugene Rose on May 24 1889. His studio was simply the corner of one of his workshops!

packing more grooves on to the wax. But this led to reduced volume and much heavier wear and tear. By contrast the discs could easily increase in size to give longer times. They could even be made twin-sided—at a stroke doubling the time! So all the real advantages were theirs . . . Now it's true that Edison's later use of *celluloid* cylinders finally solved the wear problem, but that didn't happen until 1912. And by then it was just too late!

But whether cylinder or disc, the early recording studios were all rigged out along the same lines. They were painfully bare rooms, just big enough to take 30 or so people—provided they didn't need room to wave their arms. And the recording equipment was housed in a cramped booth set up against one wall. Projecting from the booth was the recording horn or horns. Some extracts from a manual of 1897 will give a good idea of the problems faced by pioneer recording engineers:

'Only the clearest and most brilliant glass diaphragms are chosen for recording . . . It is necessary to get glasses that will respond to the peculiarities of a voice, or the qualities of an instrument, to make a faithful record . . . It may be said that different singers rarely present the same conditions to the record-maker, and the same singer presents different conditions during different stages of his work. To meet these changes new diaphragms are required or a different position exacted with respect to the horns . . . speaking generally, the singer is placed about a foot-and-a-half from the central horn, and the piano, if an upright, at right-angles to the line of the horns, preferably raised so that the horns will centre in the middle of the sounding board . . . Never use the loud pedal . . . in the case of orchestra or band work, the performers should be arranged so that those instruments that carry the melody are not subordinated to the secondary parts . . . heavier glasses are used for band and orchestra work and for loud solo instruments, while thinner glasses, gauged to the condition of the singer's voice, are invariably required in vocal work. A heavy baritone voice is best recorded by a glass that measures about 6 $\frac{1}{2}$ thousandths- 60 ▶

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of-an-inch in thickness, in combination with a rubber horn connection about an inch-and-a-half in length. This is a very sensitive glass, and is necessary in order to record faithfully the weaker tones of the lower register. The average tenor voice needs a thinner glass and on the open vowels the singer must be trained to withdraw from the mouth of the horns to avoid blasting. Heavier glasses are used for bands, measuring from 8 to 9 thousandths-of-an-inch. Even thicker diaphragms than these give excellent results, for absolute firmness is essential to prevent over-vibration . . .

'Assuming that the glass is right, variation in the size of the receiving horn will often bring the record to the required strength and quality. In general the volume and tone is thinned by decreasing the diameter of the horn, and made oral by increasing the width at the bell.

'A variation in the length of the rubber horn connection will soften the tone, and sometimes accomplish what is sought when a change of glass will not, provided a glass has been found which gives perfect mechanical results but is deficient in musical qualities. Economy cannot be practised in the use of glasses when efficiency is desired.'

The above advice applied equally to both cylinder and disc studios. As workplaces they differed little, except that before 1900 cylinder engineers had to run a number of machines at each take—sometimes up to six at one time, because there was no moulding system in use yet. Copies of the cylinders were usually made pantographically on duplicating machines, which were double-mandrel affairs—that's why the act of duplication became known as 'dubbing'. There was one other slight difference, however. Cylinder studios were kept at a higher temperature, because at that time they were the only recordings cut in solid wax blanks. The gramophone was still encumbered with the need to record onto zinc blanks that were thinly coated with a softish wax compound. The recording stylus cut through this wax, laying bare the underlying metal, then an etching bath of chromic acid bit into the bare zinc and gave a groove deep enough for direct replay or for mastering. But this presented two problems: first the acid tended to cut into the *sides* of the grooves; secondly the zinc plates used were far from pure and, unfortunately, only 100% pure zinc will etch at a uniform rate. In practice the tiny imperfections in the metal etched out at different rates, which meant that the grooves contained minute nooks and crannies that showed themselves as a heavy surface noise.

Solid wax disc-blanks were the obvious answer—but here there were patent problems because an astute gentleman who'd worked with Berliner had applied for a patent on ' . . . cutting or engraving a record groove of uniform depth, by means of the lateral vibration of a suitable stylus, upon a disc of waxlike material and then forming a matrix thereon by electrolysis, from which duplicate records are made by impression . . .' This patent, applied for by Joseph W. Jones on November 19 1897, led to much bitter conflict between rival talking machine companies. The whole story is



too complicated to unravel here, but this conflict helped to hold up disc development until at least 1900. And yet it needn't have been like that, for Professor Huston had recommended the use of solid wax blanks and the heated stylus to Berliner some nine years before Jones made his move. It was simply Berliner's clumsy way of thinking and working that allowed others to steal a march on him.

Once the courtroom battles were over, however, solid wax blanks soon ousted the old zinc plates. From then on the quality of *Gramophone* discs rose dramatically. But in noting the entry of the wax masters, one man should be remembered above all, and that's Charles Batchelor. When he was assistant to Edison he began the production of the synthetic sapphire that became essential for recording styli, and for the shaving blades used to give a mirror surface to recording blanks.

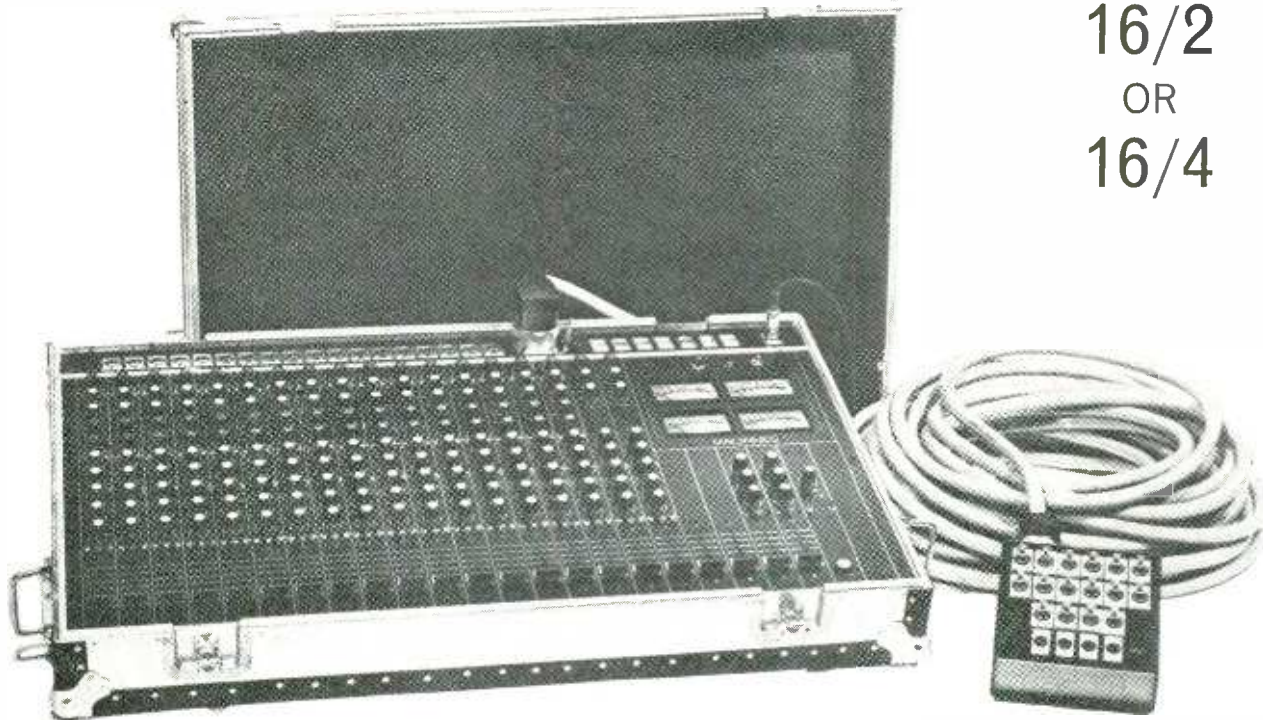
Along with the new blanks came new disc sizes. The old standard of 7-in was gradually discarded and 10 and 12-in discs took their place. This gave a maximum playing time of about 4½ minutes for the largest size, which meant that artists didn't have to tackle works that were *too* mutilated. It also meant that the recording studio became more appealing to some artists, especially to the glamorous creatures from the world of Opera. But this brought its own problems as Percy Packman, one of the early recording engineers, testified in 1905:

'It is amusing to see the doubtful look which appears on the face of a singer as he comes up against the recording machine for the first time. The instrument, of course, is veiled, and all the singer is aware of is the recording horn protruding for all the world like some grim Long Tom. Some lady singers need a lot of persuading, and get into position as gingerly as if they were facing a veritable infernal machine. Immediately behind the singer is the back of the piano, and to get a fairly loud accompaniment it is necessary for the pianist to thump with a vigour which is hardly classic. The singer standing right in front of the sound board is almost deafened until the strangeness of the situation wears off.

'It needs a great effort on the part of the singer to excel in producing a fine record even if he possesses a naturally good recording voice . . . For instead of a sea of expectant faces, he sees nothing but a drawn curtain and the lifeless tube which is to convey the song behind the mysterious arras. In this lies one of the most important features of the recorder's art; for the time he must act as conductor and audience.

'I have just returned from a tour in Italy, where I successfully made about 500 disc records for the Neophone Company. Among the people who sang were some of the finest of Italy's world famous artists, few of whom knew anything about recording . . . I had many anxious moments, together with not a few amusing episodes. The initial efforts of Signor —, for instance, who eventually proved one of the most successful singers of the tour, afforded us much amusement. His first and second attempts were failures, although the faults were slight, and I could see that the singer was getting much upset over these 62 ▶

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repeated disappointments. However, he took off his collar and coat . . . and coming up again with splendid determination succeeded in producing one of the best masters I have had the pleasure of recording. It was lucky for me that this last effort was successful. Had it been otherwise I should not have dared to face the Signor, who had worked himself into such a passion . . . that by the time he had finished, the perspiration was running down his face in streams, and he looked as though he had been engaged in a life and death struggle.

"I had my hands pretty full . . . and was compelled to watch the novices as a cat watches a mouse. Most of them found it very difficult to sing without acting, and a number of pieces were spoiled through the singer, in a moment of forgetfulness, falling back to put in some gestures. One lady, "when the fit was on", sent the recording horn flying, and smashed my diaphragm—of course an extra special one—but I was obliged to look pleasant.

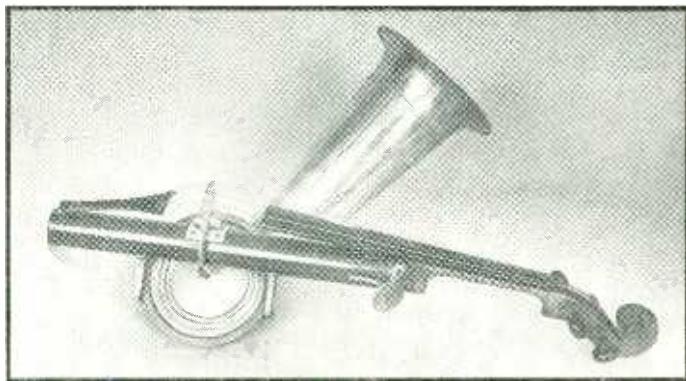
"I tried a tenor and the singer chose a selection from "Pagliacci". I soon found that something was wrong. I could hear the diaphragm throwing the voice back and labouring fearfully, and on examining the disc, I found that the walls of the track, particularly on the high notes, were broken down. Alas for my special London diaphragm; the tremendous power of the singer's voice at the climax of the song had shattered it. I had made many a good tenor record with it, but I now realised that the ideal diaphragm for *Sing me to Sleep* was useless under the strains of a fiery Italian singer in operatic tragedy. I tried less sensitive diaphragms with slightly better results, but at last had to give it up and experiment for a day or two before I succeeded in making up recorders of the requisite sensitiveness . . . I had expected to meet with many of the usual difficulties in recording, for the slightest change in atmospheric and other conditions sometimes makes vast differences in results. But we were more than satisfied with the subsequent successes."

Packman later goes on to notice that some Italian wind instruments were better suited to recording because of their different shapes. This brings to mind Augustus Stroh who grappled with this problem on behalf of the string players—he'd seen how difficult it was to register the violins in ensembles, and had guessed that this was due to the diffuse nature of their sound. As he saw it, they needed to be able to *beam* their tones towards the recording horn, so he set to work and created a special instrument meant only for the studio. This was the Stroh Violin, which kept the neck and strings of the standard fiddle, but eliminated the elegant body. Instead a thick rod supported a large metal diaphragm (based on his phonograph experiments) that fed its vibrations into a pivoted aluminium horn. When played, the violin bridge carried the string tones to the centre of the diaphragm and the music poured out of the horn, which was then angled towards the recording horn, in that way focusing the sound.

Packman's account ends with details of a unique recording session. It involved:

. . . the recording of the first 20-in record. It happened that the leading tenor of the Madrid Opera was on a visit to Milan, so we determined to get him to sing a few songs for us . . . I followed his trial selection closely, and heard every note

Stroh violin



repeated perfectly while it was being recorded, and the singer was so pleased . . . that he was as eager to sing as we were to hear him. But he had no idea of a time limit, so he chose one of his favourite pieces, *Ciel e Mar* from "La Gioconda", a truly wonderful piece, but about seven minutes long. I explained that a song of such length had never been recorded, but as the Neophone Company had lately perfected a device for making 20-in records, eight to ten minutes in length, we might now put it to the test. Appreciating the importance of what we were about to attempt, I exhorted both singer and pianist to put their heart and soul into the effort, which, if successful, would assuredly eclipse anything yet accomplished. "Gentlemen", I said, "I'll break a dozen bottles of champagne with you if this comes off." Well, it did come off, and that night we toasted the event of the first 20-in record in great style."

But with all their well-tryed skills no recording engineers could overcome the great defects of the acoustic method—the compressed dynamic range and limited frequency response. The top frequencies were about 2.2 kHz and there was hardly anything below 100 Hz; in between everything was delightfully 'peaky'. Because of these defects the timbre of instruments and voices was never registered accurately, and the performances themselves lacked the balance and flexibility that can be won in the all-electric studio. However the heavy surface noise usually associated with this era was not inherent in the recording process. Anyone who has ever heard the re-issues of 'Golden Age' vocals, sponsored by the British Institute of Recorded Sound, will already know this. These discs were pressed by EMI in vinyl and are remarkable for their smooth, velvety background noise. Yet no doctoring has taken place—they are simply straight pressings from 78 rpm masters.

When we talk about the 78s of the acoustic period it's pertinent to remember that we're really using a piece of popular shorthand. For there was no standardisation of disc recording speeds before the changeover to electric recording, and even then Erunswick and Columbia stayed with 80 rpm for sometime. Several of the first 5-in 'Berliners' ran as high as 120 rpm, while the later 7-in discs were recorded at speeds varying from 70 to 76 rpm. After the gramophone boom of the 1900s each company did as it pleased; Odeon, for example, recorded at speeds ranging from 72 to 86 rpm (there were even a few at 60 rpm). This appears to have been done in order to fit movements of suites, concertos, etc onto their 10½-in sides, which could explain why different speeds appear on both sides of many of their pressings. The highest speeds of all, though, were reached by the Pathe discs—they went up to 100 rpm, and were exceptional in other ways as well. Their discs were cut from the centre out, and had hill-and-dale tracks. The hill-and-dale or 'phono-cut' track was mainly a French speciality, although several British firms used it at times. In fact, Neophone and Marathon used nothing else, and Edison-Bell tried it for a few years. About 1910, they were phono-cutting commercial discs and even offered this service for 10-in private recordings. For a mere seven guineas you could make a fine-pitch phono-cut disc, while for five guineas you could make a coarse-cut phono-disc or even a standard needle-cut disc. These prices included hire of studios, cost of recording engineer and pianist, all manufacturing charges and six prints. Those were the days—for some at least.

Looking back on those early days it's clear that all the major developments in recording techniques had been made by 1905. (It's true that there was a much later attempt by Edison to introduce microgroove discs, cut with an astonishing 420 grooves-to-the-inch, but this led nowhere.) After 1905, most of the inventive energy was devoted to mere tinkering; there were countless curious attempts to harness more energy for recording, including Edison's 200 ft long recording horn and T A Middleton's patent recording studio. The latter boasted a giant horn-shaped auditorium that terminated in a recording booth. But not even these extreme methods could revolutionise acoustic results. All the finest records were still made with horns that were seldom more than 2ft at the mouth and 5ft long. The position until 1925 was remarkably static—this is well-illustrated in Wilson and Webb's book of 1929, which show photographs of two Columbia mechanical recording heads. One is dated 1911, the other 1926, but for all intents and purposes they are *identical*. Time had in fact stood still—in truth nothing but an electrical revolution could really take the recording art any farther.

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The Paleophone — a new invention for photographing the voice

From Our Correspondent
Paris, October 11 1877

YESTERDAY'S ISSUE of 'La Semaine du Clergé' carried an unusual article from the pen of the Abbé Leblanc. It describes an extraordinary invention that has been conceived by the poet, writer and monologist Charles Cros. To date, this invention has not been made up into a demonstration model, for Monsieur Cros is a happy-go-lucky fellow who has never had a bank balance.

For all that, the ideas have been written down in such detail that any competent mechanic could make the prototype if he so desired. One instrument-maker is said to be willing to furnish this prototype; but at the moment it is still a question of raising the funds

to pay for the labour and material.

Despite this lack of a working model, the Abbé is enthusiastic, and since he is a man of science—as well as a man of the cloth—his words are worth considering. In his view, 'If you take M Cros' invention and sing into it, or make a speech, the instrument retains a record which may be transferred to metal by the electrograving process and which, when set in motion, will reproduce your voice, your articulation, your very tone; in short, the speech that you delivered or the song that you sang, exactly as though you yourself were repeating the one or the other in your natural voice.

'By means of this instrument, which, if we were called upon to serve as godfather, we should christen 'phonograph', it would

be possible to take photographs of the voice as we now take them of the face. Will that not be one of the most curious things that can possibly be imagined?

'To listen, for example, to the singing of some song which has rendered a singer famous, and to hear this song rendered with the same identical voice by a simple physical instrument named the 'phonograph' which mechanically makes use of a plate for that purpose and which can be preserved forever?'

The Abbé dubs the machine the 'phonograph', but M Cros prefers to call it the 'Paléophone'—the 'passing voice'—and this is a name that your reporter, for one, prefers. There is something wistful about it, just as there is about the poet himself.

Exposed! The forgery racket in cylinders

From Our Correspondent
London, September 1899

THE CYLINDER recording companies are gravely concerned over the pirating of their wares. They have to pay for studios, artists and engineers in order to make their recordings, so it is galling in the extreme to find their records being sold at cut-prices by people who invest in little more than a pokey shop, a supply of blank waxes and a duplicating machine.

With the aid of these duplicating machines the pirates can turn out many copies of a studio-made recording for a cost which is trifling. It is true that these copies are seldom as good as the originals, but their lower prices attract those people who are not too discriminating.

Your reporter recently visited the premises of one of these pirates. It was a grubby shop in London's Camden Town, its battered walls decked out with gaudy posters. I asked if they had any Sousa cylinders. The proprietor said they hadn't, but they had some just as good and much cheaper. So I ordered two of my favourite marches and the man disappeared into a backroom, muttered something to a young lad who sat in there, and then rejoined me.

While I pretended to look through the catalogues, I listened carefully and sure enough soon heard the purr of an electric motor and the faint sound of the cylinder being cut. In that backroom the lad was using a double-mandrel duplicating machine to transfer a commercial recording onto a standard blank.

The recordings were then brought out and popped into professional-looking boxes. A quick look at the recordings, however, showed that some of the wax shavings were still sticking to them.

When I reached home I played the marches and immediately recognised them as Company X's

Ban the barrel organ

From Our Correspondent
London, October 1878

LONDON is plagued by barrel organs. Some are high-voiced machines slung around the necks of the organ grinders, while others are monstrous, assertive juggernauts, mounted on chariot wheels.

'Punch' magazine now suggests a competitor and an antidote to this invading horde of organ grinders. Mr Punch pictures a giant-sized version of Edison's new *Phonograph*

borne round the necks of fair damsels who parade the streets and churn out prerecorded ballads and verses.

So, in place of one nuisance, we are to have another—even if it is a departure from the mechanical inflexibility of those barrel organs.

It all sounds like a typical 'Punch' flight of fancy, but one is left with the horrible feeling that something like it may very well come true.



Captured for posterity. Franklin speaks from beyond grave

From Our Correspondent
New York, 1890

READERS will remember Thomas Edison's optimistic claims for his 'Perfected *Phonograph*'. Among them was his assertion that statues of actors and politicians could be fitted with *Phonographs* which would repeat their speeches at the touch of a button. Now he has made this dream come true.

He has constructed a life-size effigy of Benjamin Franklin which sits at his dining table. During meals the figure utters Franklin's famous homilies and maxims. It is thus instructive and entertaining at the same time.

This is truly something we would like to listen to, and the inventor is to be applauded. At the same time however, some grave doubts come to mind.

Will this example inspire every tinpot politician to now go ahead and have a talking, squawking statue built? Will every fool who has turned the heads of beer-sodden crowds now inflict his imaginary wit and wisdom on the unsuspecting passerby?

Let us pray that the answer is in the negative. A metropolis full of spouting, ranting statues would soon become a ghost town.

recordings. Of course, the spoken announcements at the beginnings had been omitted. The quality though was very different, for obviously my recordings had been duplicated from originals that had been copied many times. They were faint and noisy and a sheer waste of money.

It is to be hoped that some way can be found to safeguard the record companies from this growing band of unwholesome parasites.

Sinful sounds from pornographic Phonograph

From Our Correspondent
New Orleans, May 1895

OUR READERSHIP will be dismayed to learn that the wonderful Edison *Phonograph* is being besmirched in the interests of lewd and sordid activities. In many of this fair city's brothels the machine has now become known as 'the pornograph'.

For a dime in the slot, the debauched machines will belt out grossly obscene ditties and verses. For a few cents more the clients can even record their own foul utterances and hear them repeated while they take their pleasure.

Would that something could be done to correct this amoral practice, but it seems we are to stay

impotent. As long as recording blanks can be freely bought, and as long as recording diaphragms are sold with the *Phonograph*, there is no possible way of ending this abuse. The Devil truly finds work for idle hands—now he has a new use for idle tongues.

66 ►

Instant immortality

From Our Correspondent
Paris, May 1900

TODAY Oscar Wilde made yet another visit to the Great Exhibition. He was followed by the usual trail of insensitive sensation seekers. For though he now calls himself Sebastian Melmoth, he is too easily recognised to escape his past.

Well, the curious were amply rewarded on this occasion, for Wilde stopped at the Edison *Phonograph* stand, and most movingly declaimed part of his 'Ballad of Reading Gaol' into the recording machine.

Before making his recording debut he grimaced at the speaking tube, threw his hands up and protested, 'Do I have to put my beautiful voice into that ugly thing?' But this was done with good humour and was nothing but a bit of play-acting for the benefit of the gawping throng.

While the resulting cylinder failed to capture everything of the poet's intensity, it did provide a

memorable record of that sad genius at his most sincere.

At another stand an amazing new type of recording machine was in action. This 'Telegraphone', as the inventor styles it, records sounds on thin piano-wire by an electro-magnetic process, which involves a telephone transmitter for recording and a telephone receiver for listening to the results.

Among those who tried out the prototype machine was Franz Joseph, the Emperor of Austria. He first congratulated Valdemar Poulsen, its inventor, and then repeated his congratulations onto the wire.

Now, this wire can be wiped clean in seconds by passing it over a permanent magnet, but the Emperor's recording is not to suffer such an indignity. It is to be preserved and treasured. And the same goes for Mr Wilde's cylinder.

In these times of fast-moving changes it is good to know that some people still have a well-developed sense of history.

STOP PRESS

New York May 1977

Waxing stereophonically

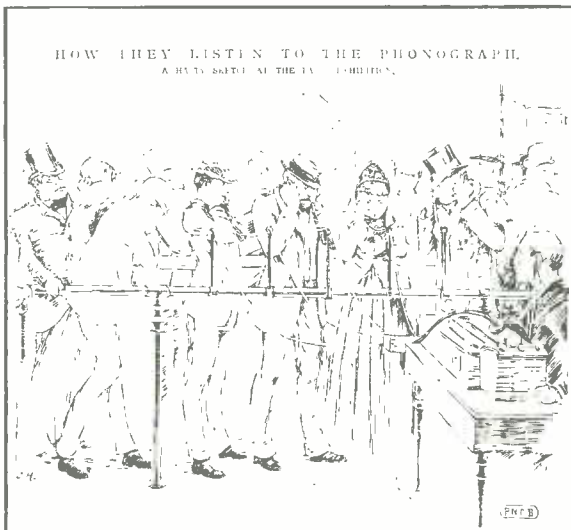
It is fitting in this, the centenary of recorded sound, that the Greater London Council is planning to commemorate the last home of Alan Blumlein with a blue plaque. This is to be unveiled on Wednesday, June 1. It would be especially fitting if the ceremony were accompanied by a stereo fanfare; because it was, of course, Blumlein who invented modern stereo in the early thirties while working with EMI. Indeed, EMI still has test shellac discs dating back to around 1931 which, with remarkable depth and realism, record the sound of Blumlein talking and walking around a room in the Central Research Labs at Hayes. EMI also has some 35 mm film dating back to 1935, with an optical sound track recorded by Blumlein in a manner very similar to that currently used for Dolby optical prints. It is also believed that EMI has in its vaults some stereo shellacs made by Blumlein of Sir Thomas Beecham at Abbey Road in around 1933. If the centenary of recorded sound passes without an issue, or at least public demonstration of this collection of audio-visual gems, it will be both a crying shame and a monumental goof on the part of EMI.

Blumlein's major achievement in this area was recording stereo with a pair of microphones and a 45/45 double-modulated groove, and using a pair of loudspeakers to re-create an illusion of the original sound spread. Others elsewhere had already experimented with double grooves, combinations of lateral and vertical cut and the reproduction of dummy head line transmissions via headphones. An American patent filed in 1920 probably represents the first attempt to record two channels of

sound in a single groove. But none of it was true stereo in the manner of Blumlein. Until recently no one questioned 1931 as the date for the first coincident pair recordings, but now, the imaginative American engineer Jerry Bruck, claims the availability of true stereo dating back to 1900 or even earlier! Don't laugh—Bruck is almost certainly onto something.

In those turn of the century days, when cylinders rather than discs were all the rage, it was impossible, or at least impracticable to mass-duplicate production runs from a single master. So to produce several dozen similar cylinders, several dozen cylinder recording machines were stacked on shelves in front of the performer, and all of them 'rolled' simultaneously during the performance. Inevitably, some of the sound-receiving horns of those machines faced the performer at just those positions which would today be regarded as ideal for a coincident stereo pair. By now you have the picture. Bruck is hunting for duplicate cylinders made at the same session on machines spaced apart by a reasonable stereo distance. The identical cylinders will then be run in synchronism, on ganged pairs of modern transcription equipment of the type conventionally used to transfer old cylinder recordings to tape for reissue. The signals from the two cylinders will be phased, using electronic comparison or headphone listening techniques, and one regarded as the left and the other the right channel. This should produce a 'genuine' Blumlein crossed-pair stereo recording of the performance—recorded some 30 years before Blumlein invented his system.

Adrian Hope



These 'news' items are based on fact.

Collated by CHARLES GILBERT

The News Free Concerts!



At any time you wish you can have a free concert in your own home—just a concert of hand and orchestra, vocal solo, grand opera, or as you please—anytime you like. The world's greatest records are at your command if you own a new 1907 model Edison Phonograph, and you don't have any other record for a one night's entertainment. But can have free opera as often as you desire.

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Thomas A. Edison

Odeon hit back at cylinder pirates

From Our Correspondent
Berlin, October 22, 1908
THE GOLD-MOULDING process of the cylinder companies has effectively killed off the pirates who preyed on them, but now the disc companies are in trouble. Unscrupulous manufacturers have found a way of duplicating discs in large quantities.

The duplicating process involves much more investment than the old-style pirates would ever have dreamed of. On the other hand the returns are so much greater.

Briefly, the new breed of pirates buy a mint pressing of the record

they wish to 'manufacture', and electroplate it as if it were a studio master record. From then on they utilise the same techniques as the legitimate record manufacturers.

In the past cylinder firms found it hard to beat the pirates, but now Odeon has actually patented a method to detect piracy. It is a method that will stand up in court and will make the pirates think twice about stealing the work of any of the Odeon companies.

In a statement directed at both trade and public, Odeon show how all their future records may be instantly identified. They are now arranging that their recording machines depart from the previous even spiral groovings. From now on the mechanism of the recording machine will take a 'little jump' in the middle of its run, which will produce a distinctly visible groove, broader than all the others.

This 'groove of recognition' is a permanent part of the record and will be transferred to any illegal copies if such are attempted. Odeon are satisfied that this simple device is a foolproof deterrent.

Cros slams Phonograph

From Our Correspondent
Paris, March 15 1878

MR EDISON'S tinfoil *Phonograph* has just been shown to the French Academy of Sciences and has excited much comment, much of which was favourable. But Monsieur Charles Cros begs to differ. Now, though he is first and foremost a poet and writer, readers may remember him as the man who designed a 'talking machine' long before anyone else.

M Cros' views are in no way tinged with envy—he has given plans of his talking machine to the world, and anyone who so cares can make and use his device.

He even admits that his own beloved disc machine has its limits—his forecast is that in the future sound recordings will need to be made on moving bands or tapes, thus allowing each work to replay without interruption. Of late he has even devised a machine that could work in this fashion.

Post-a-Sermon

From Our Correspondent
Chicago, December 1894
JOHN ALEXANDER DOWIE, founder of Zion City, Illinois and creator and head of the Christian Catholic Church in Zion has taken the phonograph sermon to its ultimate. He now records sermons and even holds services on

wax cylinders for despatch to the infant branch of his Church in Australia.

The recordings are not good will offerings though—they have to pay for them down-under. For as in all things, this modern Elijah is never short of business acumen.

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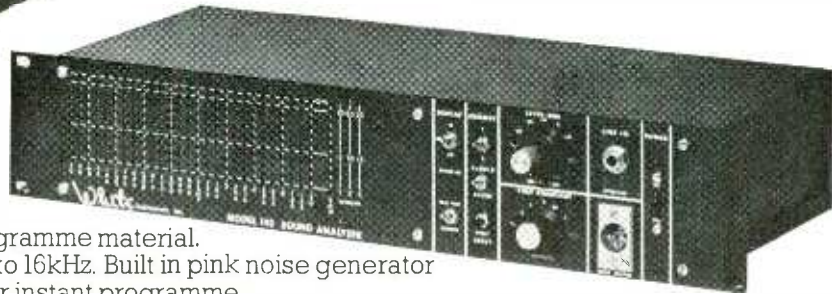
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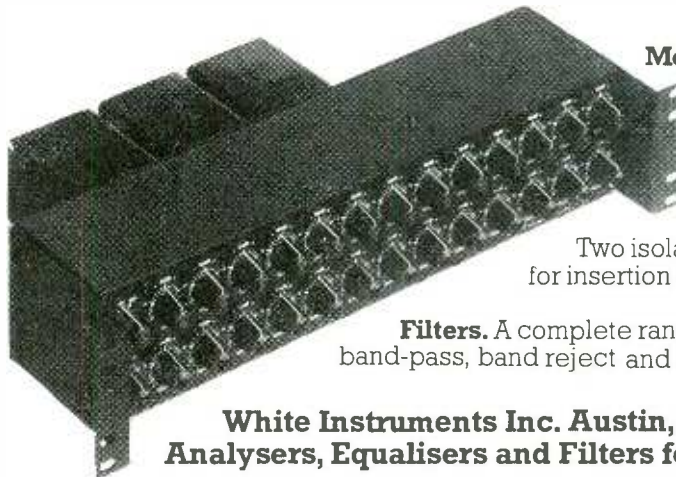


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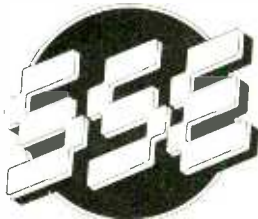
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The electric revolution

Melvin Harris

The development of the microphone and thermionic valve paved the way for new recording techniques that released artistes from the 'acoustic strait-jacket'.

THE FIRST recorded sounds ever heard were made electrically. They resulted from experiments started by Edison on July 18 1877. The recording medium was a band of waxed paper, and the recording machine used '... an electro-magnet to operate the indenting diaphragm'. Now the results may have been laughable, but they were epoch-making... I've purposely only referred to 'sounds', for although Edison continually bawled the word *Hello* into his recorder, the reproduction was so garbled that it really didn't qualify as speech. For all that, it led directly to the tinfoil recorder of that year. This tinfoil machine was a straightforward acoustic model; but in Edison's patent of 1878, two electromagnetic recording heads are shown—both were meant for use with tinfoil records. It's very probable though, that they would have proved much less efficient than the acoustic recorders, since the resistance of tinfoil to the embossing point was very high indeed.

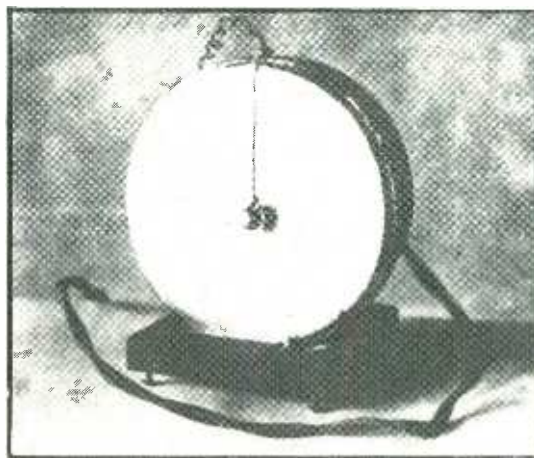
By 1886, the Volta Laboratories (Bell and Tainter) had patented their own electric recording head—but this one was different. It was fitted with an *engraving stylus*, because it was meant to record on wax. The head still worked hill-and-dale fashion, similar to Edison's machine, but was designed to *cut*, not impress its track. The design was very basic—a permanent magnet surrounded by a bobbin of insulated wire—and was meant to be included '... in a circuit over which electrical undulations were caused to pass... by a telephone for example'. In front of the pole piece of the magnet was an iron diaphragm, which pressed on a spring-mounted stylus. Speech passed through the telephone would therefore control the movements of the diaphragm, activate the stylus and cut the wax; this was only used experimentally and never reached production. As with all the early electric heads, the force behind the cutter stylus was never great enough to give a cut comparable to that of the mechanical recording boxes.

A new departure in thinking came after the invention of the *Photophone* in 1880—another brainchild of Bell and Tainter. But it was made purely as a telephonic device, and there was no suggestion, at first, that it had any connection with sound recording. Basically, it used a thin silvered diaphragm to project a beam of light that was sent out to a remote receiver shaped like a parabolic dish. At the focal point of the parabola was a selenium cell forming part of a circuit carrying battery current to a telephone headset. When speech hit the transmitting diaphragm, the vibrations caused the beam of light to fluctuate. Since the electrical resistance of selenium varies according to the amount of light falling on it, these fluctuations led to variations in the current passing through the headphones. The magnetic flux in the headphones altered accordingly, the metal diaphragms vibrated, and the original speech was recreated. The *Photophone* led a number of people to toy with the idea of using light-rays for recording, and writing in the 'Electrical World' on October 30 1886, Leon Esquill outlined *his* idea: 'Speak to a *Photophone* transmitter... The record of this speech is then obtained by simply photographing the ray of light upon a travelling band of sensitised paper. After having been developed, the articulations may be reproduced by projecting the image of the trace by means of an electric arc or oxyhydrogen light upon a selenium receiver... The speech is then heard through the receiver.' There's no

evidence that Esquill ever obtained any worthwhile results from his experiments, but the ideas he touched on were taken up by others. It was to prove a fruitful line of enquiry.

Another possibility for non-mechanical recording lay in the use of localised magnetism, which Oberlin Smith suggested back in 1888. In his view variations in the flux of a telephone transmitter could be recorded on a moving band of magnetisable material. He didn't opt for a coated band though; his idea was to use a cloth strip interwoven with metal threads. There were similar suggestions from other inventors, but it wasn't until the end of the century that Valdemar Poulsen made the first practical magnetic recorder. This soon developed into a promising reel-to-reel machine. The promises weren't fully met, however, but one shouldn't blame Poulsen for that; he was hampered by outside influences over which he had no control. Nevertheless, his invention is the true father of the modern tape recorder, and in a number of ways it did speed up developments towards the electric era of sound. But more of that later.

By the beginning of the century there emerged three distinct lines of research: the Poulsen method of recording on magnetic materials; the optical method, using light fluctuations and photo-electric cells; and the older method of using moving-irons controlled by electromagnets. But despite their differences, all



In 1877 Emile Berliner claimed to have invented the loose-contact carbon microphone (shown above). Edison took issue with him and stated that his own carbon transmitter was prior to Berliner's, and what's more it worked! But the Bell people sided with Berliner, because his patent was of value to them in combating Edison's rivalry—and the lawyers grew rich. Meanwhile in England, David Edward Hughes independently made a carbon-rod microphone in 1878; and in the following year, while using it, discovered radio waves. The Paris Opera also used the microphone to transmit landline 'broadcasts' in stereo as early as 1881, and this led directly to the first regular landline 'broadcasting' system. The place was Budapest; the date 1893. There the 'Telefon Hirondo' transmitted for 12 hours a day, seven days a week, and sandwiched commercials in between the news bulletins.

three methods had the same basic problem to face—lack of electronic amplifiers meant that their recordings were feeble. This limitation made them uncompetitive and severely restricted their acceptance; these systems were used mostly only in laboratories.

Yet this constant bugbear didn't stop experimenters from concocting new electric recorders, some of which were most forward-looking. Particular among these is E H Amet's patent of 1911. His idea was to make multitrack recordings on wax cylinders, each track to be cut by a separate telephone-style recording head, with each head wired to a separate carbon microphone. As Amet visualised it, a theatre stage could be fitted with these microphones at various positions. Then as a group of actors or opera singers acted out their roles, they could take up their normal, spread-out positions. Each track on the cylinder would therefore represent the input from a particular part of the stage; for replay, each microphone stand was to stay where it had been situated during the recordings, but the microphone was to be replaced by a telephone loudspeaker. Then each track would be monitored by an electric reproducer which would feed a signal through to its particular speaker. In that way, an empty stage would resound with the voices of the absent performers, each voice coming from the right section of the stage—just as in a live performance. And did it work? Well, look at the date and you'll realise there were still no amplifiers around. But things were about to change, for in the US, Lee DeForest was hard at work.



Sir Harry Lauder giving it all that he's got.

At the Bell Laboratories in the US, public address and recorded sound projects were given priority. At DeForest's Labs, priority was given to sound-on-film recording—this was to be based on the earlier researches of Lauste and others into light-ray methods. In Germany, another light-ray recording system was being sought. This one was based on a glow-lamp light modulator jointly devised by Engel, Massolle and Vogt. The three partners founded a firm called Tri-Ergon, a name that was to feature in the later electrical revolution. During this period, though, they were thinking only of sound for talking pictures.

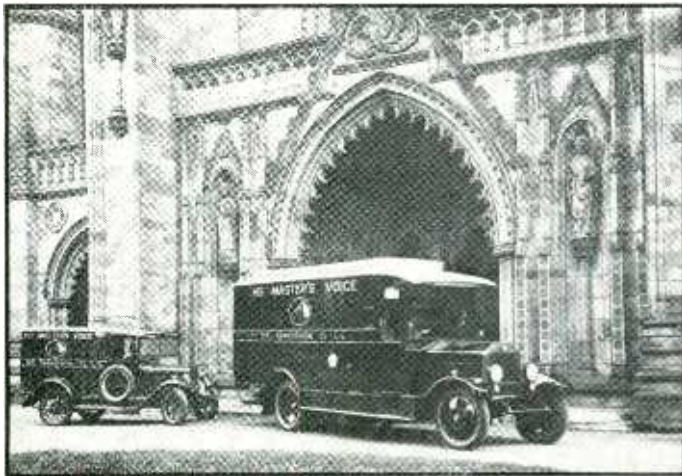
At the same time in Britain, two ex-officers of the RAF were ahead of everyone else. Major Lionel Guest of London and Captain Horace Merriman of Hamilton, Ontario, had worked together during the war developing loudspeakers powerful enough to be heard from air to ground, and in this work they'd used a Fessenden vibration motor. When peace came they decided that their experience could be used to make '... records by electricity using the Fessenden vibration motor.'

Guest and Merriman began by making a clockwork-operated turntable fixed at 80 rpm. Above it was a travelling bridge driven by a lead screw, and this carried the vibration motor and the armature that moved the recording stylus. The equipment, together with its amplifiers and heating stove (blanks were cut at 28°C) was built into the back of a van to make it more versatile.

The first great test of their system came on November 11 1920. On that day they electrically recorded part of the 'Ceremony of the Burial of The Unknown Warrior' at London's Westminster Abbey. In the Abbey they installed a group of carbon microphones fitted with horns, the wiring for which ran through one of the windows to the van lurking outside. A number of discs were cut, but the results were disappointing. Only two discs were considered good enough to issue, and even they were noisy and poor in quality. But they *were* put on sale in aid of the Abbey Restoration Fund, and hence count as the world's first electric issues. (The copper matrix is now kept in the British Museum.)

Six months after this event the partners recorded the great organ in Notre Dame Cathedral, Paris. They couldn't make a high-gain amplifier that did not suffer from prohibitive distortion, so they were forced to place ten microphones *inside* the organ itself to get the results they wanted. Following this, their work came to the notice of the Submarine Signal Company of Boston, and for six months their equipment was used by that company. When this period was up, further experiments continued at the London studios of Columbia Records. Then it was back to the US once more. But now the equipment was set up at a house in Queens, Long Island, in order to keep close contact with the American Columbia Company. At the beginning of 1923, the 'Merriman-Guest' recording system was taken along to the Bridgenorth Studios of Columbia, and it looked very much as if that

70 ►



The HMV mobile recording van outside Hereford Cathedral in 1927.

DeForest's first thermionic valves were hampered by the vacuum pumps he had to use; they were good but not good enough. Once a new hyper-efficient pump had been devised things altered—he could now get the standard of vacuum exhaustion that his valves needed, and could look forward to reliable and efficient results. So in 1912, he began designing a series of amplifiers that were intended for sound recording. The amplifiers were meant to be used with Poulsen's *Telegraphone* since he had the highest hopes for this machine; he even used it to make some experimental talking pictures. But the American Telegraphone Company's affairs were too strangely entangled to allow DeForest to work with it, so he turned away from magnetic recording and began to think in terms of recording sound optically. However, on looking at his patents of 1913, it can be seen that all his amplifiers were to be used in conjunction with the Poulsen recorder—so the 'Danish Edison' provided an inspiration at just the right time.

The First World War then altered the direction of most electronic research—but not all the alterations were detrimental; on balance it was probably the very opposite. Special microphones and amplifiers were called for by the military, to be used in detecting aircraft and submarines. And special high-gain valves were created for use in intercepting wireless messages and tapping telephone lines. So when the war ended, there was a good deal of new knowledge to lay hold of, and a good deal of new equipment. Much of this Government-surplus equipment was in fine condition, so naturally it was grabbed up by every laboratory that had the slightest interest in sound problems. And with this fresh knowledge and their new toys, the researchers went to town.

THE ELECTRIC REVOLUTION

record company would back them. When the partners left the studios they were highly optimistic, and promised that the next demonstration would feature improved and refined results. But it took until November before they were ready to display their new wider-frequency recordings; and by then, Columbia was in the hands of receivers. A new set of officials was in charge, and they weren't at all interested in electrical recording. For Merriman and Guest this was the end—they gave up their work and passed into recording history.

While those two pioneers had been struggling, others had been much more successful—but they had kept their work semi-secret. Then in 1922, they started to come into the open. Tri-Ergon led first, with a showing of its sound films. They were soon followed by Lee DeForest with his 'Phono-Films', and then Western Electric entered with their brand of 'Talking Pictures'. The Western system though, differed radically from its rivals since it used synchronised gramophone discs, not optical tracks: and these discs were recorded *electrically*.

Western's system used public address amplifiers (developed by its Bell Labs) in conjunction with the condenser microphone invented by E C Wente. The amplifiers were possibly the best around at the time, and the microphone had a wide, smooth response. It was unequalled, although it had defects—output was low and had to be boosted by a built-in head amplifier. This could cause some noise, but was simply due to the state of valve development. More troublesome was the noise caused if moisture condensed inside the head case. However, as long as it wasn't used to record bathroom sequences this could be guarded against.

These amplifiers and microphones were so designed . . . that the current delivered to the recorder circuit was essentially proportional to the sound pressure at the microphone diaphragm'. The recorder itself was an electromagnet with a soft iron armature pivoted between the pole pieces. Coils surrounding the armature produced a variable magnetic flux when signals from the amplifiers were passed through them. The armature controlled a shaft, which carried the cutting stylus, and one end of this shaft was gripped by a rubber rod which acted as a mechanical 'filter'. This design, by Maxfield and Harrison, gave a response from 60 to 5000 Hz, with a linear response from 3000 to 5000 Hz. Below 300 Hz the response fell away at a rate of 6 dB/octave, but at the top there was a more dramatic cut-off at about 6000 Hz.

Although the system was aimed primarily at the motion picture industry, Victor Records were the first to take an active interest. Negotiations were opened and at one time it looked as if Victor might gain the exclusive rights. But a tip-off to Columbia in England prevented that. It came after some masters from the Bell Labs had been sent to the American Pathé Company for processing and pressing. Frank Capps, who was in charge of the Pathé plant, listened to the pressings and was astounded by their quality. He knew that Victor was interested, and realised that if they gained a monopoly it would kill off many other companies. Among those other firms was English Columbia, which was presided over by Capp's old friend, Louis Sterling, so out of friendship Capps sent him an urgent warning. Surprisingly enough, a set of the Bell pressings also came in the post to Sterling! As soon as Sterling heard the discs he realised that his firm was sunk if his rivals were in sole control of the new system. However, his own firm hadn't been completely blind to the possibility of electric issues, but at that time their experimental recorder was little more than an improved telephone earpiece fitted with a stylus, and their best microphones were still carbon affairs. Work was in hand on moving-coil microphones (one used a glass diaphragm and a mains-energised field) but these were still inferior in output and frequency response to the carbon models, and were consequently nowhere in the same class as the Wente. Sterling considered his position carefully, but not for long. He took the next boat to New York and started talks with Western Electric. The bargaining was tough, but he got what he wanted. He returned with a licence to use the Western Electric methods on an equal footing with Victor.

By mid-1925, the electric issues started to reach the shops, but they didn't emerge in a blaze of glory—in order to give dealers a chance to clear old stocks, there was no publicity. Today, it seems incredible that such a revolutionary event could be initiated

without a lot of ballyhoo, but that's how it was. In the first advertisements for the new discs no mention is made of electrical recording, and no hint is given on the record labels—though the recording of a choir of 4850 voices must have raised some eyebrows. This was accomplished by Columbia, when it recorded *Adeste Fidelis* at the New York Met; and it was records like these that first made people aware of the dramatic change in recording techniques.

By 1926, Western Electric was challenged by rival systems. The Tri-Ergon light-ray method was quickly utilised for disc recording, and then Brunswick began using another light-ray method on its recordings. The Brunswick method traced its ancestry back to the work carried out by Rümer in 1901. Then, following fresh work on his ideas by DeForest, Case and Sponable, a new ultra-sensitive recorder was evolved, which in turn led to the Brunswick recording instrument known as the *Palatrope*. It looked rather like a microphone, but inside was a crystal mirror weighing only 5 mg. This was caused to vibrate by the soundwaves, and was so delicately balanced and so sensitive that it responded to the slightest whisper. A powerful electric light was focused on this mirror and reflected onto a photo-electric cell; the fluctuations of the light were thus turned into changes in current. These signals were then fed to an amplifier, which in turn passed its output to a moving-iron recorder.

What was so remarkable about this system were the claims made for it, one of them being that it recorded all frequencies from 16-21 000 Hz; and it was further said that the Brunswick electric reproducers—called *Panatrope*s—could actually reproduce this range. This is surprising, for the machines used heavy moving-iron pickups to begin with, and were there any pickups able to deal with the claimed frequency range? Then again, although I've never heard a *Panatrope*, experts who have testified that there was very little top and the bass was tremendously boosted—none of this testimony ties in with the published claims.

The other rival system worth noting was developed by P G A Voigt of the Edison-Bell Company. This incorporated his 'slack-diaphragm' microphone and a moving-iron cutter, and was used to make his company's 'Electron' issues.

The struggle between rival systems never amounted to much, but it led to the development of moving-coil microphones and cutters by English Columbia, which freed them from the financial burden of their licensing terms. The man who carried out that work was Alan Blumlein. But before he set to work, the electric issues had already sparked off some quite unexpected developments; for in order to use synchronised discs for feature films, the Warner Brothers had been forced to ask for a new recording speed. Their problem was to match the disc to the running time of a 300m reel of film, which meant that the disc had to play for almost 11 minutes. When the problem was passed to the design engineers, they looked at the gears that were used to couple the studio cameras and the recording turntables, and came up with a speed of 33½ rpm. It just happened to be the one speed that would fit in nicely and give them the least headaches. So 33½ rpm it was; and this new standard passed first to radio transcription discs and then to the original lp discs of 1932. This was a premature venture that failed, due mainly to economic reasons—it was launched while the world slump was hitting.

But there were technical problems as well. New light-weight pickups were urgently needed, as were new materials for pressings. Companies were still forced to use the old shellac, because anything softer was gouged to pieces by the weighty pickups; this was one of the major problems with which early stereo experiments had to cope. As early as 1931, Blumlein had developed methods of stereophonic recording using 45/45 and 180/90 approaches, but his shellac test pressings could never do justice to the methods he used. It was to take a second World War before the right type of pressing materials were developed.

Until the war came disc developments were slight. The frequency range was continually being pushed up—6000 Hz by 1933, and up to 9000 Hz six years later. But apart from that, there was a relative quiet. In Germany, however, the first significant recordings had been made on a promising new machine. This was the *Magnetophon*—a magnetic recorder using coated tapes. At first, it looked like a potentially dangerous rival to the gramophone. No one realised that, in fact, here was the greatest ally that disc recordings could ever hope for.



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The thin brown line

Basil Lane

In outlining the developmental history of any great industry there must be an inevitable preoccupation with technology. It is obvious that for the recording industry artistic progress has often been limited by engineering problems, and it is only in recent years that we have seen a change in this state of affairs. At last, musicians and composers are able to take advantage of the unique capabilities of electronics and recording processes to create an art form not previously possible.

IN THE 1930s, however, this rather ideal state of affairs was far from even being a dream, and the recording industry as a whole was in a sorry state. Companies that had been enormously successful in the early days of mechanical disc cutting had suddenly declined and were in difficulties. Even Columbia, a name that has survived until today, found itself in the hands of the receiver during 1923.

To analyse the reasons for this sort of disastrous situation in this sort of time perspective is not too easy. There was a world recession, but perhaps for the recording industry its first major competitor—broadcasting—was a principal reason for the hiatus. In 1923 formal broadcasting got under way in Europe and the Americas, and as an entertainment medium in the home proved to have an overwhelming fascination. What is more it became possible to do what the record industry had never been able to do, and that was to provide the sound of an orchestra playing a lengthy work without interruption.

There was also an immediacy about broadcasting that was to temporarily divert the interests of the public away from records. Even now there is a competition between broadcasting and the record industry, this despite the fact that the broadcasters were later to be responsible for the most important innovation in recording technology since the beginning in 1877. Similarly, motion pictures were to have a salutary effect upon the recording industry, and the early application of the disc in providing sound tracks added impetus to develop beyond the prime restrictions of mechanical cutting techniques.

Initially, it was the electric microphone and cutting head that provided the opportunity of expanding the application of disc recording—suddenly it became possible to record much more complex sound scenes, although the lack of amplification techniques was to prove a temporary bar to further progress.

Also symptomatic of the troubles that beset the recording industry of the time was the merger of the Gramophone Company and Columbia to form the now familiar Electric and Music Industries (EMI). This event in 1931 was also accompanied in November of that year by the opening of a remarkable studio complex at No 3 Abbey Road, London—the famous Abbey Road Studios that have always played an enormous part in the subsequent history of recording sound.

A comparison of the sort of facilities offered, and the way in which the conversion from mechanical to electric recording had affected methods, can easily be seen from the photographs of the studio at 21 City Road, London, and at the Abbey Road opening ceremony in 1931. In the left-hand picture, one should note the recording horn protruding from the centre of the end wall, the almost total absence of acoustic treatment (is the curtain a concession to acoustic damping?), and the apparent necessity for the piano-player to hover six feet off the ground to ensure the correct musical balance. In the right-hand photo, note the almost modern looking suspended microphone, and the presence of talkback speakers (on the stand to the left of the staircase). Clearly technology had progressed in a very short space of time. But whereas it is probably true to say that the early motivation

came from the public thirst for records—any records—around the 1930s it was the competition of broadcasting and films, coupled to the combined technical resources of these three industries, that had driven recording companies to progress still further.

Naturally, one of the main advantages gleaned from the progress and success of broadcasting was the technical innovation of the valve. Not only did it free the recording engineer from the old bugbear of poor microphone sensitivity, it also made new methods of control in cutting possible. Immediately the necessity for equalisation became obvious and the resulting improvement in quality was very obvious.

A second advantage brought to the recording industry by broadcasters was the effort put into studio design. Acoustics were becoming very important and although methods of artificially modifying the signal to recreate ambience were still a twinkle in some engineer's eye, the need for an acoustically isolated room had become very evident.

Electric recording was to remain the backbone technique for a further 15 years throughout the largest part of the civilised world. This was reinforced to a great extent in the USA by the acquisition of the old Victor Company by the Radio Corporation of America (RCA) in 1929, and the consequent flow of technical improvements from the broadcast world into the recording industry—and *vice versa*. In the UK, even the BBC was not adverse to working in close cooperation with commercial recording companies. A typical example was the use of EMI's recording facilities to make recordings of many of the important early broadcasts.

To survive, the record industry needed to learn from its greatest rival in home entertainment, radio broadcasting. This early competition provided the background for a series of

The studio at 21 City Road acquired in 1902.



unique technical developments that later would revolutionise the recording and broadcasting techniques of later years.

In a field such as communications, progress is not marked by a series of well defined stages—although one could easily be fooled into thinking that this is so from the contemporary accounts. There are a series of overlapping threads in the story, and to progress to the next part of our story we need to go back briefly to 1898 when Valdemar Poulsen, a young engineer working in the telegraphy industry, established the first practical system of magnetic recording. It is a matter of common knowledge that although he fathered the magnetic recorder, and indeed suggested many of the modern applications, his was not a successful commercial venture; it took another man, Kurt Stille, to recognise the real value of the technique in broadcasting.

In the early 1920s Stille formed a remarkable company in Germany, called the Telegraphic Patent Syndikat, the objectives of which were to obtain the rights of many patents for inventions relating to telegraphy and telephony, to originate further patents, and then to license these for commercial exploitation. One of the inventions to result from this curious commercial enterprise was the Stille recording machine. Far from being the world's first tape recorder, nevertheless this machine was the earliest example of a magnetic recorder using solid metal steel tape and principles of magnetic recording designed specifically for professional applications.

In the UK, licensing arrangements were taken up by Louis Blattner, who had been attracted by the possibilities of the machine as a means of providing the sound track for movies. Stille had already obtained a patent in the UK that covered this particular application, and suggested that the synchronising problems could be simply overcome by using sprocketed metal tape. Louis Blattner opened his Blattner Colour and Sound Studios in London and by 1929 had produced his first practical machine, which he promptly launched in a fine presentation to the Press of the day. The event was graphically recorded by a correspondent for the magazine 'The Electrician' as follows:

'A system of making and reproducing sound records, which seems to be destined to supersede the old system employing discs or cylinders, was demonstrated last week to pressmen and others by Mr Louis Blattner, at the Blattner Colour and Sound Studios, at Elstree. The nucleus of the new system, which is now ready for commercial exploitation, was discovered some 40 years ago; Dr Kurt Stille began to work upon it 25 years ago, and the Ludwig Blattner Picture Corporation of London, and the Telegraphic Patent Syndikat of Berlin, have recently conducted laboratory and studio work which has resulted in bringing the system to a stage which indicates that the invention will probably revolutionise present day practice.

'The process is as follows: the sound waves are impressed on to a microphone, which converts the acoustic vibration into electrical vibrations, and these are conducted into the coils of an electromagnet. Past the cores of these electromagnets a thin steel tape or wire is made to move at a constant speed. The

electrical vibrations are recorded and fixed as magnetic vibrations on the tape or wire. Reproduction is effected by the reverse process. The different magnetic values of the steel tape or wire influence the small cores of the electromagnets, giving rise to current impulses, which are made to influence a loudspeaker or telephone diaphragm and are thus converted into sound.

'This method obviously effects an economy of space and increases portability, in comparison with discs or cylinders, and enables records to be made of almost unlimited lengths. Records giving three hours continuous reproduction have already been used. Another advantage of these steel records is that they can be used an infinite number of times.

'The items in the demonstration referred to include a reproduction of a monologue recited by Mr Henry Ainley whose enunciation was faithfully reproduced, and a "talkie" picture of Miss Ivy St Helier, who sang to her own piano accompaniment and concluded her performance with an amusing talk. The picture was very realistic, and the sound record was distinct and well synchronised . . .'

It is also interesting that one of Blattner's employees at the time was one Donald Aldous, who relates that Blattner was an interesting character with quite a bit of showbiz acumen. He tells how the Blattnerphone (as it was to become) would often provide the musical background to an ebullient stage presentation by Blattner, who would conclude by inviting lady members of the audience to a dance to the reproduced music from his machine. Meanwhile Aldous was busy backstage wrestling with the intricacies of the sound system!

Undoubtedly the Blattnerphone impressed the BBC as much as its German equivalent, made by Lorenz, impressed the Reichs-Rundfunk-Gesellschaft, for both these organisations adopted magnetic recording for broadcast purposes. Shortly after, Blattner relinquished his interests in the steel tape machine to Marconi, who developed the famous Marconi-Stille recorder that was to provide such sterling service in overseas broadcasting.

It was at this point in history that the disc method of recording was first seriously threatened. But even so there were a number of snags that were to prevent magnetic recording from appearing in commercial studios. Not the least of these was the sheer massiveness of the recorder, coupled with the high cost of the tape. Running speeds were high and the tape reels were of very large dimensions, and consequently rather heavy. Furthermore, the fidelity obtained was no better than that from a good disc.

For broadcasters the advantages lay in the length of possible recording time, and the important cost savings represented by re-using the tapes time and time again. That the BBC was concerned about the future use of the machines is to underestimate their forward vision, for in an issue of 'Wireless World' dated November 1937 the following news item was published:

'The BBC's recent exchange of views with the German broadcasting authorities on the subject of recordings has raised doubts as to whether recording can be overdone. Are tape and discs supplanting "live material"? The Corporation would answer with an emphatic "No". Strict rules have been laid down for the guidance of producers and announcers.

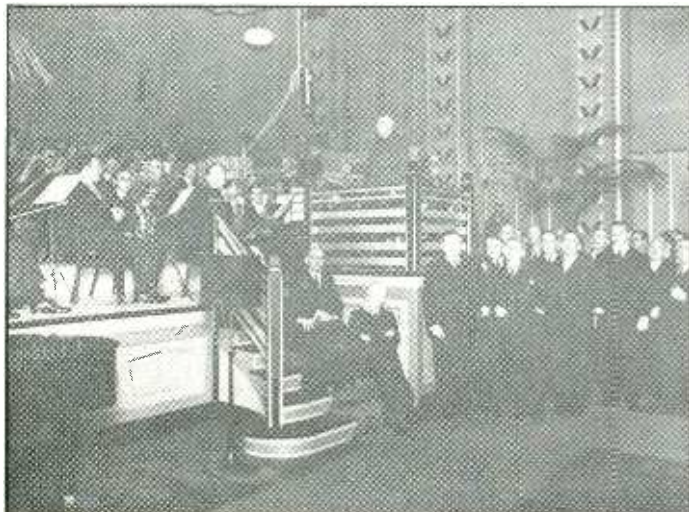
'Briefly, recordings are permissible in the following circumstances: they may be used when the timing of an event is inconvenient to the majority of listeners; when an outside broadcast is impossible from the place at which the event occurs; and in feature programmes of the reminiscent type such as the "Scrapbooks".

'Records are also permitted when an original programme is to be repeated, and on certain occasions, when a recorded programme is announced as such.

'Again, records may be used in the case of technical breakdowns and also to fill-in when bad reception during features of the "Round the Empire" type is liable to spoil continuity.

'Finally, it is laid down that artistes must not be led to imagine that they can record their act in advance, so as to be free for another appointment or bridge party. In exceptional circumstances a speaker may record his talk if public engagements make it impossible for him to be at the studio at the time of the broadcast.'

The opening ceremony of Abbey Road.



THE THIN BROWN LINE

Although these limitations were intended to apply to all forms of recording, it is probably true to say that the incentive for generating such a missive rested in the great success of the Marconi-Stille machines in the BBC's Empire Service; often a programme either needed repeating several times within a few hours, or important events had to be recorded for posterity.

It is possible that the advent of the steel tape machine also emphasised the value of tape as a medium that could be simply edited by splicing. In this instance splicing was actually a soldering job, but the end result was exactly the same.

In fact, although magnetic recording formed only a part of the total recording armoury used by the broadcast organisations in Europe, such technology led to the eventual adoption of a number of techniques that are very familiar in modern recording studios. The continuity desk used in broadcast studios was made more versatile with the addition of tape sources, and represents the earliest form of mixer; it is true to say that most studio mixing desks were derived from broadcast practice.

Editing techniques came from this era as did multitrack recording. One of the earliest examples was an attempt at binaural recording made by Bell Labs in the 1930s. They used a steel tape machine carrying two reels of steel tape on each spooling motor and recording two tracks, one on each tape, running in synchronisation.

The film industry also produced ideas adopted by the recording studios, including the use of 33 $\frac{1}{3}$ rpm as a standard for long-playing discs.

Perhaps of most importance was the fact that at this time the broadcast, film and recording industries were beginning to develop a mutual interest in new recording technologies. Although time was to prove that the steel tape machine was a blind alley as a technical development, it opened the way for the magnetic tape recorder that was to become the recording standard of professional studios.

Again, we have to take a brief retrospective glance, this time

K4 Magnetophon (with hf bias)—date 1940.



to the late 1920s, when Fritz Pfeumer, an independently-financed engineer from Dresden, was attempting to perfect a flexible recording tape using a coated magnetic surface, and also a machine with which it could be used. By 1929 he had secured a patent describing a paper-based tape that was coated with fine iron particles embedded in a rather nasty-sounding glue, but he was clearly in difficulties with the tape recorder. He sought the assistance of AEG, at that time a very large electrical manufacturer. With their help, development proceeded apace and the task of commercially producing the tape was given to I G Farbenindustrie Aktiengesellschaft of Ludwigshaven (later to become BASF). This company was already a specialist in the manufacture of chemical pigments, and had some experience in the production of fine magnetic powders for use in the cores of loading coils developed for telephone lines.

Some 18 months after the start of the project, Wilhelm Gaus of I G Farben reported to AEG that favourable progress had been made, and that the technical reports from AEG on the quality of the initial samples was encouraging. As for AEG, their 'breadboard development' prototype was also nearing completion and all should be ready for the 1934 Radio Exhibition in Berlin. However, as in many other similar cases, the air of optimism was to be rapidly dissipated as AEG discovered the problem of translating a breadboard prototype into a finished working model in a cabinet. Within weeks of the show opening, the exhibit was cancelled and the explanation offered by AEG to I G Farben was tape noise and mechanical deficiencies in the machine. Despite the immediate publicity clampdown, at least one report appeared of the new recorder in the magazine 'Filmtechnik', this being the first fanfare to open a new era.

Few took any notice, but by the following year AEG and I G Farben were able to display three portable and two console machines to a fascinated Press on August 15, 1935. These machines were designated the *K1 Magnetophon*, which was the portable, and the *T1*, a console version. However, the run of bad luck had not deserted these companies, for three days later a disastrous fire destroyed all the machines. Some spare parts existed, and from these another machine was hurriedly constructed. It appeared a few days later and worked satisfactorily until the end of the show.

By late 1935 a further two types were introduced: the *K2*, a three-motor portable machine with a tape speed of 77 cm/s; and the *FT2*, a remote-controlled dictaphone. In 1936 came the *K3* and *FT3* which were slight improvements on the previous models.

Although AEG had solved many of their problems and produced a machine that looks not unlike many machines of this day and age, I G Farben were having their troubles. This arose from an internal political wrangle about who should actually be responsible for tape production. At the time there were two divisions of the company: the chemical division, who had developed the early sample of cellulose acetate film and then coated it with the iron powder; and a photographic film coating plant in Wolfen who believed it was their prerogative to proceed with the manufacture.

The coating plant later became Agfa-Gevaert and achieved their objective of manufacturing magnetic tape, although this did not happen for some years. An interesting sidelight on the argument was the delay in settling the problem caused by the indecision of the German Broadcast Organisation to settle on any one recording method as a standard. Part of the reason for this was that, like the BBC, they were already using steel tape machines to an extent, and were well equipped with disc cutting equipment. Furthermore, the commercial competition between Lorenz and AEG was quite fierce. Just to add to the complication, an effective optical system of recording had been developed, which both broadcast organisations had purchased for evaluation.

An interesting story confirming the degree of competition between the various camps came in 1936, when Sir Thomas Beecham was invited with the London Philharmonic Orchestra to go to Ludwigshaven to record a concert on magnetic tape. Although fragments of the recording have survived until today, Beecham could not have been overimpressed himself, since he purchased some German optical recording machines during his visit. These were installed in Covent Garden, where he used them to make private recordings of his performances.

In 1938 the future of the magnetic tape recorder was secured when the Reichs-Rundfunk-Gesellschaft adopted flexible coated tape

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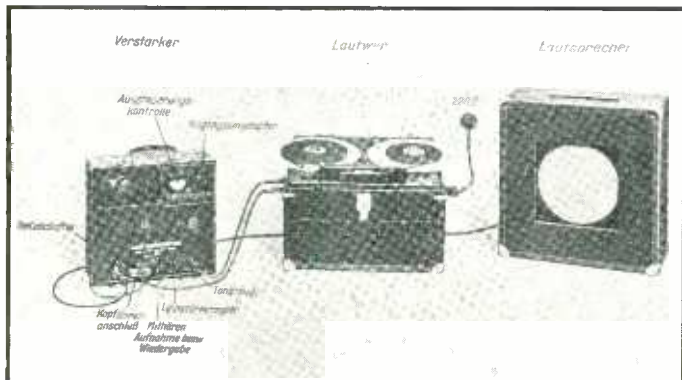
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THE THIN BROWN LINE

as a future standard for broadcast recording in Germany, and from then on rapidly phased out their direct disc cutting studios.

The curious thing about the development of the tape recorder to this stage is how little information on the new products appeared outside Germany. There were a few isolated reports in technical journals, but either the idea was dismissed as being impractical, or the information was too slight to impress engineers in other countries. Certainly it is true to say that when the Second World War broke out, the development of magnetic recording in Germany was proceeding with the coated tape, and elsewhere with wire or steel tape. Even towards the end of the war, when the American Brush Company started experimenting with paper-tape machines, the main interest was in wire recorders for portable use and steel tape recorders for broadcast applications.



A portable version of the K4 Magnetophon (1942).

From 1930 the record industry had been concentrating its efforts on improving the technology of the disc, part of this effort being directed towards improving the playback systems. The use of electric motors had come quite early, and during the Thirties the electromagnetic pickup became a feasible proposition since the valve had been developed sufficiently to allow amplification. The real difficulty was the sheer mass of the pickups used that would often reduce a record to shreds in a very short space of time. It was a time of consolidation for the industry, and although there were no real record booms at consumer level, a steady enlargement of business occurred. Technical innovations were being introduced, some at a very experimental level. A typical example was the pre-war Blumlein experimental stereo disc recording, which never saw the light of day, partly because there was no replay equipment in existence.

But the war put a stop to further commercial development of the industry, and the fascinating work undertaken in Germany disappeared for the duration—but hardly stood still. At a very early stage Hitler and his Nazi party had recognised the value of the broadcast and recording media, and even before the war they were making extensive use of them for propaganda purposes. Part of this exercise even involved entertainment recordings, where an emphasis was laid on the recording of classic German works to remind the nation of its stirring background.

Thus at the onset of the war there was a strong interest in the tape recorder and a big development effort was applied at AEG and the Reichs-Rundfunk-Gesellschaft. The result of this was the rapid introduction in 1938 of an improved K3 Magnetophon, which still used dc bias, and two years later the re-discovery by Doctor Hans-Joachim von Braunmühl of ac bias and its patenting in the July of that year.

June of 1940 saw the first public presentation in the UFA-Palast am Zoo, Berlin, of the K4 Magnetophon, a machine that incorporated ac bias techniques. From that point on development of the magnetic recorder shifted towards military types and the remainder of the important work was undertaken by the engineers of the German broadcast organisation.

Typical of these converted K1 Magnetophons were the two or

three stereo machines that made use of stacked tape heads giving two tracks across the width of the tape. Details of these machines are sparse, but it is known that there are a number of surviving stereo tape recordings of the period, probably in a German archive.

The first tape machine to appear in America was the Brush Soundmirror, which used a paper tape coated with black iron oxide. However, the interest in wire recording was obviously much stronger, for the Soundmirror remained unchanged through the war years until at least 1944 when Dr Ralph Oace of the Minnesota Mining and Manufacturing Company (3M) was asked to develop better tapes. Also, in 1941 Marvin Camras, a young researcher with the Armour Research Foundation, patented—once again—the long-forgotten ac bias technique. But this was only to be applied to wire recording machines, which were an important machine used in airborne service.

By 1945 German broadcasters had already developed a curious reputation for being able to transmit extended musical works and speeches at any time of day or night, and from all over the country—either they had phenomenal performers with remarkable stamina, or a new recording technique unknown elsewhere was being used. The secret of their success was revealed by the Allied forces who uncovered the story of the Magnetophon, much to everyone's astonishment. From this point on it was a case of technical pillage, with information and machines being spread amongst the Allied nations.

Something of the feeling for the mood of the period is expressed in the words of Jack Mullin, a man who was later to make recording history in the USA. Mullin was part of a team of American engineers following the Allied armies in Germany to analyse some of the technical innovations that were discovered. During one trip to Frankfurt, he met a British Army officer with whom he shared a common interest in music. Mullin says in a later account:

'He asked me if I had seen or heard the Magnetophon, a magnetic tape recorder which the Germans had developed and which he assured me performed with fantastic dynamic range, from full orchestral crashes to virtual silence without background and with incredibly low distortion.

'I told him we already had about six such machines back at our laboratory in Paris, but that their dynamic range was poor since their background noise was not as good as a shellac record, and their distortion had been found to be very inferior in the tests he had made. He urged me to go to the studios of Radio Frankfurt and hear the performance of such a machine myself. Thinking this chap must have a tin ear, I bade him farewell and began to drive down the mountain. As my assistant and I reached a fork in the road, with every intention of turning westward, I reconsidered. Suppose he had something there after all? We turned eastward.

'The British officer had told me that Radio Frankfurt had vacated the city during the heavy bombing raids and had relocated in a large house at a resort spa north of the city, a small town called Bad Nauheim. I drove there, found the house and confirmed that the radio station, as he had informed me, was now being directed by US Armed Forces Radio Service. The German staff was still operating and maintaining the equipment.

'I asked if I might hear one of the machines they were using. An order was directed to one of the technicians. I was taken into a room in which there was a large speaker and two of the Magnetophons. The mechanism appeared to be the same as the ones we had in Paris, but there was an obvious difference in the electronics.

'The technician placed a roll of tape on one of the machines and started it. Suddenly, out of complete silence, an orchestra blossomed into being with fidelity such as I had never heard in my life. From deep resonant brass to the shimmering of the flute—it was all there.'

From this moment, Mullin worked on the Paris machines to convert them to the same electronics as the Radio Frankfurt machine, and was rewarded with similar results. He was able to send two of these machines, together with 50 reels of tape, back to his home as war souvenirs, and these were later to play a very significant part in changing the face of the American broadcast scene.

Similar activities were being undertaken by all the armed forces, and soon samples of the broadcast machines were in the hands

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of the BBC. At first they were not terribly impressed, the summary from their research report on the first *K7 Magnetophon* being as follows:

'The noise level is rather high but is due mainly to hum and rumble rather than to noise from the tape. It is, therefore, not intrinsic to the system and could be eliminated. The speed constancy of the tape, while sufficient for most purposes, is hardly that of a first-grade recorder. The overall performance of the *K7 Magnetophon*, whilst not as good as the best that can be obtained from a high-grade disc recorder, is good enough for all normal purposes, but the equipment as it stands is not entirely suitable for BBC operational use.'

Despite this somewhat summary dismissal of the German machine, other people in the UK thought that the principles were worth developing. EMI immediately started working on a tape machine based exactly on the design of the *Magnetophon*, but with the advantage of additional ideas contributed by their own engineers. In November 1947 EMI announced its first ever studio tape recorder, the *BTR1*. A year later these were installed in their Abbey Road Studios in increasing numbers, until by 1950 they were to form the backbone of studio master recording. A few of the machines still survive there today—but relegated to the humble task of spooling tape.

Similarly, the BBC, now impressed by the performance of the *BTR* machines, decided to adopt them for studio work and commenced a changeover from disc-cutting machinery to tape. It was to be a long time before the disc-cutter eventually disappeared from BBC's Broadcasting House, but the impact that the change made echoed through the rest of the UK recording industry.

In America a similar process was under way, a process in which Mullin was playing a vital part. In 1947 a film producer, Hugh Palmer, approached Mullin with a problem. He had seen some demonstrations by Mullin of the versatility of the *Magnetophon*—especially when it came to editing the recorded material—and went on to explain that they had been having a lot of problems with a programme being broadcast by NBC. That programme was the Bing Crosby Show, which at that time was recorded on disc and then edited by transferring from disc to disc, with a consequent loss in quality. Having seen the facility with which material could be assembled on tape, merely by using adhesive and a pair of scissors, Palmer wanted to know if Mullin was prepared to undertake some experiments for him.

The ensuing scene was a competition in which the NBC technicians recorded a performance on several lathes and Mullin recorded on the *Magnetophons*. Also present was a Colonel Ranger who, like Mullin, had been in Germany, had also come across the *Magnetophon* and had returned to manufacture some machines of his own. The result of the 'competition' was that the *Magnetophon* won hands down. From that point on, the Bing Crosby Show was recorded on tape—but with only 50 rolls of tape and two machines, Mullin badly needed some backup. This was not long in coming—tape from 3M and machines from the newly-formed tape recorder division of Ampex. The result of this close cooperation and effort is now part of the history of recording; Ampex appeared with their 200 professional studio recorder and 3M with the *Type 112* tape (otherwise known as *RR* or *Raven Red*).

A new era had burst upon the recording industry, and soon tape recorders were appearing in studios all over the Western World. The value of the process in the home had also not gone unnoticed, and before long a wide range of domestic machines were being offered. For a while, such was the popularity that some recording companies took out insurance by offering pre-recorded tapes for sale—obviously concerned at the impact the new medium might have on the disc!

Suddenly a whole new range of recording possibilities were available, and stereo and multitrack recording were explored simultaneously. Stereo was not new to the recording industry—Blumlein had experimented with stereo discs before the Second World War; and in America, Bell had conducted several experiments in stereo transmission by wire, and had even tried recording the results. Initially, tape machines were modified simply by the addition of a second tape head, staggered from the normal recording head.

But this was clearly full of hazards and before too long stacked tape heads started to appear on tape machines.

By 1954 EMI's Abbey Road Studios were regularly making stereo recordings, and in April 1955 launched their *Stereosonic* tape records. This was a 2-track stereo recording initially mastered at 38 cm/s and then duplicated down to 19 cm/s for domestic consumption. In America, RCA launched mono tape records in June 1954 and then in the September produced a staggered-head stereo record.

Two years later the impact of the multitrack recording head was to truly break upon the industry when Ampex demonstrated a three-core stacked head, this being the precursor of multitrack machines that were very soon to follow. In the UK Abbey Road at first installed the EMI 2-track *BTR3* recorder, and then in 1958 installed the first Telefunken *T9U*, modified for 4-track working. It was on these latter machines that the Beatles made their forays into the new and exciting world of multitrack recording.

What followed is still very much within the memory of most of those who presently work in the industry. But it is interesting to see how the various threads that had been parts of broadcasting, film and record for many years suddenly drew together. Up to the 1950s, artists had performed in quite a formal manner, and the finished record, film soundtrack, or broadcast was the result of quite straightforward recording techniques, recording quite straightforward performances.

From the Fifties onwards, record producers discovered that a new dimension had been added to the record—the possibility of creatively modifying the recording *after* it had been recorded. New words were added to the language: 'mixdown' instead of just transfer, and so on. Interest in the 'one man band' was aroused by such brilliant innovators as Les Paul and later Wout Steinhaus. And at the same time, the record itself was progressing with the introduction of the Decca *ffrr*—'full frequency range recording'—high-quality disc, the re-introduction of the 33½ rpm disc with the new 'microgroove', and the competitive introduction by RCA of the 45 rpm disc.

The era of rock and roll triggered off a tremendous boom in the industry, from which it has hardly looked back. By 1946 RCA had already celebrated the production of their billionth disc, but this sort of effort was to be exceeded quickly in the years that followed. Bing Crosby was awarded a platinum disc in 1960 to mark the sale of 200 million records, and by 1970 he had gone on to top 300 million records sold.

But before one becomes too complacent about the success of the recording industry in generating new ideas, it should be remembered that somewhere there is always someone who has done it before. Although multitrack recording was not to appear in a record company studio until the late 1950s, Walt Disney had done it all before with his remarkable film 'Fantasia'. Around 1939/40 the *Fantasound* system was developed using four tracks on the film: one for control signals that switched the replay amplifiers to various speakers in the auditorium, the other three forming the soundtrack.

Somewhere in the history of sound recording there is the basis of an idea that will be announced with great fanfare sometime in the future, but I wonder who will acknowledge the past? Perhaps the most salutary tale is told by a friend of mine specialising in the study of mechanical music instruments. He remarked that recorded sound is considerably older than 100 years—after all Haydn had scored music for a carillon which still works to this day in some corner of Germany. Under his supervision the music was transferred to the pin drum that actuates the bells, and must now be one of the only surviving examples of a sound record of a piece of music that is played *exactly* as the composer had intended.

It is also interesting to speculate that here was a composer intimately involved not only in the creation, but also the recording technology. From the inception of what we recognise as recorded sound that degree of immediacy was lost—until the present day when again composers who are engineers and *vice versa* are directly producing records that make use of the recording technology itself, to create sounds that could never be heard otherwise. After all this time we have come almost full circle—the composer, the recording engineer and the technology are truly a part of the total process of creating music. From recording the events on a sound stage as faithfully as possible, we are progressing to an age where the musicians on stage are trying to recreate what they have laid down on a record. ■

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George Martin

the formative years

George Martin needs no introduction . . . here he discusses the early part of his career with PAUL LAURENCE

WELL I've always been in music of one sort or another; mainly as a kind of amateur thing. I started playing piano when I was five years old. And I really only got into it professionally because I found out I couldn't do anything else quite as good.

I was running a dance band when I was a kid, which was the equivalent of what a group is today. At the tail end of the war, I joined the British Fleet Air Army when I was 17. And when I came out of it, I was about 21. I had no career—nothing. But all the time I'd been writing music and I'd been playing—just as a hobby—and one of the guys who was interested in what I was doing was a professor of music at the Guildhall School of Music, London. He urged me to take up music seriously. And as I couldn't think of anything else to do, I went and passed an audition and examination for the Guildhall.

I studied there for three years—I got a grant to do so—and I took up the oboe. I studied composition, conducting, orchestration, and at the end of the three years I emerged as a *real* musician, instead of just an amateur one.

I was pretty good on harmony and counterpoint. On music theory I was good—I mean, I got pretty high marks. I wasn't too good on playing; my oboe was all right—I was able to earn a living when I came out of it—but I wasn't a great performer; I was a very nervous character.

But I was able to earn a living when I left. I'd worked for the BBC for a while—in their music department—during the day, and I still played the oboe in the evenings. I'd play for Sadlers Wells and that, and the odd orchestra in town now and again. And out of the blue I had a letter from a guy by the name of Oscar Preuss, who worked for EMI, asking if I would be interested in working with him as his assistant because my name had been given to him. I didn't know who had recommended me to him, but I was quite grateful. Anyway, I went along and he offered me the job and I took it. And I thought 'Well, it'll be okay'—again—to work during the day, and I can still play at night and do my writing and so on'. But the job was to produce classical records for EMI's Parlophone label. Or rather to assist him to do that. And I found out that my fairy godfather—the guy

who's taken such an interest in me way back—had a friend who was a producer of operatic records at EMI, and he was a friend of Oscar Preuss, and that Oscar had said, 'Do you know a young musician who'd be interested in this kind of thing?'. My name got around; that's how it happened—I was very lucky.

So you started off actually producing?

Yes, learning how to produce; and I took it on really as a kind of second string because I wasn't really all that interested in recording.



George Martin producing an early Beatles' recording session.

But of course, as soon as I really got into it, I got hooked, well and truly. I found it completely fascinating, and I gave up all ideas of becoming a 'Rachmaninoff III' and decided to concentrate on recording. Five years after I'd started with this guy, he retired and I took over his job as head of Parlophone. So it was a fairly quick rise—I was still in my twenties

then. That was a long time ago.

What was the A&R Department like?

At that time? There wasn't an A and R department of EMI; there was a label which had its own people. And EMI consisted of HMV, Columbia, Parlophone, and I guess Regal-Zonophone. And then the important labels like Capitol. Now HMV and Columbia were the big boys—they were the big labels—and their pop labels and their classical labels were handled by different people. The pop label was handled by the head of production—the guy who ran the label, in fact—and he was also responsible for importing stuff from (in the case of HMV) RCA Victor, and also making his own records. And the same with Columbia—they had input from CBS, and they also made their own records.

In the days when Oscar Preuss was my boss, Leonard Smith was head of Columbia, and Norman Newell was his assistant. And Wally Ridley was on HMV. When I took over Parlophone, Norman Newell became head of Columbia, and Wally Ridley was head of HMV on the pop side. The classical end of those two labels was done by other people—Walter Legge and David Bicknell, and so on. On the Parlophone half, it was such a small label—much smaller than the big guys—that there was no other person for the classical end. We were the classical end, so we did everything. So that on our label: it was me, and that was it. I had an assistant eventually, by the name of Ron Richards, who later became my partner. And the whole label was run by four people—me, Ron Richards, my secretary Judy Lockhart-Smith, and Ron's secretary Shirley Spence; and that was it.

Who did you work with?

People you probably will never have heard of. I started off with a group called the London Baroque Ensemble, which was a classical group of woodwind musicians. I used to do everything. I used to *have* to do everything, because it was a small label. And we had classical music; we had jazz; we had pop music of its day; we had light, middle-of-the-road orchestral stuff. So, on the one hand I might be recording something like . . . a

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GEORGE MARTIN

45-piece orchestra with a Leroy Anderson kind of music. It was very much muzak nowadays. On the other hand, I might be doing jazz with the Johnny Dankworth Seven or Humphrey Lyttleton.

These were the pop people of the day. But you just had to do everything that came along, and try and find something a bit new. When I took over the label in 1955, I had to try and make a go of it; I started recording spoken work a lot—on comedians.

What about the Goon Shows?

The Goons were three people; four people originally and one soon left—Michael Bentine was the guy who left—and so it became Peter Sellers, Spike Milligan, and Harry Secombe. Spike Milligan wrote all the scripts and was the kind of eccentric genius behind it all. Peter was the man of many voices . . .

When I first met Peter, he was kind of stooge act to a radio show—before he ever made films—and Harry Secombe was a genial . . . er idiot who would sing. Had a very fine operatic voice; he still does, of course—sings very well. A marvellous trio of people—beautiful people. And they started doing great shows on radio. At that time, I got to know both Peter and Spike, and I started making records with just Peter. I also made a record with Spike, and made a record with Peter and Spike together.

I bought from the BBC some of the Goon Shows that were being aired on the radio. These were then edited down and issued on record. It was a very zany form of humour—the forerunner of 'Monty Python'; it was marvellous working with these people, and I became very firm friends with them all. And in fact, I was best man at Spike's wedding, which was a pretty crazy affair too.

I made three albums with Peter Sellers, which were big hits in England; I made records with Spike too. Harry Secombe recorded for another label, because he just recorded his singing—his operatic singing. So that was that.

Were the Goon Shows a source of a lot of the crazy sound effects on the Beatles' records?

Yeah, that, of course, was great fun to do. We had to create everything for ourselves; and it was painting pictures in sound, which was great. It was a very useful experience—in fact, to be quite brutal about it, I don't think *Sgt Pepper* would have existed without Peter Sellers.

Things always rub off, you know. When the Beatles first came along, I think one of the things that they liked about me was the fact that they knew that I made these kind of records . . . 'cause they were pretty zany too.

What, if any, were the 'producer' influences?

Well obviously I like lots of records, but I really don't think I've ever been influenced by another producer's record. Producing's a pretty lonely job—you don't know what another guy does; you never see another guy producing. You just develop on your own lines . . . it's no good 'studying' other people's techniques, because you can't really know for sure how it's done, unless you're actually

there. All you can do is think how those particular things were achieved. But I think it's much better not to inquire about other people's, just plough your own furrow—you try and find out things for yourself.

How about arranging?

Well, orchestration and arranging for instruments varies with the kind of performance that's going to be made. So, for example, you will do a different score for a pit orchestra behind a musical, to the kind of score you will do for a film, and to the kind of score you will do for a gramophone record; each one depends upon how it's going to be performed.

There are some fantastic orchestrators of the past—Ravel, of course; Tchaikovsky was a great orchestrator; Debussy was pretty good. And these are the kind of people whose scores I studied. Stravinsky is fantastic. And I would find out how they did things . . .

When I was 15, I was enormously turned on by going to a symphony concert in England, where they played *L'Après-midi d'un Faune* by Debussy—*Afternoon in the Life of a Fawn*. It's just a tone poem—an orchestral tone poem—and the sounds that I heard, as this boy of 15 sitting in this auditorium, I couldn't believe that those ordinary human beings in front of me were making! It was just so beautiful, so fantastic—they were gorgeous. I was so enthralled by this I thought, 'Well how does it work? How do they do it? How did they write that music? I must find out!'

I got the score for that piece and I studied it and looked at all the notes—I saw what instrument was on which and so on. And even today, many years later, I can still listen to that same piece of music with awe, because I know how it works—I know what is done, and I can write music just like it now. But I know exactly how beautiful and how brilliant they were; it was purity of style.

That means two things in music. There's the way in which it is put over, ie orchestration, the colouring. And then there's the pure notes themselves, whether it's done on a harmonica, a synthesiser, or a symphony orchestra. The actual musical frequencies and notes that go out are the original musical creation, and what you do with it and the way you colour it is another matter—they're two distinct things. The design—the actual design of the music—is like a blueprint. And you don't need to hear it—you can look at it and you can admire it; you can hear it in your mind by looking at it.

And Bach, for example, was a fantastic designer of music. The purity of his music is incredible and, in fact, it's so contemporary in many respects. A lot of pop songs that we have today are based on Bach's ideas.

Of string quartets?

String quartet writing does teach you something; it teaches you to be economical, for a start. When you've got four lines to play with, it teaches you the way to dispose those lines together. And, in fact, if you write well for a string quartet, I believe you write well for strings in general.

A lot of people make mistakes when they

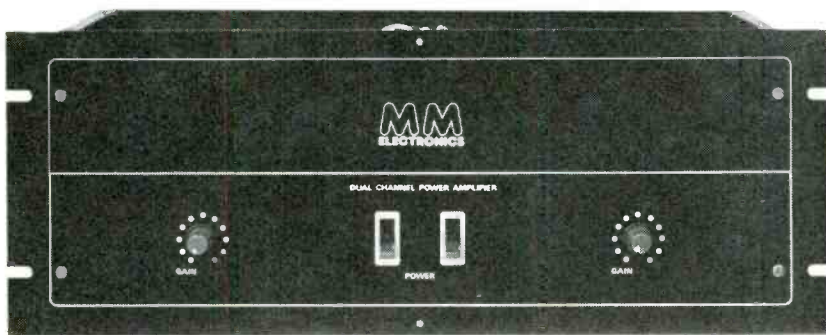
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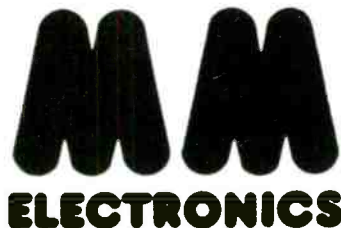


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GEORGE MARTIN

start trying to write for strings by thinking in keyboard fashion. Because a lot of people play piano, they look at their two hands and they think, 'Well if I transpose that to strings, it's gonna sound okay'. But it doesn't work that way; you've got to think in contrapuntal terms of four lines working together. And once you've got that into your system, then you can write, I think, for strings.

It's a question of the grouping of the notes. The tendency for a pianist, when he starts out, is to write a bass line and a group of things in the top. Like his two hands: the left hand is the bass line, and the right hand is a bunch of chords. And they tend to write like that—the violins and violas are up bunched together, and the cellos down by themselves. And that really doesn't work too well; it doesn't make for an even-spread sound.

You've got to think of the music as an entity, without thinking too much of the instrument which is natural to you. If you are a pianist, or if you're a guitar player, you are imprisoned by what you play, so you tend to think the way your fingers go. That's why so many pop pieces of music, written by guitar players have kind of . . . whole-tone slides because they do that on their frets; they find a particular chord position, and by moving a couple of frets down they get another whole-tone of the same chord. And a lot of compositions are dictated by that. A pianist will do particular things which fit his hands and influence his writing, but any guy who's writing music should try and free himself of those fetters. Because writing music is cerebral—it's something you *think* about—and you shouldn't really be influenced by the *physical* aspects of your body. You should think of your mind.

What about the Beatles signing?

I signed them to Parlophone Records for four years. I actually signed them for one year, with three options by EMI to sign them for a further three years. So it was a four-year deal. There weren't any guarantees—they were unknown people, and were lucky to get a chance. And the deal—for them—was pretty rough. They didn't get much money at all out of it. On the other hand, it was the kind of thing where I said that, you know, if you have anyone who shows promise, then obviously you change the contract. It was as simple as that.

Weren't the Beatles the first of those kinds of groups to get a record deal?

Yes, and in fact they'd already been turned down by every other record company in the country. But that doesn't mean much, does it? I mean, the kind of deal I signed them to wasn't gonna break the bank if they didn't work. I needed something, and I thought they were good. So I signed them.

Were they considered the best Liverpool band at the time?

Not really. If you look at the bill posters of the time, they were kind of way down the list; you've got other people above them in the billing.

Was there such a thing as a 'Mersey Sound'?

I think the answer—why Liverpool happened to be the place—was that Liverpool was probably the busiest port in England, outside of London. And these guys in Liverpool rubbed shoulders with all the sailors coming off the shore. It's very much a dock area, and a seafaring town. It's also the sort of focus of all the Lancashire industry—Manchester and Birmingham send all that stuff through to Liverpool; it's kind of a connection point, if you like. Rather like Hamburg was. And I guess influences came that way.

Were the Beatles on a demo?

The very first demo I had was a tape that Brian Epstein brought to me, which I thought was interesting. I got them down for an afternoon in the studio—it was a recording test, in fact. And I spent an afternoon with them, and they played through some of the stuff they did, which was sort of standard things. There weren't many of their own compositions—they were things like *Yer Feet's Too Big* by Fats Waller, and *Over the Rainbow* and things like that. I don't remember the actual tunes they played, but I know that there were a lot of things that . . . were fairly recognisable.

What did you think of their writing initially?

It was okay, but I wasn't knocked out by it. It wasn't very good, actually; it didn't show the enormous promise that came later. I think the only influence I had on them at that stage was to tell them to go and do better. Because after *Love Me Do*, I looked around for a hit song for them, and I found one, written by Mitch Murray—who was one of the writers of the day in Tin Pan Alley—I told them to record it, and they weren't very happy about it. They did record it, and the tapes are still there. In fact, there was a radio station that had been playing it. *How Do You Do It* was the title. They came to me after we made the track and they said, 'Look, we can do better than this', and I said, 'Well I don't believe you can, but show me'. And they came back with *Please Please Me*, and I admitted that they had a super record. That was what I was looking for.

Did they have any kind of sense of their best tunes at all?

Oh sure. When *Please Please Me* came along, we all . . . I knew it was a hit. And I told them so after we'd finished the thing—I said, 'You've got your first number one record'. And from then on, that spurred them on to writing more.

How were the tunes selected for the first three or four albums?

I would listen to what they had to offer, but I wasn't very impressed with it. The very first record I issued, which was *Love Me Do* and *PS I Love You*, was the best of the bunch they had. And it was okay, but I wasn't knocked out by it. I mean, it was good enough for a first issue, but it wasn't the big one I was looking for. And that was borne out by the success of things, because it only reached number 17 in the British charts.

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GEORGE MARTIN

For the first album, about how many tunes were under consideration?

I already knew their material when we did the first album because I'd seen them up in the Cavern and I'd seen them performing. Their first album was a matter of expediency—we had a number 1 single hit, and I wanted an album out quickly to cash in on it. So I got them down to the studio and I said, 'Right. We're gonna do all the stuff you do at the Cavern. And I want you to knock it out quickly'. We started at 10 in the morning, finished at 11 at night, and that was the album. Not much art in it, but it worked. It had that raw, gutsy thing that we wanted. Not bad considering that the band had had no recording experience before *Love Me Do*.

Did they understand about recording?

Well, they didn't know anything about recording at all in those days. They knew that a microphone was a thing you sing into, and that was about it. All they knew was that they wanted a very driving sound, a very powerful sound.

What about the Capitol of Canada version of 'Love Me Do' that's radically different?

We did make several versions of *Love Me Do*, but there couldn't have been more than about two or three; there weren't that many. I don't know, people pinched tapes, didn't they? Only one was issued, that's for sure.

Every single was released in mono. It was never thought of as being stereo, because there were no stereo singles in those days. But the facilities I had in the studios were very primitive. We didn't have 4-track—we had stereo machines and we had mono machines. I used the stereo machine because it was better than the mono machine. I used to use it as a twin track—put all the backing instruments on one track and all the voices on another. I don't think people realise today how primitive life was in the recording studio in 1962. Nothing was intended for stereo release.

Why was it customary for the singles not to be included on the albums in England?

Because we thought it was better value for money. First of all, if you're gonna make a single you should make a single, and if you're gonna make an album you should make an album. And if you *did* include a single in an album, it should be an *addition* to the album rather than part of the album. So that if we included a single on an album, we would make it a 14-track album instead of a 12-track album, and the extra two tracks would be the single.

Why did the United States get so many mono versions of tunes that appeared in England in stereo?

Well in the early days, Capitol did some very strange things; we didn't like what they were doing at all, but we had no control over it. I got very uptight about it all. *Sgt Pepper* was the first album not to have been tampered with... Capitol then in those days was run by guys who thought that they knew all the

answers. Anytime we'd complain, they'd say, 'Well, you don't know the American market. We do.' And what can you do from England, 7000 miles away? Whenever I came over I was an embarrassment to them anyway; I was sort of kept in the background.

Capitol even changed the running orders and B-sides.

Well, I guess people were trying to justify their existence. As I say, we had no control over it—we didn't know what was being done. We knew later when it was done, but the answer always came back: 'We know this market better than you do, so stay out of it'. And they took the credit for it too. I got very uptight when I'd see records that I'd produced. I'd see an American version of it and it said: 'Produced by George Martin in England and Dave Dexter in America'. Look at some of those early albums—you'll find it that way. In fact, on the first album it was just: 'Produced by Dave Dexter'.

Alan Livingstone, who was head of Capitol at that time, would sort of hog all the lime-light. I remember a press reception... and somebody kept me in a back room, 'cause I was there. And I was never introduced to any of the press, or anyone else.

It seems to be the feeling at Capitol that this was a transient sort of phenomenon, and best cash in on it right now.

Well everybody thought it was a transient phenomenon anyway—even at EMI; everybody did. They'd say, 'It couldn't last'.

At what point did you begin to realise what you were on to?

I never did realise... I just knew that I wanted to make something and I didn't want it to stop... I wanted to keep going. I didn't really think about it being a transient phenomenon at all, it was just something you did.

Did the Beatles generally supervise all the harmony parts being worked out?

They had their own basic sound, which I elaborated on. Whenever they wanted anything new worked out, we used to work it out together—it was a team. Eventually, when it became as complicated a track as *Because*—which was three sets of three harmonies—when we worked out those harmonies, I would sort of go down to the piano and say, 'Right, John, you sing this; Paul, you sing this'. And Paul would then say, 'Well can I sing such-and-such'. That was the way we worked it out.

Were there any sort of standard 'slots'? When, say, John would take the lead—assuming a standard I-III-V harmony—would George usually take the third and Paul the fifth?

The basic starting point was the song—it was a tune, and they would add harmonies to it as they felt like it. It depends on what period of their development you're talking about; in the early days it was obvious just to add a third above or below the main voice, according to which way the chords were... it was very elementary stuff.

George Martin, thank you very much. ■

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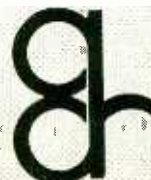
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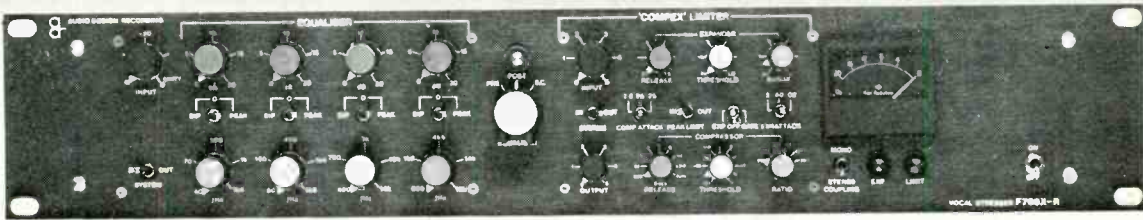
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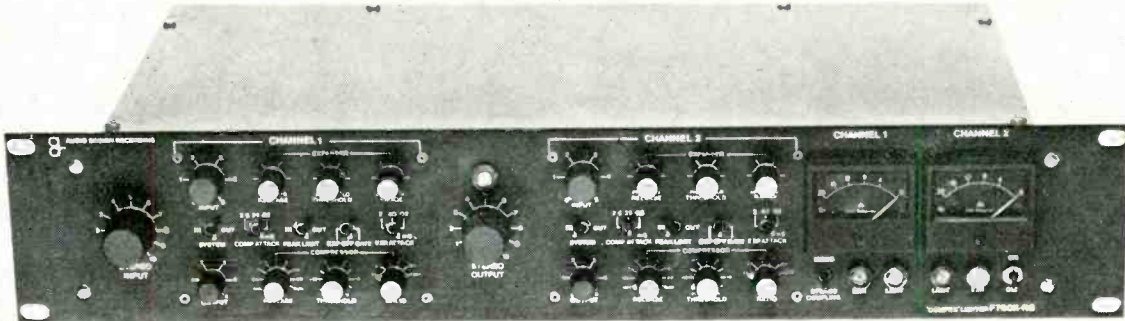
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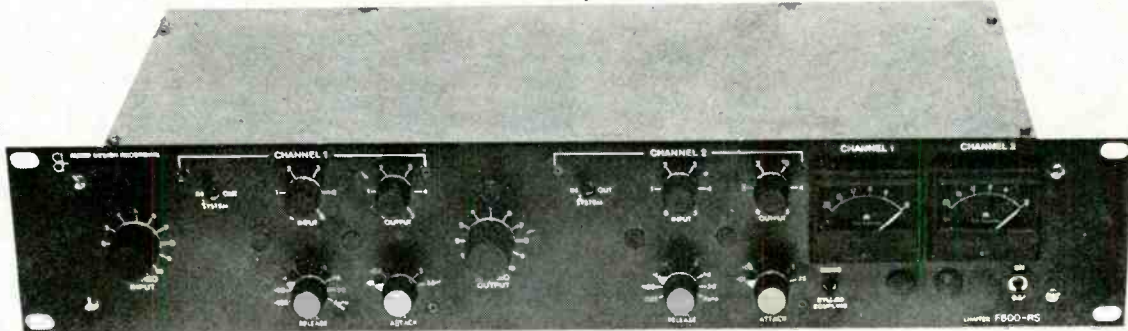
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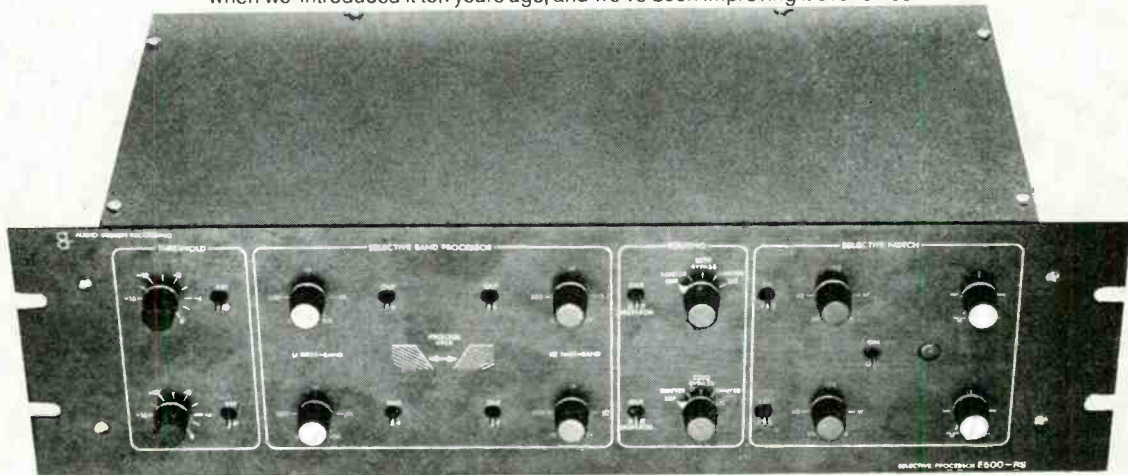
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Rock 'n' Roll rules —ok?

Jeremy Pascall

It is only slightly overstating the case to say that 1956 witnessed the start of a bloodless revolution that, over the next two decades, was to have consequences almost as far-reaching and, in many ways, as profound as the violent events that had occurred in Russia 40 years previously.

JUNGLE DRUMS

**'Rock and roll will always be,
It'll go down in history.'**

Danny and the Juniors, 1956

IT WAS a revolution without plots or conspiracies; without, initially, any political motivation. It was, however, the revolt of a generation, and its revolutionaries were held together not by ideologies or class solidarity but by age—by *youth*.

The leaders of the revolution were not Lenin, Marx and communism, but Bill Haley, Elvis Presley and music—rock and roll music. Rock and roll erupted, almost by accident, in 1956, and sparked a well-defined and, subsequently, deeply-entrenched generation gap with accompanying political, social and financial changes that were so sweeping as to become global within a startlingly short period of time.

In the historical perspective of twenty years, the inevitability of the rise of rock and roll and the emergence of teenagers as very nearly a separate species with their own, very individual culture, is quite easy to see. The signs were there before 1956. Rock and roll wasn't the wedge that split the generations, it was the sledge-hammer that drove the wedge home. The thinnest edge of the wedge had become evident several years before.

In 1951, J D Salinger's 'Catcher In The Rye' had been published to wide acclaim. As the critic Walter Allen has said, it had a significance beyond literature; 'Its sensitive and confused hero, Holden Caulfield, narrating his story in a vernacular of his own, part high-school, part hipster slang, became a myth-figure with which adolescents everywhere identified themselves'. Perhaps for the first time the yearnings, aspirations and depressions of the young had found a literate expression.

More of the wedge was to become apparent in the next few years in a less literate way, but one that probably had a more widespread impact. Significantly, it was the cinema—an intensely visual medium—that portrayed cult figures to whom the young could relate. However, the movies had been geared, commercially, to an adult audience; the stars appealed to a reasonably mature market that demanded sophistication. Two actors were to break the strangle-hold of the fluent, capable screen idols—James Dean and Marlon Brando. Three films starring these young men were to draw the battle-lines of the generations.

Dean made an enormous impression on the young in 'East Of Eden', released in 1954. The film portrayed an intense and painful confrontation between two men of different generations. Dean's surly, hunched and aggressive characterisation appealed immediately to the young, and his position as the misunderstood, sensitive anti-hero was consolidated the following year in 'Rebel Without A Cause'.

The adult audience regarded this film with particular dismay because Dean did not portray an underprivileged kid from slum tenements but, as film historian Leslie Halliwell has noted: 'For the first time the hoodlums were shown as coming from rich, comfortable homes'. To adults, Dean's anti-social behaviour was inexplicable; to their children it was symptomatic of their search for

identity and the apparent futility of materialism. James Dean's popularity was further increased by the manner in which he carried over the surliness from his screen persona to his private life. To clinch his tragic stature he was killed in 1955 in a car crash; a fittingly violent end to a short, turbulent and explosive career. Dean soon achieved the dubious role of martyr and was posthumously borne on a flood of necrophilic love.

In 1954, Marlon Brando caught the attention of the young in 'The Wild Ones', an aggressive and violent story of a motor-cycle gang (precursors of Hell's Angels). The film was considered so threatening and anti-social, that it was banned in Britain by the Board of Film Censors and only screened in one cinema.

The adult public reacted to these films with disgust mingled with fear, and soon tended to interpret any break of convention by the young in terms of violence. They seemed to imagine that any new trend their teenage children adopted would be accompanied by hooliganism and delinquency. Adult authority squared up to take a repressive stance.

To the young, such movies were an articulation of their own disaffection and discontent. They were blindly searching for a means of expressing their individuality, and a way of rejecting their parents' values and life-style that did not need to be overtly violent.

The turning point, significantly, came with a film *and* a song. The film was 'The Blackboard Jungle', the story of a well-meaning white liberal teacher who takes a post in a tough slum school whose pupils seem to be uniformly delinquent. It appeared in 1955 when the Press and politicians were intensely concerned with the problems of 'juvenile delinquency'. Glenn Ford as the harassed teacher tries to communicate in an enlightened manner with his thuggish young charges. A method he adopts is to take his treasured collection of jazz records into the classroom, and use music to bridge the communication gap. With ill-disguised symbolism the students reject his music by callously smashing his beloved 78s. That's not their kind of beat; what they want is the sort of song that was used over the film's credits—*Rock Around The Clock*.

Both the film and the song fired the imagination of young audiences, who were frequently heard to cheer at the record-smashing scene. The film was released in America in February 1955, and by May of that year *Rock Around The Clock* by Bill Haley and the Comets was in the Top Ten, where it stayed for five months.

At last the young had a music form that was uniquely their own. Although it seemed to take almost everybody by surprise, rock and roll wasn't, of course, a sudden and wholly new type of music; it was a distilled and, to a large degree, cleaned-up version of black music that had its roots deep in rhythm and blues and other distinct forms of negro music. It wasn't widely welcomed by American youth until most of its black origins had been obscured, and it had been adopted and adapted by white performers.

Rock Around The Clock had been originally written in 1953 as, of all things, a novelty foxtrot!

But once it had gained a hold, rock and roll spread with remarkable rapidity—it was just what the young had been waiting

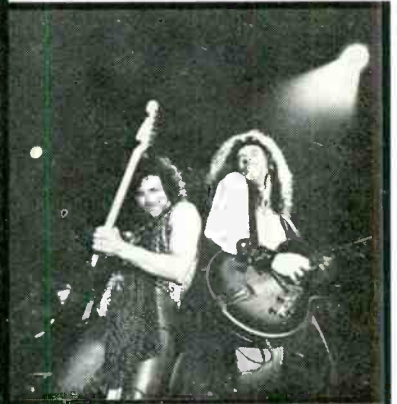
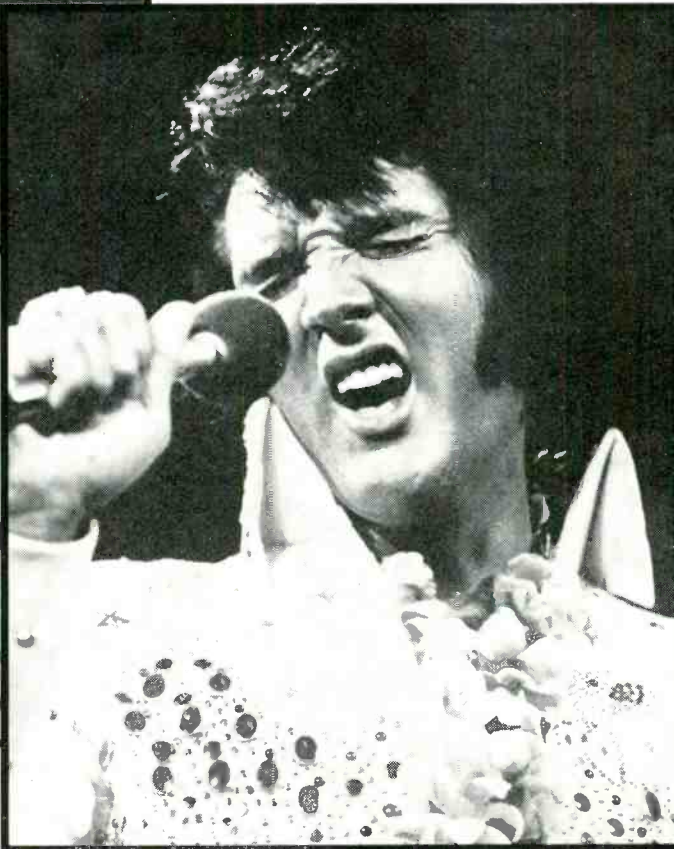
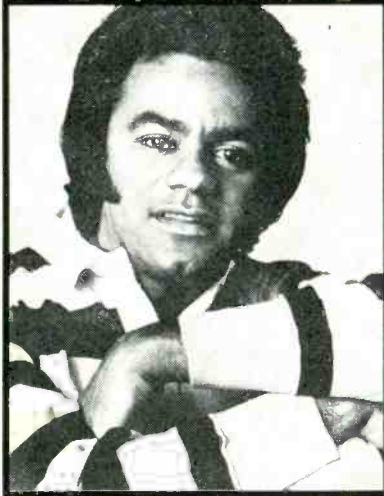


understand the music had firmly linked in their minds rock and roll with violence.

By the time the film reached Britain the violence myth was well established, and it was there that 'trouble' came. The film played in 300 cinemas in the UK without any trouble (and many of these were in the very toughest areas like Glasgow). But when it was screened in London a few hundred teenagers came out of a cinema singing and dancing. They held up the traffic with their youthful enthusiasm, and were responsible for the breakage of some cups and saucers. There were a few arrests and the offenders were subsequently given trifling fines for their minor misdemeanours.

The Press, rather typically, claimed the incident was 'a riot', and that numbers in excess of 2000 were involved. Such reports clinched in the corporate public mind the unsavoury effects of rock and roll on youth.

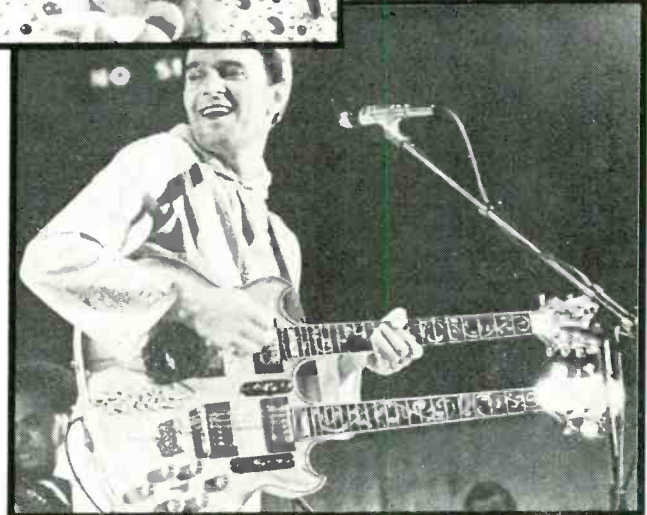
Authority around the world acted quickly and repressively. Egypt saw the film 'as part of Eisenhower's policy to disrupt Middle East affairs by undermining the country's morale'. Moscow 90 ▶



for. Its association with 'Blackboard Jungle' gave the music rebellious connotations; it was brash and raw and unsophisticated. Adults didn't like it because the music was noise to their ears and the lyrics meaningless and incomprehensible. To adults, two strong and interconnecting themes were embodied in rock and roll: a direct challenge to their authority, and an increasing worry about juvenile delinquency. Their suspicion and fear of it became even greater when they realised that it was not just a passing fad.

In 1956 Bill Haley—who with disc jockey Alan Freed became the identifiable leader of the rock and roll phenomenon—made a film in his own right also titled 'Rock Around The Clock'. As an indication of the movie's popularity, it is interesting to note that it cost only \$200 000 to make and grossed \$1 million in one year in the USA alone.

It was almost as if adult authority and the Press wanted the film to be met with juvenile disturbances at every cinema, even though its reception in America was wildly enthusiastic but in the main quiet and uneventful. However, adults who disapproved or could not



ROCK 'N' ROLL RULES—OK?

condemned the music as 'fake folk', and Iran went as far as to declare that rock and roll was 'a threat to civilisation' and immediately banned the film.

Such over-reaction had the effect of impressing upon the young that their youth denied cultural and national barriers and, for the first time, they saw themselves as a homogeneous and identifiable group. 'Rock Around The Clock' wasn't simply meaningful to white Western teenagers—it had a similar impact in the Near, Middle and Far East, as witnessed by the fact that the film ran for 11 weeks in Bombay.

Although rock and roll was the music that brought youth together, its early high priests were not yet of their own generation. Bill Haley was older than the average teenager and had been singing in a country style for several years. Alan Freed, the disc jockey who brought the music to a wide American audience, was also firmly adult. 'I really dig Alan because he's not like most older people. He's like a father ought to be. He makes me feel wanted', said one female teenager.

What the young wanted now was a hero of their own generation, and they didn't have to wait long. 1956, a year of extreme adolescent excitement and change, saw the arrival of one young man who was to give rock and roll its style, and firmly imprint his personality on a generation.

In many ways, Elvis Presley epitomised rock and roll. He was born in Tupelo, Mississippi, the son of poor whites in the poorest state in the Union; his background allowed him to absorb both ethnic black and country and western music. His people were underprivileged in an affluent nation, and his father had to move to find work.

Presley's impact on the young was unprecedented and enormous. He had the smouldering good looks of Brando, a unique vocal style and—probably most important of all—sex appeal. His act was overtly sexual—aggressive, arrogant and challenging; particularly his pelvic wiggle, and whether he stuffed rolled-up handkerchieves down the front of his trousers (as some claimed) was immaterial. Girls all over America (and later the world) reacted to him in the same physical manner. Even more telling was the fact that Presley's appeal was bi-sexual—girls squirmed at him and boys imitated his curling lip, his hair, his clothes and his swagger.

Appropriately, Presley was introduced to America through television. Teenagers didn't have to go out to see him; he came right into their homes; he was beamed to a wide and unselected audience, adults and children alike watching him on the networked 'Stage Show' programmes. They reacted in their own ways: the young loved Presley; the mature loathed him. The split was open.

His acceptance by the young was swift and total—his popularity knew no bounds. The showbusiness establishment could not ignore him, and yet it could not quite approve. The problem was sex: when his persona and act were matched to the sexuality of the music, the brew was a blatantly erotic one that worried adults. On the 'Steve Allen Show' Presley was ordered to wear evening dress and eschew movement; when he appeared on Ed Sullivan's tv programme the cameras shot him only from the waist up. In Florida the police filmed one of his stage shows following complaints from local parents' organisations—'the only thing I could move was my little finger!' claimed Presley—and the 'New York Times' once complained that he 'injected movements of the tongue and indulged in wordless singing that were singularly distasteful'. When Presley snarled lyrics like, 'I was born standing up and talking back', he crystallised the new-found confidence that parents so deplored in their children; they could readily believe his sung assertion that 'I'm evil'. Presley was a *bête noir* to parents and a *cause célèbre* to teens.

The impact Presley had on the new teen culture cannot be over-stated. His success turned recording into a multimillion dollar global industry. If adults grumbled that they couldn't understand the words he was singing, they missed the point; youths in Germany, France, India and Malaya couldn't understand the words either, but they could understand the feeling that the music conveyed. Rock music became the language and achieved much more in communicating internationally than Esperanto could ever hope.

Presley's rock and roll started trends. The young felt a spiritual homogeneity; next they wanted a uniform, and an industry sprang up to cater to their tastes. Presley's name endorsed products and his hairstyle was copied the world over. Jeans were now more than just work trousers—anyone without them was improperly dressed. The new post-war affluence gave teenagers spending power, and there were businessmen astute enough to supply the goods their money could buy. For the first time in history, the young became a separate and financially viable commercial market with records, films, publications and a vast range of fashion and cosmetics goods tailored for them. Once the financial bastions had fallen to them, it was only a matter of time before all others would follow. With the birth of rock and roll teenagers had found themselves, recognised their individuality and drawn around themselves the jealously-guarded trappings of an elitist group. Once rock had breached the walls of adult domination a flood of allied interests and ideas would pour forth. The young had finally found their voice; now they would find and flex their muscles.

THE EMERGENCE OF THE BLACK CULTURE

'Sing it loud. I'm black and I'm proud.'

James Brown, 1968

In the mid-1950s America was still a deeply racial society; socially, politically, financially and culturally the population was split between black and white. The blacks—poor, underprivileged and in many areas denied their civil rights—had retained a close-knit identity that found expression in music. Black music had a strong and enduring stream running through it that sprang from the work songs of the slaves, through the blues, jazz, gospel, and culminated in urban or rhythm and blues.

There was also a tradition of mainstream white entertainment drawing on the rawer black sources, frequently diluting and re-presenting them or allowing certain 'acceptable' black performers to join the entertainment industry. For every Bessie Smith, Paul Robeson, Ella Fitzgerald and Louis Armstrong that made the grade in a white-dominated show business, there were thousands of lesser-known, but no less original and creative performers who enjoyed only local, black or minority white popularity.

Just before the sudden rise of rock and roll, the Top Ten chart was dominated by 'Italian' artists, primarily those from immigrant backgrounds, led by Frank Sinatra. These artists were primarily crooners and ballad singers whose subject matter was essentially of the 'Moon/June' variety. The few blacks who could command national popularity were those like Nat King Cole whose physical attraction conformed to a white stereotype, in that they weren't obviously negroid in features, and who were called upon to perform typically 'Italian' songs.

But true black music existed and flourished in a limited market. In urban areas with large black populations, and in some large rural districts, there were small recording companies that produced black music performed and written by blacks for blacks (commonly dubbed 'race labels') and radio stations that broadcast this music. The strongest thread was rhythm and blues. The blues had come from poor blacks in depressed rural areas, but over the years, and with the migration from the land to the cities and ghettos, the blues had become more strident, and by the 1950s more frantic as if in tune with the sounds of the streets. What now appeared were urban blues—harder, louder and more raucous than before; blues with a pounding rhythm.

The music was less mannered and certainly less inhibited than the tunes that consistently made the Top Ten. Underlying them was a joyous, sexual exuberance that offended the stricter mores of white society. But, coupled with the independence of mind of the youth revolution in the mid-1950s came an increased awareness of sexuality. Just as a small clique of experimental whites in the 1920s and '30s had discovered blues and jazz and then passed them on to the world at large, so now were some young middle-class whites tuning in to black radio stations to find there what was missing in the record charts.

A limited awareness of black music was growing, and while it was still unacceptable to a mass white audience in its original form, certain songs were being taken, 'cleaned up' and recorded by white performers. Lyrics thought to contain specific and metaphorical 92 ►

BURBANK USA

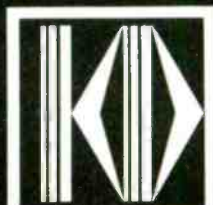
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sexual references were excised or entirely new and acceptable ones written. When rock and roll finally emerged most of its black origins were carefully covered over, and although adults deplored its supposed sexuality it had little connection with the overtly erotic content of its sources.

However hard the directors of established recording companies tried to expunge sex from the new music they were producing, they could not obliterate two obvious manifestations—the dancing that accompanied the music was deeply sexual in symbolism; and the very name itself which is euphemistic of the sex act. Sex was at the very bedrock of the music; you could castrate the words but you could not similarly emasculate the beat.

Initially, the blacks received little benefit from the extraordinary and unexpected popularity of the music they had engendered. The songs were at first stolen or imitated by whites; eventually they were taken over completely and subtly, but fundamentally altered. There were some exceptions, however. As rock and roll gained greater popularity a few black artists were recognised, and achieved fame. Fats Domino—a very important figure in the birth of rock—had several hits, and younger wilder performers like Little Richard and later Chuck Berry became prominent.

Now that youth began to find an identity and to share something that was wider and bigger than racial differences, they could start to question traditional standards of behaviour. It took several years, but eventually the bonds forged by music became social and political in nature; and the black struggle became the struggle of a generation.

As early as May 1956, however, there were those who recognised rock and roll for what it was—black-rooted—and thought they saw in it a direct subversion to their way of life. In that month white citizens in Birmingham, Alabama, paraded with placards bearing such slogans as: 'Ask your preacher about jungle music'. In rock music they saw the influence of 'those uppity niggers', and viewed rock and roll as a direct threat to their superiority. In the Southern States of America the blacks were treated with a callous brutality, and while the whites still had the whip hand, the ghettos were starting to simmer.

The first stirrings of black unrest took a long time to come to the boil. It was, after all, only a few years since the full cry of the McCarthy witch-hunts, and there were strong internal pressures for conformity. But there were signs that the blacks were starting to fight back.

Although black performers didn't gain recognition immediately, they started to find a wider audience after 1956. As one rock historian has noted: 'During the Forties and early Fifties there were rarely as many as three black singers simultaneously in the hit parade. After 1956 at least a quarter of the best-selling records were by black singers'. And, what is more, 'they usually sang in their own cultural idioms'. It is difficult to say whether the increased number of accepted black singers effected a general social change, or merely reflected it. However, it's possible that it gave the blacks more confidence and, allied to the unrest increasingly felt by blacks with their lot, may have opened the way for and sped the rise of a strident black protest.

Certainly by 1961 blacks felt so assured in their own music and culture that they could start their own recording company in Detroit. Tamla-Motown was not only run by blacks and for years recorded *only* blacks, but was one of the greatest success stories—culturally and financially—of the Sixties.

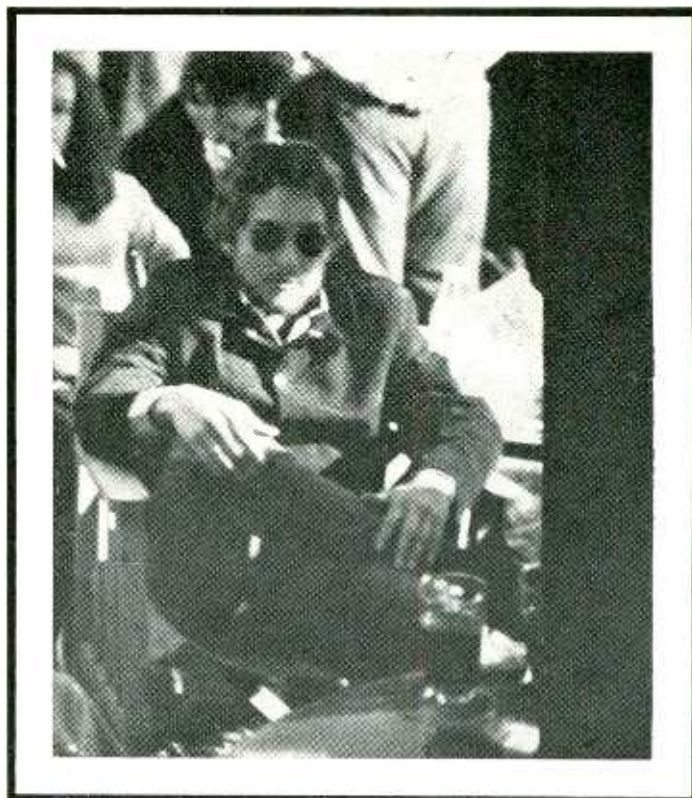
YOUTH BECOMES POLITICAL

**'How many years can some people exist,
Before they're allowed to be free'**

Bob Dylan, 1963

It was the black struggle in America's Southern States that helped to make the young political. In 1956 and '57, as rock and roll was consolidating, the blacks in the South were attempting to put into effect the desegregation laws.

White liberals had become increasingly committed to helping the blacks in their fight for civil liberties, and by the early Sixties hundreds of young white students were going to the South to lend



their support. In May 1961, the Congress of Racial Equality sponsored the first 'freedom ride', and by the end of that summer hundreds of people, black *and* white, were in jail for demanding equality on public buses. In December of the same year, Martin Luther King and seven hundred of his supporters were arrested in Albany, Georgia.

America was in a ferment. The political and social fights of the Southern blacks coincided with a revived interest in traditional, ethnic and folk songs; and the focus for folk singers was Greenwich Village, New York. Woody Guthrie had sung songs telling of the migrant workers running from the American dustbowl, and other socially-aware but now outdated songs were rediscovered. Such songs were performed to a select few aficionados in basement clubs and coffee houses all over the US. This folk circle gradually extended to include a growing number of young people, particularly students who were better educated, better informed and more socially aware than any previous generation.

Performers like Pete Seeger, Odetta, Joan Baez, Peter, Paul and Mary were presenting material that had meaning to the audience. There was a wind of political change stirring that reached a peak of youthful optimism with the election of John F Kennedy as President in 1962.

The struggle in the South for civil rights had crystallised the previously amorphous feeling of discontent and given it direction.

Pop music—for pure rock and roll as such had been superseded—had lost its banality and had a purpose. But Guthrie's songs of the 1930s didn't suffice; new songs—anthems—were needed that narrated the sufferings of the poor, the disenfranchised, the alienated of the Sixties. A man was needed who could capture the mood of the restless young; when he came he had a parallel but differently emphasised impact of Presley eight years before.

Bob Dylan was fluent and literate and caring enough to provide the music that would unite black and white. His music contained elements of direct protest—they weren't just songs of thwarted pubescent love, but lyrics that threw a direct challenge to politicians, to the apathetic, racist or the exploiting middle-ground of America.

Dylan's music was both propagandist and symbolic. It communicated in an urgent, stark and almost journalistic style the stories of real abuses, like *The Ballad Of Emmett Till* that told the true story of a 14-year old Chicago negro who was visiting his uncle

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in the Mississippi delta in 1955. Till made the mistake of whistling at a white woman and was set upon, beaten, shot to death, and then dumped in a river by a gang of whites. His murderers went unpunished.

Such songs filled the young with a feeling of outrage and probably did as much as press and media reports to galvanise them either into direct political action or to demonstrate, agitate and protest. Dylan recognised that pop music need not be trite or ephemeral. 'There's other things in this world besides love and sex that're important too', he said. 'People shouldn't turn their backs on them just because they ain't pretty to look at. How is the world ever going to get better if we're afraid to look at these things?' So he wrote a series of songs around such themes: *The Lonesome Death of Hattie Carroll* about a negro beaten to death by a rich white; *Oxford Town* about James Meredith's attempt to enter the University of Mississippi; and *A Hard Rain's Gonna Fall* which was prompted by the Cuban missile crisis of 1962.

One song above all reflected the mood and the spirit of youth at the time—*Blowin' In The Wind*, a series of rhetorical questions linked to an easily-assimilated melody. The song fired youthful imaginations when recorded by Peter, Paul and Mary and released in June 1963 to become an enormous hit. But more important than its commercial success was the way in which it was taken up and used as a protest anthem everywhere. In America it was sung on civil rights marches; in Britain it echoed the frustrations of the vast number of young people who had their own cause, the Campaign For Nuclear Disarmament.

From this point of departure there was a commercial craze for protest songs—the worst of the most successful probably being *Eve Of Destruction* which appeared to protest about almost everything—and although the 'protest' phase in music died out, the movement did not. Seeing that their voice could carry weight and be heard, students and other young people persisted and radicalised into campus unrests, violence and near-anarchy. What Dylan had given to pop was literacy. As he moved on he became more than an articulation of the hopes, fears, suspicions, frustrations, aspirations

and discontents of his generation; he matured into a poet and single-handed probably did more than any other individual to give popular music stature and meaning.

It was from the spur that Dylan gave, that a new and more perceptive youth emerged—a youth that has since produced its own literature, vitality and force; its own art; its own journalism. It was Dylan (and a little later the Beatles) who turned youth sub-culture into a real culture comparable in merit and achievement with the traditional forms that had preceded and run parallel with it.

THE PERMISSIVE SOCIETY

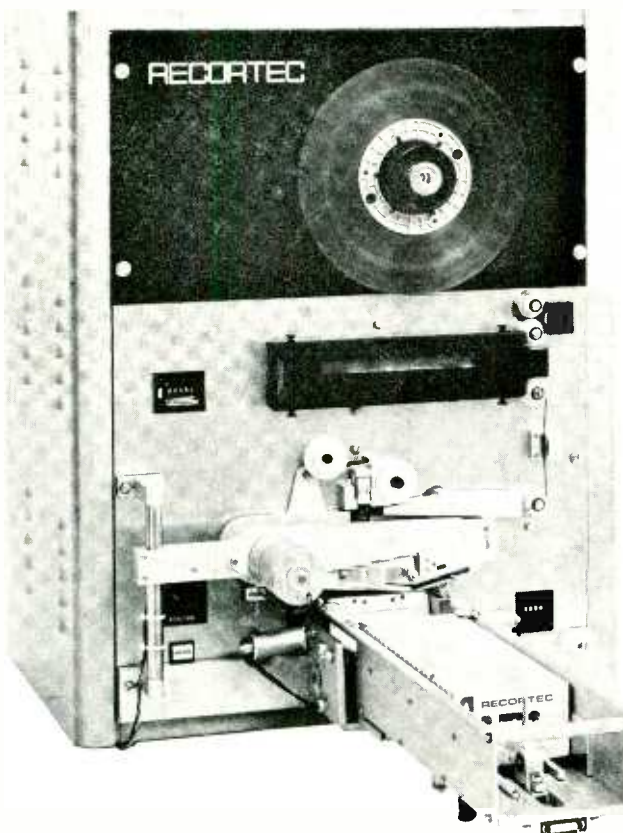
*'Let's spend the night together,
Now I need you more than ever,
Let's spend the night together.....now'*

Rolling Stones, 1966

Since 1956 sex has been a dominant ingredient in pop music. Adults have traditionally feared—probably because of jealousy—the sexuality of the young. Despite the 'moral laxity' of the war years (which could be rationalised by the pervading uncertainty and need for relief of tension and release, however temporary, from fear) the immediate post-war years were, on the face of it, as moral and strait-laced as any before the hostilities. Although girls had swooned over Sinatra and even emitted screams, it had somehow been more lady-like; a genteel faint when emotion looked like becoming uncontrolled.

It was all much more covert than the blatant posturings, guttural groans and wild excitement of rock. Adults were shocked—in April 1956 some white churches in America's South wanted rock and roll suppressed. Teenagers, on the other hand, were delighted—it could be no coincidence that their interest in loud beaty music and abandoned dancing coincided with puberty and a sexual awakening. Young middle-class whites were starting to look towards the less-inhibited sexual attitudes that the blacks had always held.

And just as parents had always been rather afraid of their children's sexuality, conservative whites had always professed disgust at the blacks' joyous acceptance of sex, much of which may have been jealousy. A disturbing number of Ku Klux Klan outrages were



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in the form of castration and mutilation of the sexual organs of their black victims. Blacks, however, had always laughed at the sexual hang-ups of whites, and freely expressed sex in their music. Suddenly 'shake, rattle and roll', Elvis Presley and the newly emerging black artists were all much franker than anything that had appeared before. It was a cause for concern.

Girls reacted to Presley by simulating orgasm, and boys copied his cocky sexually-assured swagger. Part of the generation's general questioning of adult-held standards was by challenging the strictly-enforced attitudes to sex and virginity. Rock and roll was only symbolising what had actually been happening on the back seat of parked cars or the sofas of darkened living-rooms.

Adults and the controllers of the pop industry felt, however, that this sudden flowering of sex should be curtailed, and after the initial impetus of rock and roll, which took the major record companies by surprise, with control going briefly out of their hands (one should not forget that Elvis Presley was the product of Sam Phillips's tiny independent 'Sun' label) there was a concerted and rigorous policy of taming the music. Instead of raw, crude music and equally exhibitionist performers, record companies—with the wholehearted relief of other adults—softened their output. From wild rockers they went to clean-cut boys-next-door—the Fifties version of Mickey Rooney's 'Andy Hardy'—and a strong emphasis on love rather than sex; and puppy-love at that. Paul Anka, who was hardly into his teens, sang soulfully of an older girl, *Diana*; Pat Boone told of *April Love*; Frankie Avalon discussed *When A Girl Changes From Bobby-Sox To Stockings*, and so on. In effect (and often in fact) these were second-generation Italian balladeers. The adults had the reins back in their hands—they attempted to staunch any sexual allusion and return to the shared ice cream soda, ingénue love and romantic fiction of a 'teen angel' and her high school date. Any sexual activity stopped at a chaste kiss and perhaps a mysterious pastime called 'petting'.

It seemed, thankfully, that the morals of minors and the chastity of the nation's youth were safeguarded. However, one strand of youth was breaking out of these strictures in a very physical manner. Older teenagers and young adults were abandoning the materialistic

yardsticks of their parents' middle-class values and literally taking to the roads. They were proclaiming their individuality in their philosophy and life-style, and in exterior physical manifestations—they grew their hair long, failed to wash with scrupulous regularity, affected bohemian clothes, which were often scruffy and ill-fitting, and indulged in so-called 'free love'.

Their habits, their non-conformity, their seemingly total disinterest in the things that middle-America has traditionally held dear and, perhaps most disturbing of all, their adoption of left-wing French philosophy, earned them the general disapproval of the yet-to-be-dubbed silent majority—they were called beatniks, and almost universally reviled. But they too had their voice, and a fluent one it was. In 1957, Jack Kerouac's 'On The Road' was published; it was their testament, 'the Bible of the beat generation'. Kerouac's preoccupation was with travelling, bumming around America, sex, drugs and mysticism.

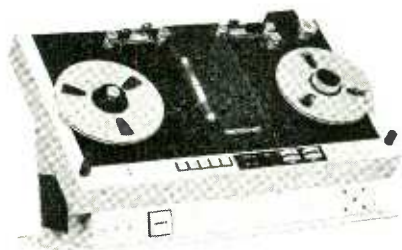
Many of the beatniks ended-up in New York's Greenwich Village and provided the nucleus of a slightly scandalous bohemian society, from which later came the 'folkniks' and Dylan. They were political in a theoretical rather than active way, leaning heavily towards Sartre and left-wing ideology. The Village milieu had a contempt and hatred of political and sexual repression.

The young people who gathered there—and they were repeated in other 'villages' usually centred around campuses and coffee-houses throughout American urban areas—rather self-consciously flouted their rejection of conventional sexual attitudes. Ostensibly, they did not marry, preferring rather to cohabit, change partners, and indulge in brief, emotionless and experimental sexual liaisons. Their sexual attitudes were reflected in their music, which often contained veiled references to their 'unconventional' affairs or rather bitter disillusion with love (some of Dylan's early songs about women contain quite savage attacks on individuals with whom he had formed relationships).

The beats' way of life had a distinct appeal to others of their generation who adopted their dress, vivid slang and, of course, sexual mores. The barriers slowly started to tumble; sex was spoken, written and sung about; more important it was performed outside

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ROCK 'N' ROLL RULES—OK?

marriage. Sex, like hair, became a real symbol of youth and the fears, ignorance and hypocrisies of their parents' generation were mocked.

It wasn't until the 'pill' became available in the 1960s and, perhaps, the unashamed nudity portrayed in 'Hair' and on the cinema screen, that nearly all the old taboos were smashed and a reactionary backlash started.

THE DRUG CULTURE

'I'd love to turn you on'

The Beatles, 1967

Drugs—like sex—were treated more openly in the black ghettos. Jazz musicians, first black and later white, took them (several died from their addictions) but apart from pills and a little pot-smoking amongst 'intellectuals', they were little-known and less used by the majority of middle-class white teens. Certainly, in the mid and late 1950s, the beatniks had smoked pot and possibly even experimented with hallucinogenic drugs like peyotl, and a certain amount of marijuana was used in Greenwich Village.

It can be said with a degree of confidence that drugs did not become a part of the pop culture until the mid-1960s. Those using cannabis in one form or another may have been introduced to it by their black friends. Later the use of drugs was accepted as a natural extension of the musical, political and sexual revolt among the 'hipper' young people.

It was comparatively late in the pop culture history that drug references crept into songs. Although the composer has denied this, many suspect that Dylan's *Mr Tambourine Man* is a drug-induced vision. Certainly *Eight Miles High* by the Byrds has drug allusions, as does Donovan's *Sunshine Superman*, these being among the first of the drug records.

Interestingly, by the mid-1960s the Anglo-American pop élite was quite small and intimate. After the Beatles created a huge international market for British pop stars, dialogue was established between the top American and British artists who met each other quite regularly. This meant that ideas and trends were communicated between the fraternity with speed, and a new experience—like, for example, taking LSD—was assimilated into their work at about the same time. In this way, when the Beatles were writing songs directly influenced by this 'new' drug, there were people in America—particularly on the West Coast—who were also working along the same lines. This makes it rather difficult to discern exactly when the so-called drug culture first became evident.

There is little doubt that much of the early hallucinogenic experiences occurred in California. The American West Coast has a certain precedent for the bizarre and mystical—it has long been a hot-bed for obscure religious, spiritual and mystic sects—and for the exploration of exotic experiences. Curiosity had been aroused by Aldous Huxley's 'Doors Of Perception' and 'Heaven And Hell', and fairly wide research into the psychotherapeutic properties of LSD had been undertaken between the Fifties and Sixties in both Canada and America, with pioneering work from Timothy Leary in particular.

Many exaggerated claims had been made for LSD by those who took it, and many felt that they had a mission to pass on the benefits—supposedly total loss of ego, improvement of personality by the repression of aggression, mystical quasi-religious revelations, etc. Quite soon many songs contained fairly overt references to it or attempted to explain in words and music the effects of a trip.

There can be little doubt that this 'advertising' of LSD through music made it attractive to very many young people and influenced them to take it. Concurrently, there was a distinct trend towards the smoking of marijuana. There are many reasons for the introduction of such drugs into the youth culture, and even more theories—of greater and lesser validity ranging from those attributed to criminologists and social workers to those from purported gurus and mystic dabblers—to explain why so many young people have accepted drugs as yet another cultural badge like sex and hair. Suffice it to say that the rise of drug usage is directly related to the progressive nature of pop music.

A significant year for drugs was 1967 when an altogether remarkable phenomenon occurred on an international scale. There was a sudden and brief blossoming of a 'love cult'. The roots of this flowers/love/peace reaction are rather obscure, but it seems fair to



conclude that they sprouted directly from LSD.

Cliques—mainly composed of pop stars and their circles—had started to take the drugs and felt that there must be an alternative society. Simultaneously there was a new interest among certain of the pop 'aristocracy' in religions, particularly those of the East. The first indications of these twin impulses probably came on the Beatles' *Revolver* album that was released in Britain in September 1966. There were many new musical avenues explored on this record, but two songs in particular signalled a change of emphasis: *Love You To* in which George Harrison first displays his interest in Indian music (although he had played the sitar, be it only in a Western context, on the previous album, *Rubber Soul*); and *Tomorrow Never Knows* which has the faintly distorted and disturbing nonsensical dream qualities soon to become known as psychedelia.

The resultant flower power/psychedelia bloom burst into life in 1967, when there was a veritable spate of groups emanating from the West Coast who were to change, yet again, the face of rock. Drugs came from the underworld into the light of day and were quickly assimilated into the generation, spreading—in by far the most alarming trend yet observed by adult authority—throughout Europe and the Western-oriented world.

Flower power's moment of glory came when the 'love generation' felt an intense desire to congregate and demonstrate their unity at the 1967 Monterey Pop Festival. The unity was manifest in music, in life-style, in youth; it was a joyous celebration of the youth culture—almost a convention to which delegates from all over the world flocked in finery and peace. Monterey demonstrated that the youth revolution had arrived in a tangible and spiritual way; the loose flexible movement that started with rock and roll in 1956 had flourished, despite opposition, via a continuing process of change and expansion.

The Monterey Festival saw the first great tribal gathering of the young and set a precedent for mammoth outdoor concerts. These started modestly as 'love-ins' or 'be-ins' at which hippies gathered to celebrate their togetherness, to make love, exchange craft-works, and openly trade and take drugs—invariably to the accompaniment of rock bands who gave their services free.

Such gatherings were so popular that before long commercial interests moved in to provide huge all-star bills that played to massive audiences in natural open-air amphitheatres. Undoubtedly the high-point came in 1969 at Woodstock, where an estimated 500 000 young people gathered for three days billed as 'the first Aquarian exposition of the arts', to listen to a truly astonishing bill including Jimi Hendrix, Sly and the Family Stone, the Who, Crosby, Stills, Nash and Young, Joan Baez and Joe Cocker. This glorious event—probably the finest and most spontaneous flowering of the love generation—was immortalised in a Joni Mitchell song, a triple album and a monster, blockbusting movie. The whole thing seemed to prove that the alternative lifestyle it represented actually *could* be made to work.

Sadly, the dark side of festivals was exemplified at Altamont in California in 1969 where the Rolling Stones performed at a vast free concert amid great confusion. During the concert Hell's Angels, who had been hired as 'security guards', ran amok, terrorised and beat members of the audience (many of whom were over-dosing on bad LSD and eventually killed one young man. The spirit of 98 ►

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ROCK 'N' ROLL RULES—OK?

Woodstock died that night—festivals never really recovered, and consequently passed in folklore.

The one significant result was the increased technological strides taken to amplify sound so much that the gathered thousands could hear the performers. These advances in amplification were passed on in the shape of vastly-improved sound systems that could cater for huge, and often unsuitable auditoriums and outside arenas. Ultimately, vast stacks of speakers were adopted in the Seventies to improve the sound quality for the great roadshows by such superstars as the Stones, Elton John, Wings and Peter Frampton that took the place of the more intimate tours of the Sixties.

SINCE THE BEATLES

'There's nothing you can do that can't be done,
There's nothing you can sing that can't be sung'

The Beatles, 1969

The second great watershed in the development of the pop culture came in 1962. In October of that year a record called *Love Me Do* was released in Britain and made the lower reaches of the hit parade. The group that made it was, of course, the Beatles.

The emphasis shifted quite suddenly from America—which since 1956 had been the breeding ground for all that was new in music, and most of what became internationally adopted by the young throughout the world—to Britain. Once the initial impact of rock and roll had expended itself and the manipulators had reduced its energy to stereotype pap of the 'teen angel' variety, a sterility took hold and there was nobody in the USA that could obviously break the stranglehold of teen love.

It is true that the Twist, promulgated by Chubby Checker, had been an enormous international hit, but this was a dance that drew no lines between the generations. It was danced as often, if not as vigorously, in smart, chic clubs in New York, London and Paris by the middle-aged, as it was in small, sweaty dance-halls by the young in the same cities.

At about this time Dylan was acquiring a small cult following in Greenwich Village and university campuses, but it would not be for some time that he would achieve international status as the rock poet of the generation.

Britain in 1962 was ripe for something like the Beatles. The young there had also been affected by the rise of rock, and later had started to become politically aware through their involvement with the Campaign for Nuclear Disarmament. Just as rock and roll was surging forth in America the British theatre had taken a great leap forward with the production of John Osborne's 'Look Back In Anger', which had transformed the stage from drawing-room comedies to an arena of social comment and realistic portrayal.

By 1961 theatre had again figured prominently by pioneering a novel form of revue—'Beyond The Fringe'—in which four young university graduates lampooned politicians, sacred establishment cows and long-cherished beliefs. This satire perfectly crystallised the feelings of the new, well-educated and informed British youth to whom the Edwardian and avuncular figure of Prime Minister Harold Macmillan characterised all that was anachronistic in the country.

By 1960 the British cinema had experienced a new wave of writers, directors and actors, who in films like 'Room At The Top', 'Saturday Night And Sunday Morning' and 'A Taste Of Honey' took a genuinely realistic view of working-class life.

The arts in Britain were undergoing a period of profound change that featured, on the one hand, the gritty and often grimey truths of life in impoverished districts and, on the other, started to promulgate a glamorous and venerated world epitomised by the cult James Bond series of books, with the first film from them, 'Dr No', released in 1962. In the middle stood clever, witty and irreverent young men who through 'Fringe' on the stage, the publication of the fortnightly satirical magazine 'Private Eye' (October 1961), and with David Frost leading a formidably and wickedly funny group of writer/performers in 'That Was The Week That Was' (November 1962) on television, sniped with distressing accuracy at anybody and everybody who represented outworn values or bureaucratic pomposity.

When the Beatles arrived, they certainly took the Press and Media by surprise, but the young embraced them with a fervour and enthusiasm that was overwhelming. The Beatles were exactly what the generation had been waiting for.

The rise of the Beatles to almost world domination in popularity

is too well-known and minutely chronicled to bear repeating here, but the repercussions of their global success are decisive when considering the new youth culture. They certainly out-stripped Presley, partly because international communications had made huge advances since his heyday, and partly because they travelled. Presley never toured outside America (indeed the only time he 'left' America was during his period in the US Army when he served in Germany) but the Beatles, for a few years at least, went to the people. They literally stormed America, they played in Europe and then in Asia.

Their music had a directness and freshness, a spontaneity that was lacking in the sugary manufactured pop of the time. On paper it appeared banal in the extreme—'She loves you yeh, yeh . . . yeh'—but on record it was alive and vivid. They too acknowledged their roots by performing, in the first years anyway, rock and roll standards like *Roll Over Beethoven* and *Long Tall Sally*, and even more they bowed to black artists. They were admirers of Tamla-Motown music (then barely known at all in Britain) and probably helped to bring that to a wider audience. At the same time, the Rolling Stones were harking back even further into black music and drawing deeply on blues and rhythm and blues sources. The Stones presented another face of pop and, in the event, one that was to predominate even over the Beatles. Where the four Liverpudlians were initially 'cute and cuddly', the Stones were described as 'drugged, dirty and drunk'. They forged their own path, adopted their own values and never deviated from them. They have survived almost in their original personnel, losing Brian Jones to a sad and wasted death; one of the first to mark the new paths of pop when others like Jimi Hendrix, Jim Morrison and Janis Joplin were overwhelmed by their lives and drugs.

Throughout their career the Stones had a pre-eminently anti-social image, snatching up the mantle of James Dean and posturing insolently at the howls of outraged respectability. In the early days of the Sixties, the Stones, and especially Mick Jagger, seemed to epitomise the lowest ebb of the young culture in adult minds. And even into the 1970s they continued to clash head-on with authority, mainly through frequent and well-publicised drug busts of some of their members.

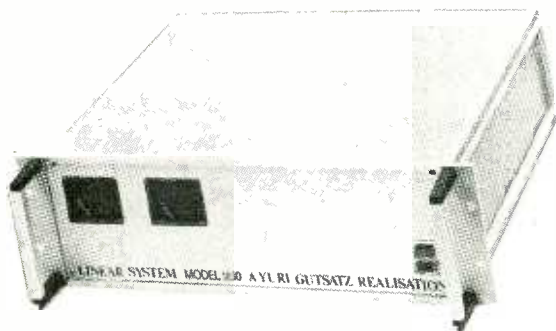
The Beatles arrived on the scene, almost miraculously, at the precise moment when they could unite every facet of youth. London was just starting to be recognised as a fashion centre, thanks primarily to Mary Quant; people now had more money than ever before (Britain's Conservative Party slogan had recently been 'You've never had it so good') and the young were itching to spend it.

Quite soon Britain was the very nub of the youth culture. London's Carnaby Street became world famous as a fashion bazaar and the young people were the hippest, the best dressed and the most glamorous anywhere. Quite soon it was 'Swinging London', celebrated in glossy magazines in every developed non-communist nation. Photographers like David Bailey; models like Jean 100 ▶



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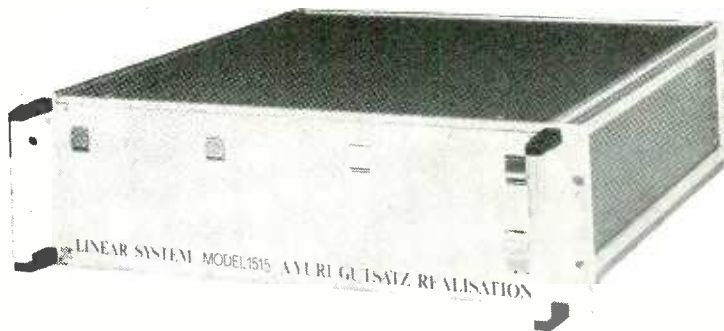
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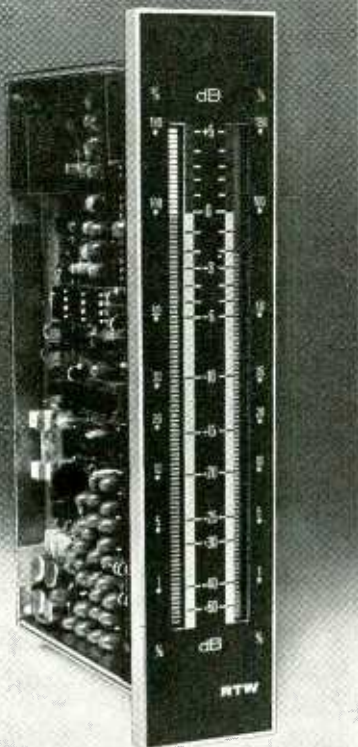
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ROCK 'N' ROLL RULES—OK?

Shrimpton and Twiggy; artists like Alan Aldridge; actors like Albert Finney, Peter O'Toole and a host of others; personalities like David Frost—all were in demand internationally.

As a result America, Japan, Australia and Europe followed the British lead. Never before had young people looked, felt and acted so good. For the first time the adult world was copying their fashions, applauding their efforts, courting their idols; it was a complete turn-about.

There were so many innovations that the Beatles introduced personally, or that came about directly as a result of their pioneering, that it would be impossible to mention every one. If there was one great symbol, though, it was hair. At first their hairstyle was thought bizarre, unwholesome or effeminate; but pretty soon every young man was letting his grow, and many 'straight' adults were having less taken off by their barbers. Hair and music reunited the generation and reaffirmed its peculiar identity.

The demise of the Beatles in 1970 coincided both with the new decade (which broadly marked a new style in rock) and with a new trend towards a fragmentation of the market. The Beatles had welded together a generation by their commanding presence, but as they progressed through the musical experimentation and the recording breakthrough (both artistic and technical) of *Sgt Pepper*, they left some of the market behind and pushed other performers to force musical technical frontiers even further.

The Beatles' remarkable success inspired others to emulate their achievements. One of the most interesting phenomena of the late Sixties was a fairly cynical attempt to manufacture a successful pop stereotype. The result was the Monkees—four young men assembled into a group using personality and sex appeal as the criteria, rather than musical accomplishment.

The Monkees are interesting on three counts. First, they were factory-made to an apparent success formula. Second, they were sold via television, a bold and perhaps rather obvious step that, unaccountably, had not been considered previously. Thirdly, their appeal was aimed directly to a new, very young market that had not had its own rock stars before.

The campaign was remarkably successful. The Monkees' tv show pulled excellent ratings, they sold vast quantities of records, and sparked off a hysteria among the very young—dubbed first teeny and then weeny-boppers. Suddenly a lucrative sub-teen market was discovered and exploited over the next few years. Ultimately, the Monkees—Mickey Dolenz, Davey Jones, Peter Tork and Michael Nesmith—broke up, but not before they had set a trend towards sub-teen idols that was followed by David Cassidy (also the result of a pop tv series, 'The Partridge Family'), the Jackson Five, the Osmonds and others.

In the 1970s rock became stratified. There were bands appealing to every level of the rock market, from the teeny appeal of the Bay City Rollers (with their stylised uniforms and bland anti-creative music) to the glamour rock of Gary Glitter; from the theatricality of David Bowie to the broad showiness of Elton John; from Deep Purple to Lou Reed; from Led Zeppelin to Peter Frampton; from Wings to Status Quo. Never before had rock fans been so widely catered for; never before were the pickings so rich.

The Seventies also saw the rise of the global superstar, a category into which many of the aforementioned fall. A performer like Rod Stewart could earn untold sums from records and massive tours. An entire industry could be established to feed their fans' seemingly insatiable appetites for posters, mementoes, souvenirs and other memorabilia.

Rock stars were projected into a new class—they became a wealthy élite, so rich and cosseted that they were removed from reality and placed in a pantheon that had previously only held the movie stars of Hollywood's golden age. Stewart, John, the Stones, McCartney and the Bay City Rollers now took the place of Gable, Monroe, Bogart and Garbo. Their rewards brought them a lifestyle that opened an unbridgable gulf between them and their fans. They indulged in conspicuous consumption and enjoyed a life-style that had previously been the sole preserve of oil and shipping multimillionaires. The flamboyant wealth of these stars had only been equalled before by the jet-set of Kennedy, Onassis, Niarchos and the like.

By mid-decade, their life-styles were so pampered and outrageous that even the most fanatical devotee started questioning the means

by which it had been achieved. And, because for every action there must be a reaction, some young people revolted against this privilege. In London and New York, there was a movement against superstardom, a rejection of glamour. Some underprivileged sections of the rock market spat—both metaphorically and literally—on the élitism of these Olympians.

Showbiz glitter was reviled; the trappings and toys of the clique were loathed; their carefully constructed, technically perfect recordings were abhorred—1976 saw the start of the 'Punk Revolution'. To punk rockers, the showbusiness establishment, its works and its heroes were abominations: they started anti-fashion, anti-chic; their clothes were ugly rags, plastic bin-liners; their jewellery was pins and razor blades; their manners were crude; their music was basic, unschooled and technically naive.



Groups like the Sex Pistols, and performers like Patti Smith adopted the mantle of the Rolling Stones, who had cast it off once they had achieved global stardom. Punk groups set out to offend and outrage—they substituted crudity for attempted poetry; they replaced musicianship with energy; they were rock Luddites who scorned the advantages of technical innovation, and attempted to get back the rawness and excitement that had marked the birth of rock and roll. To Punks, two and a half minutes of raucous stimulation was more valuable than a carefully-crafted, superbly recorded, quadraphonic album of impeccable quality and musical invention.

With the Punks, the revolution seemed to have come full circle. These were street kids who confronted the rock business, parents and the media with lewdness, a vulgar gesture and took a seemingly perverse delight in affronting sensibilities. Those who professed shock at their tactics had forgotten the effect that Elvis Presley had once had on accepted morality; they had forgotten the outcry raised in the media when one of the Rolling Stones had urinated against a garage wall approximately a decade earlier.

The Punks will undoubtedly inject a new and necessary urgency into rock music. It's too early to estimate the extent of their contribution, but when the initial fuss has died down it will be seen to be an important, if not always desirable force in the continuing evolution of rock and its culture.

The changes in the last two decades have been shattering. Youth culture has transformed into the cult of youth, and it is hard to see that there will ever be a total return to the old order. Everything that Dylan prophesied in *The Times They Are A'Changin'* has been seen to be wrought.

All the while popular music has kept pace, frequently presaged and often influenced the continually shifting scene. It has been a mirror and a crystal ball, but most of all it has been the catalyst that has provoked this enormous upsurge of vitality, of power and of creativity.

Pop music has been the spearhead. All that has happened to the young—protest, rebellion, drugs, fashions, art, life-style, attitudes, sexual liberation—can be related to the growth and development of pop music. In the light of what has already happened, and in anticipation of what is yet to happen, it is true to say that rock and roll, all that has sprung from it, and all who work in it have helped to mould the course of this century. ■

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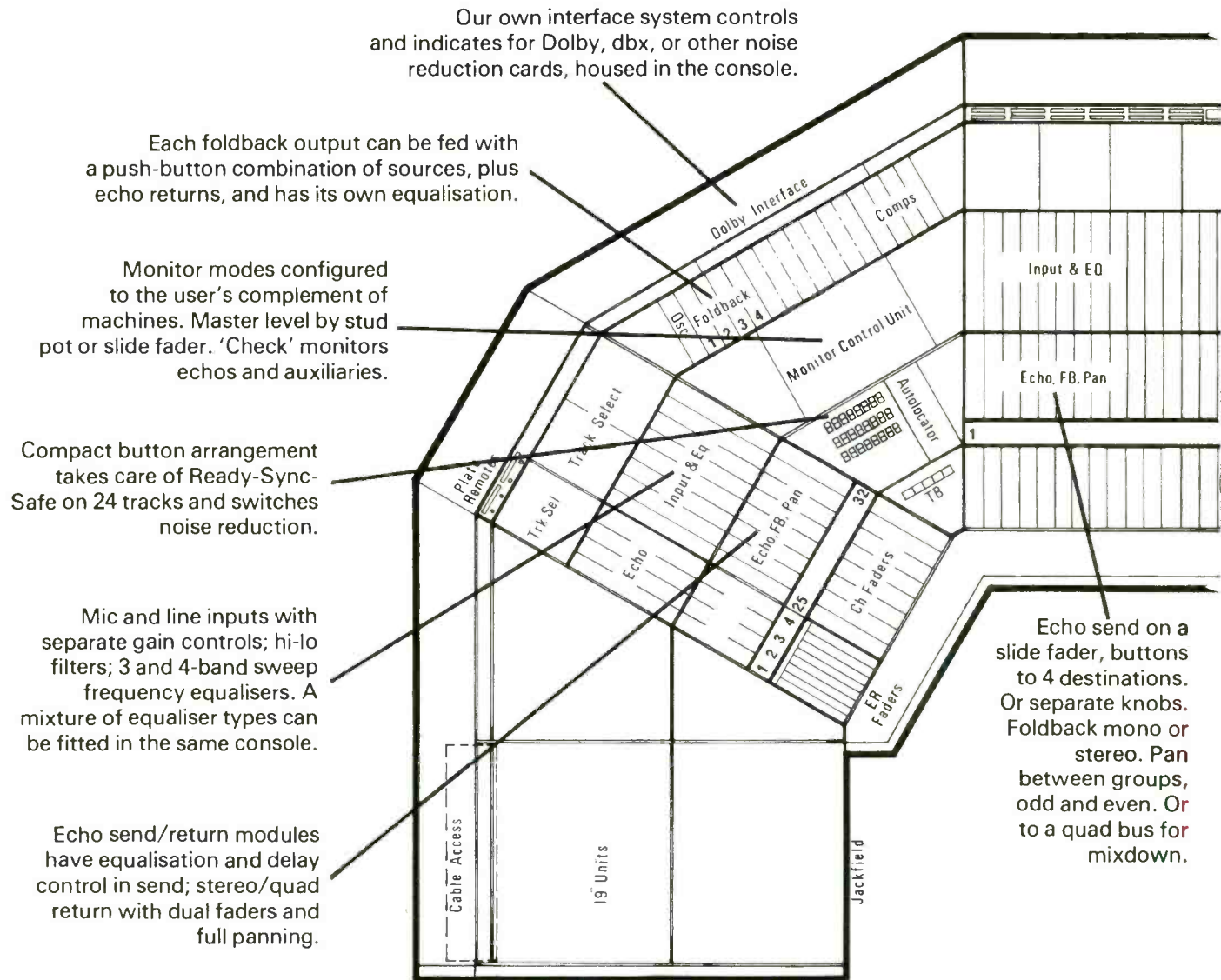


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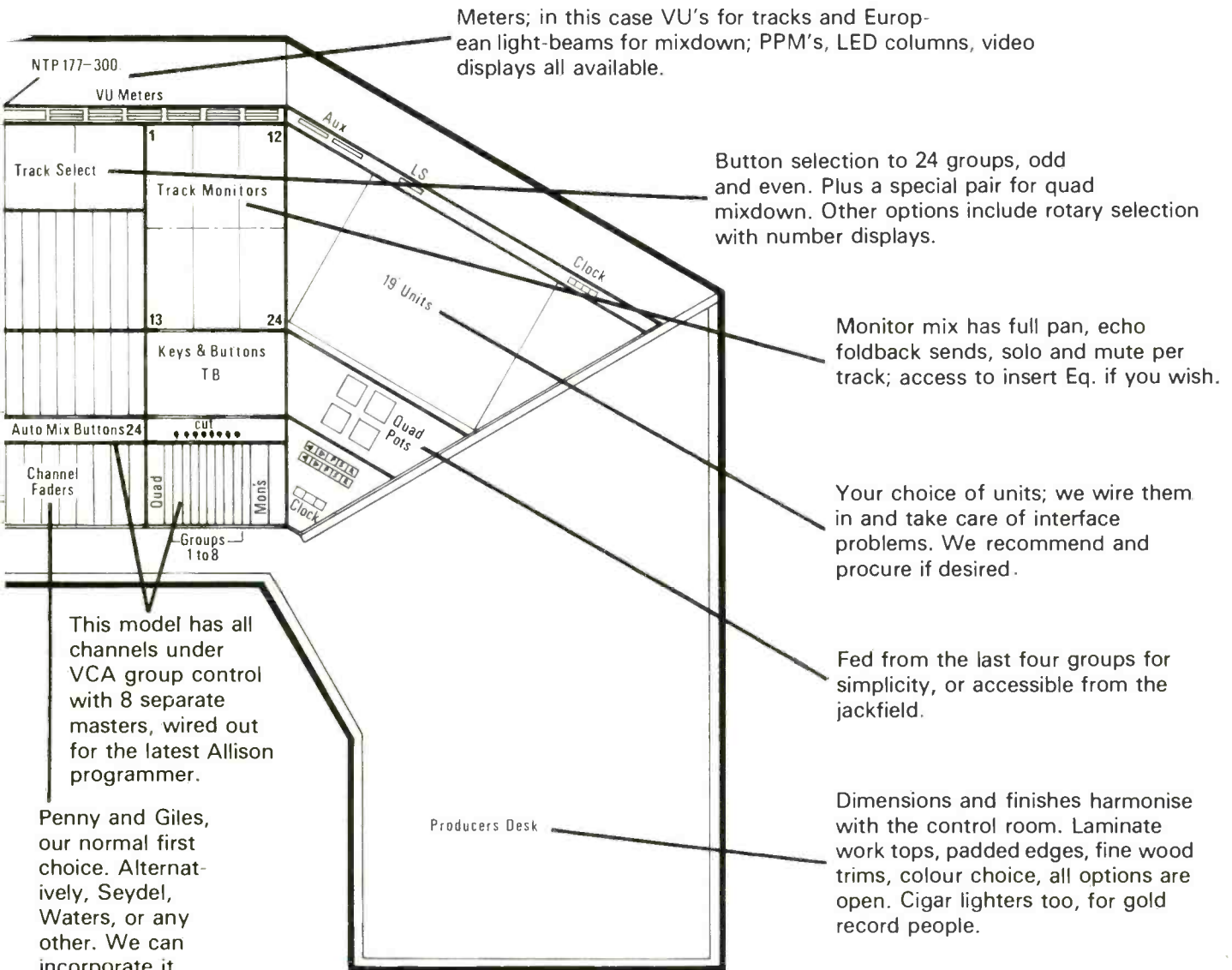
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If pigs could fly...

Ray Carter, Frank Ogden
and Adrian Hope

Pink Floyd are a state-of-the-arts phenomenon; not only is the studio used as a creative tool for their music, but in live performance they create an excitement that many emulate, but few match. In this two-part article we look at the group's development, and spotlight their recent concerts in London

Getting it together...

AS FAR as the Pink Floyd are concerned, they have always tried to expand and improve their type of sound; not only on record but also with respect to live performance. It was easier for them in the beginning to experiment with the sound in the studio, as opposed to their live performances, because the equipment for gigs was very, very basic; just valve amplifiers. Bass bins were virtually unheard of.

In the beginning

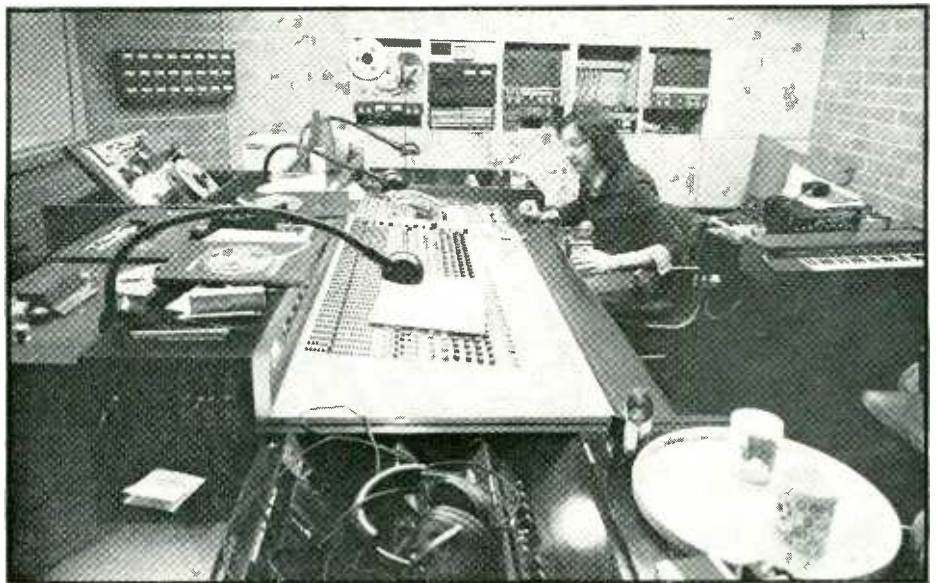
Originally, Waters, Wright and Mason were architectural students at the Regent Street Polytechnic, London. Back in 1965 they were part of a college band called Sigma 6 which later—like all the best college bands—changed its name to the Tea Set and then finally to the Architectural Abdabs. People split to become architects and bus conductors, leaving the embryonic Floyd with a problem—three musicians without a lead guitar between them.

Syd Barrett was a friend of a friend from Beckenham Art College, morose but very talented, who was known for playing a very mean lead Bo Diddley and some ingenious 'rip-offs from Beethoven'. More than that, he had a real ability to write original material and allegoric lyrics to match. El Syd, unquestionably the early driving force behind the band, supplied the songs for the first lp, *Piper at the Gates of Dawn*. The band changed its name from the Architectural Abdabs to a bunch of unknown heads called the Pink Floyd Sound—an amalgam of the Georgia blues men Pink Council and Floyd Anderson.

Early sessions

It really started when they went down to Abbey Road where they did their initial stuff with Syd Barrett when he was still a member of the band. Syd was one of the great innovators; his lyrics at that time were pretty insane and were very inspired by the whole 1967/68 acid flower-power.

Arnold Layne was a nice little tune about



The control room at Pink Floyd's Britannia Row studio.

one man's desire for ladies' knickers. Both Syd Barrett's and Roger Water's respective mums used to take in lodgers from the girls' college up the road. Consequently there used to be great lines of young ladies' underwear strung out in their parents' gardens. Bits and pieces from the lines disappeared mysteriously in the night; Arnold, whoever he was, took the blame although he was never caught. As Nick Mason said: 'He probably went into bank raids or something'.

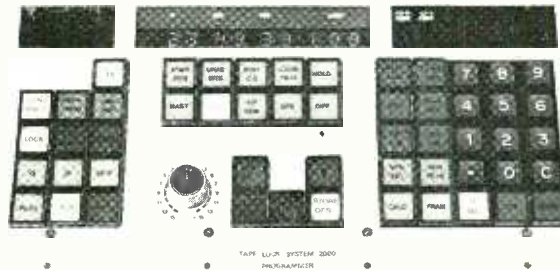
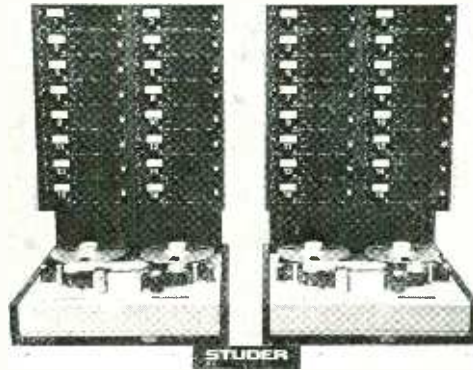
The record went high into the charts, and would have made the top if it hadn't been banned by the BBC. The flip side was rather more controversial. Entitled *Let's Roll Another One*, the name was changed at the insistence of the record company, Columbia, to *The Candy in the Currant Bun*. While the record may not have endeared itself to British djs Pete Murray or David Jacobs, it fielded the empathy of the suburban hippy fringe, an area of support that has never deserted the band.

The first session that the Floyd did at

Abbey Road was with Norman Smith, who was then their executive producer. Out of that session came *See Emily Play* (previous to *Arnold Layne* that Joe Boyd produced). Norman Smith at that time was just starting out as an associate producer for EMI. He'd just been twiddling knobs up to that time—then they experimented with something that had never been done before, which was using a speeded-up tape halfway through the middle coda of the record. This is something that Syd had wanted, and was made possible by EMI's facilities, as limited as they were at the time. Even then they were looking at new ways of making sounds—via technology. The Floyd were always looking to embellish and change the sound—in those days they were using speeded-up tapes; today they're using vocoder machines. To give a pig snort a human-type sound they use voice synthesiser techniques which, in fact, they had experimented with many years before.

Right from the start, the group were known

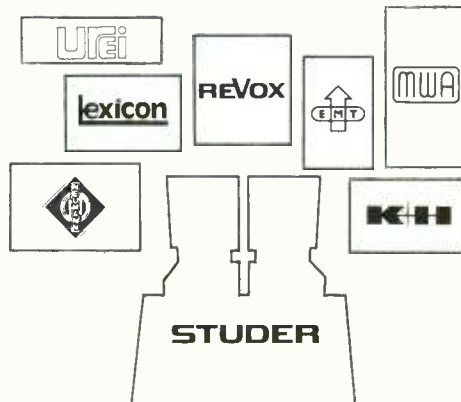
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IF PIGS COULD FLY . . .

as much for the light shows at live gigs as for the music. An extract from the local press of the time: 'Last Friday the Pink Floyd, a new London group, embarked upon their first "happening"—a pop dance incorporating psychedelic effects and mixed media—whatever that is! The slides were excellent—colourful, frightening, grotesque, beautiful—and the group's trip into outer space sounds promised very interesting things to come . . . Unfortunately, all fell a bit flat in the cold reality of All Saints Hall, Powis Gardens . . . The Floyd need to write more of their own material—psychedelic versions of *Louie Louie* won't come off . . .'

Producers

Norman Smith encouraged them to come out of the studio and into the control room, which is something that many bands in those days didn't really want to do. There were some notable exceptions, however. The Beatles with George Martin were beginning to understand the basic techniques of recording. They didn't just sit in the studio to listen to the playback, but would go into the control room and find out how it all worked—whereas other bands would not. The Rolling Stones would just stay in the studio and play their instruments and let the producer work out the mix, equalisation and other details.

The self-help philosophy started around the period of the *See Emily Play* sessions. When they did *A Saucerful of Secrets*, Norman Smith didn't really understand—quoting the band—what the Floyd were trying to do. *Saucerful of Secrets* was the least commercial thing that they had ever done, and in fact Norman tried to stop them from releasing the album because he could not fathom it out. If you had a producer in the control room who doesn't understand what you're trying to do, then obviously it was a natural process for Norman to be edged into the background. It wasn't a matter of: 'Okay Norman that's it, you're out'; Norman just faded away naturally.

Engineers

Regarding the more humdrum processes of recording, both Nick Mason and Roger Waters handle the majority of the operations. Even so, many engineers have been involved in Floyd recording.

Dark Side of the Moon was engineered by Alan Parsons, and when Alan left Brian Humphries did *Wish You Were Here*. That was Brian's first album, although he was around on the *Dark Side of the Moon* sessions, for which Alan got the engineering credit. Brian Humphries is a first-class engineer, as he proved not only on Pink Floyd albums but also the old Traffic material he was involved with. Given the limitations of the equipment they had at that time, some of those Traffic albums were masterpieces both in terms of performance and in quality of the recorded work. In spite of this, and no matter how proficient they are musically, no band could come up with such a

complicated album as *Animals* if they didn't understand the techniques—the band could be in the middle of a session and Roger or Nick or Dave would say: 'Well, why not stick this through a vocoder', or 'Why not add 3 dB more top', etc.

Films

The Pink Floyd did several film scores. Perhaps the offers arose out of a real sense of appreciation for the descriptive instrumental style. More cynically it would seem that, with the benefit of historical perspective, Floyd music was solicited to support what would otherwise have been a bunch of celluloid stinkers; without a doubt the big PF sold a few more tickets.

The first film to get the treatment was 'More', a Barbet Schroeder production released in 1968. The resulting lp contained good material although the film flopped badly. 'The Body' with a Floyd soundtrack featured orchestrated bowel movements, together with an interesting journey down the alimentary canal. Actually it was rather a good film allied with even better music; sadly the latter never appeared on disc.

The most embarrassing production for all concerned was 'Zabriskie Point', which was released in 1970. In an earlier interview, Waters and Mason put it this way: 'We went to Rome and stayed in this posh hotel. Every day we would get up about 4.30 in the afternoon, pop into the bar and sit there till about 7. Then we'd stagger into the restaurant where we'd eat for about two hours and drink . . . these really insane wines. The crêpes suzette would finally slide down by about a quarter to nine . . .

'We'd start work at about nine; the studio was a few minutes' walk down the road . . . We could have finished the whole thing in about five days because there wasn't too

much to do. Antonioni [the film's director] was there and we'd do some great stuff, but he'd listen and go—I remember, he had this terrible twitch—"Eet's very beautiful but eet's too sad", or "Eet's too strong". It was always wrong consistently; there was always something that stopped it being perfect. You'd change whatever was wrong and he'd still be unhappy. He would sit there and fall asleep every so often and we'd go on working until seven or eight in the morning. It was hell, sheer hell.'

In the event, Antonioni used only four tracks in his film, with the musical balance being supplied by the Grateful Dead. The £6 million film flopped in a style that others never achieved.

With one possible exception (film: 'La Vallee, 1p: *Obscured by Clouds* . . . brilliant music to a tedious film about a bunch of French kids taking their clothes off while wandering around New Guinea) Floyd and films never worked, even when the band was both subject and music. 'Pink Floyd Live at Pompeii' was, surprisingly, about Pink Floyd live at Pompeii. The prime justification for the film seemed to hinge on the band swanning it around AD 79 (or what's left of it) strumming their golden greats to orchestrated magma. At the time of the film's release, Charles Shaar Murray of *New Musical Express* offered this rather concise critique: 'Unless you're a solidly committed Floydian, avoid this intergalactic turkey like you would a severe case of Venusan blisters'. Roger Waters, however, was of a different opinion: 'I liked it just because it was like a big home movie'.

Technology

The technology usually comes before the sound. For instance, the Floyd do not think of a sound first and then look for the technology to implement it; it is usually the other way round, with music always providing the impetus.

There's one fine example of how while just pottering around in the studio they came up with something which is now almost a classic in terms of Pink Floyd music. They were in the studios at Abbey Road and Rick Wright was playing the piano . . . he was just pinging one note. There was a pickup in the piano and something had gone wrong, so every time he pinged it instead of getting the timbre of that note he got something else. He got the note, plus some unexpected harmonics all around it; they just happened to record those notes, along with the associated harmonics. No matter how hard they tried in the studio after that, they could not reproduce that sound after they realised that the pickup had gone wrong. Anyway, they had it on tape and managed to overdub it into *Echoes*.

It's these sort of things, sometimes by mistake, sometimes by desire, which work themselves out in the studio. Someone may have pushed the wrong button or they may have panned it way over to the left, and they say: 'Oh, that sounds great, why don't we try this?'. They're that sort of a band—it's always a case of: 'Why don't we try this, why don't we try that?'.
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Nick Mason—
contemplating his drum booth



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IF PIGS COULD FLY . . .

Problems

There was quite a problem following *Dark Side of the Moon*, which is why *Wish You Were Here* took so long to complete. There are also other reasons why *Wish You Were Here* suffered. Without going into details, the band were having a very difficult time—there were problems within and without the band, individual problems. The album is flawed because of that, although some people think it's the best thing they've ever done. *Animals* is technically better—the sound is much brighter—possibly because the mixdown was done on JBLs! It has more punch and attack to it than anything they did at Abbey Road.

This also has a lot to do with how the band was feeling during the sessions that begat *Animals*. They were very, very close and it's very much Roger Waters' album anyway—his solo effort if you like—and he dictated more or less what was going to go on. But most of all it is better because they could sit in their own studio and work things out without looking at the clock.

Studios

Nick Mason is very much the businessman of the group—it's a lovely combination to be not only a superb drummer but an entrepreneur as well. It was really his baby getting the Britannia Row Studio designed and built. Of course it's more than just a studio—there are offices and a playroom upstairs with the latter doubling as a rehearsal and billiards room, which was Nick's idea.

The actual studio is very unFloyd in appearance. There's a lot of visible brickwork—more than would be needed simply to acoustically brighten a working area—that gives a fairly austere aspect to the place. The usual coloured mood lighting has been replaced by fluorescent strip and tungsten spot. The overall visual impression is a simple workmanlike environment.

Neither the studio or control room lacks space. While the control room houses an automation-ready MCI series 500 console, the usual master and reduction tape machines, four JBL 4350 cabinets, etc without feeling particularly cramped (although there isn't

much room left) the studio floor is big by any definition. The band can leave any number of things set up without interfering with the gear actually in use at the time.

The main point about the Floyd's studio is that they don't hire it out to other bands at the moment, though this step might have to come in the future. The Who went through a similar experience with their Rampart Studio in Thessaly Road, London. Like the Floyd's theirs was magnificent—they used it on *Quadrophenia*—but very soon it filled up with other bands, and it's now difficult for the Who to get into their own studio.

While recording *Wish You Were Here* the Floyd were not particularly happy at Abbey Road, their chief discontent arising from the fact that they had to clock watch all the time, thus cramping their production style. It was for this sort of reason that their own studio was built. Hourly rates were so galling to them that they felt like retiling the lip: 'Wish We Weren't There'.

Techniques

There were some new techniques in *Wish You Were Here* that other bands have copied. For instance during *Have a Cigar* a very heavy guitar riff changes into the sound of a guitar coming through an untuned radio. As it's retuned another guitar is being played supposedly on another station, and then that is taken out of equalisation and given the whole studio treatment. The radio tuning effect was recorded from Roger Waters' car radio.

There are things in *Dark Side of the Moon*, such as *Money* and *Time*, where clocks and other effects were recorded in various antique shops and then stuck together in Nick's home studio. Other sounds on *Dark Side*, like the various voices very low down in the mix where someone says, 'Oh there's no dark side of the moon really, it's all dark', were deliberate. The group went about 'those voices' in very deliberate places. It was done in Abbey Road and anyone that happened to be around there at the time was stuck in front of a microphone and given a series of cards on which questions were printed relating to the themes of *Dark Side*—although the people who were answering the questions didn't know that. They were questions like: 'When was the last time you were violent?'; 'Did you think you were right?'; 'Do you still think you were right?'

People would sit in front of the mic with the cards and answer them. They used between 45 and 50 different people from the stage-door keeper, who's the guy who says: 'There's no dark side of the moon really'; to Jimmy McCulloch who says: 'Oh I was really drunk at the time'; to Jimmy McCulloch's wife saying: 'It was Christmas Eve'. A lot of those voices were used in the final recording of *Dark Side*, when the album was in its later stages and they felt there were some linkages needed.

Sounds

Floyd puts music together from any source. It doesn't necessarily have to be a musical sound; it can be anything from a cash register to a sheep bleating. Sounds fascinate them . . . any sounds.

Roger Waters is the one who writes the lyrics. He will listen to a sound and something will move him to write the lyrics. It doesn't necessarily start with a sound; it can start with an emotion and halfway through writing he will hear a sound. For the paranoia sequence on *Brain Damage*, the group all wrote down a series of subjects that people were paranoid about—death, money, time, etc—and Roger actually went away with this list and wrote lyrics.

While *Sheep* was being performed, the idea of incorporating the 23rd Psalm came about. It was done quite a few times before they got it right. Nick Mason did an overdub, and that didn't work, so they used the roadies. That's what you hear now, but very, very low down in the mix. One of Roger's great attributes is that he can change the lyrics to suit—if he has an idea about paranoia and consequently writes a song about paranoia, if it doesn't fit, the tune isn't wasted since it may be accommodated later with different lyrics.

In the recording studio, there has never been anything particularly special about the equipment used by the band. The truly workmanlike production on Floyd records results from the subtlety with which the equipment is handled, rather than by its intrinsic properties. Having a Studer 8-track A80 on hand purely for loop echo surely helps when creating a quadrasonic echo, as on *Us and Them*. However, the machine remains no more than a simple 8-track tape recorder—it's the way that it is used.

Many people believe, quite wrongly, that Floyd is no more than a ring modulator and a *Kepek*. If that was true then most other bands would be little more than half a dozen vocal overdubs—which is also patently wrong. The confusion arises from the gear accompanying live performances. Tape-recorded backing tracks, expanders and cart machines are a necessity since virtually all Floyd material has been conceived in a recording studio rather than for the live stage. This implies that manipulation of machines provides an *instrument* for a characteristic sound without which the musical fabric would fall apart. Sadly it is equally true that studio technology doesn't easily adapt to real-time.

Special thanks to NICKY HORNE for his invaluable assistance with this article.

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IF PIGS COULD FLY . . .

Where it's at!

A LIVE performance by Pink Floyd explains why the Beatles broke up. After *Sergeant Pepper* and *Abbey Road* it was no longer sufficient or satisfying for the group to stand grinning on stage while shouting the words of *Please Please Me* over the screams of ecstatic teenagers. They had to do one of two things. Either they could devise a stage act that matched their recorded offerings, or throw in the towel . . . they threw in the towel.

Pink Floyd, like the Beatles, have never been a group to jump around on stage, smash instruments or spit at the audience, in an effort to entertain them. And, unlike the Beatles, they are seldom seen to smile on stage. However, Floyd have always accompanied their musical performance with a visual show of some kind, and as their stage and studio sound has increased in complexity, so has their stage act—to the point where a Floyd performance is now almost pure rock theatre. After their recent tour, to promote *Animals* and re-promote *Wish You Were Here*, it's hard to see where the group can go next. But doubtless they are already working on just that.

As is well known by now, Floyd have reversed the policy that is the downfall of so many groups with an exotic sound on record. Instead of using studio techniques to develop a sound on record, and then either striving to reproduce it live on stage or disappointing their audience by acknowledging that the task is impossible, Floyd have tended to develop a sound live, hone it to perfection on tour, and finally record it in the studio. It is just this that has caused them so many problems over bootlegs in the past. Until *Dark Side of the Moon* was finally issued on record, there was certain to be percentage in smuggling a Uher into a Floyd concert to tape some *Moon* tracks live and release them without authorisation. As Floyd drummer Nick Mason said last year, it wasn't so much the loss of income from bootlegs that worried the group, but the feeling that they should be entitled to choose what they released on record, and when. This is why the stewards would originally make a sweep down the hall at a Floyd concert, looking for recorders. When they found them, they snipped the microphone leads and confiscated the tape. But at the recent Wembley performances, I saw no such sweep. Presumably, Floyd, true to Nick Mason's comment, are not unduly concerned if anyone really wants to make a low-fi concert recording of material already available on commercial release.

The extent to which Floyd have simulated studio sound live on stage and *vice versa* is easily overlooked. Writing in 1973, Alan Parsons remarked that the group had been experimenting with 4-channel systems long before the word 'quadraphonic' appeared with increasing regularity. As Parsons, who engineered *Dark Side of the Moon* (and re-mixed it into quad) explained: Floyd called it 'sound and around'. Their name for a quad panpot was an 'azimuth co-ordinator'. I remember wide publicity for Floyd live in

London, complete with azimuth co-ordinators in the early Seventies. At that time the group was using an 8 kW stereo stage pa, quad station loudspeakers around the hall, and knee-deep dry-ice fog. They also used Teac 4-tracks for pre-recorded tape. At the recent Wembley concert they were using the same quad panpots (no longer called azimuth co-ordinators), around 30 kW of pa power, and so much dry-ice fog that at one stage I thought it would totally submerge not only the drum kit but the first few rows of the audience.

As anyone who reads the popular and musical press will know, the visual entertainment at Wembley also involved an inflatable pig weighing about 36 kg that floated out from behind the black stage drapes, rambled along guide wires high over the audience, stopped, glowed in the eyes, rotated, and lumbered off back out of sight, never to appear again. (That, incidentally, is my definition of style—build a feature like that and use it for no more than a few minutes without even a recall for a finale bow.) And of course there were the other inflatables, like a dad and 'Mae West' mum on the couch that shrank and swelled in bizarre fashion as compressed air was pumped in and valved out by a control system resembling that on the Graf Zeppelin. Then there were the animated films projected on to a vast circular back projection screen, about 10m across and lowering over the band. A couple of cherry-picker lighting cranes on stage, painted jet black, worked by operators in black and carrying fireworks and lighting spots created an eery pair of 'War Of The Worlds' monsters in the darkened hall. Small wonder that there are only limited numbers of halls here and abroad that can hope to stage the Floyd show—apart from anything else, the flying inflatables, cherry-pickers and massive back-projection screen require enormous headroom.

The lighting control and sound equipment is of a complexity that is guaranteed to boggle the mind of any casual onlooker.

Live mixing for the Floyd



A studio engineer would find nothing of particular surprise in its own right. But he would be surprised that any group should consider, let alone be able to afford, carrying around such a rig. In many respects it's a gypsy version of the Britannia Row studio, plus extras. The nerve centre (in the main mixing compound, at front centre in the audience towards the rear of the hall) is a 3-section Midas desk to provide 40 line or mic channels in, and eight stereo subgroups out. How can you use up 40 channels on six musicians (Floyd plus two) on stage? Easy. There are ten mics on the drum kit alone, not counting an off-stage Leslie. The eight subgroups are used to feed the main stage pa; this is two vast speaker stacks, one each side of the stage painted black, like the podium and most of the equipment, to merge into the acres of drapes. The mix fed to these stereo stacks on stage is in fact mainly mono, to produce a central image for most parts of the audience. The pa amplification is by around 50 Quad 303s and 40 Phase Linear 700s. Crossover is 4-way. The mics and direct injection feeds (for instance from the keyboards and bass) are split on stage to provide a separate, independent set of feeds to the on-stage (but out-of-sight) console for the monitor mix.

The attitude of the group varies over what mix they prefer to hear, so there is a choice of on-stage monitor sound available via headphones and floor speakers. The mix to each stage position is individually controllable by the on-stage engineer, under voice instructions relayed from the musicians via an intercom. There is also one on-stage submixer to provide local changes of monitor mix at that section, independent of the main on-stage console. And, of course, the split feeds mean that every mix the group hears on stage is independent of the mix that comes out of the stage pa for the audience. So the group are operating in what, in many respects, resembles a studio situation on stage.

At the same time another studio situation exists at the main mixing console in the hall. The Midas desks provide the facility for anything from the main 40/8 subgrouping to be routed into a subsidiary board which carries the six quad panpots. These in turn can route the panpotted signal round extra quad stations located high up at the sides and rear of the hall. In this way any channel or mix of channels can be lifted out of the main pa mix and their sounds sent round the hall. Additionally, there are auxiliary quad feeds from Otari and Brenell 8-track tape decks (four tracks only of each being used). Another quad feed comes from the 35 mm 4-track magnetic back-projector. The 4-track film sound and the tapes are dbx encoded. Together they contain studio remixes or re-recordings of backing tracks for the items to be performed on stage.

Click tracks on the tapes and film can be routed to the headphones on stage, so that the group can synchronise exactly with whatever sound is coming up next. Likewise the group can synchronise with film action on the screen without watching it. On the assumption that our readers are not given to drooling over equipment lists, it would be more significant to list what's missing in

terms of equalisation, compression, echo and whatever. Come to think of it, I can't recall or notice anything that was missing other than Dolby, which is absent in favour of dbx. What matters far more is how, in practice, you get everything together, on the road and working.

It takes a technical crew of around 30; the band and wives, etc, number another 25. The gear goes by truck, as for the most part does the crew. The group travels by rail or air, depending on distance—in America everyone flies. To set up in Wembley took the weekend; by Monday afternoon, with the first show on Tuesday evening, something approaching a sound check was possible.

Working in a hall like Wembley Stadium, designed mainly for skaters and with enough headroom for flying pigs, you need more than just equipment to produce sounds that match those which most of the paying customers are used to hearing at home on disc. Remember that people who buy and listen to Floyd records tend to know about sound. I watched the crew tame the Wembley acoustics by running noise through one pa stack after the other and equalising with a spectrum analyser. By the time they'd finished making even a rough check in the empty hall the graphics looked like switchbacks. During the first night a repeat check is run with the hall full. By the time I saw the show it was Saturday, and the sound was good.

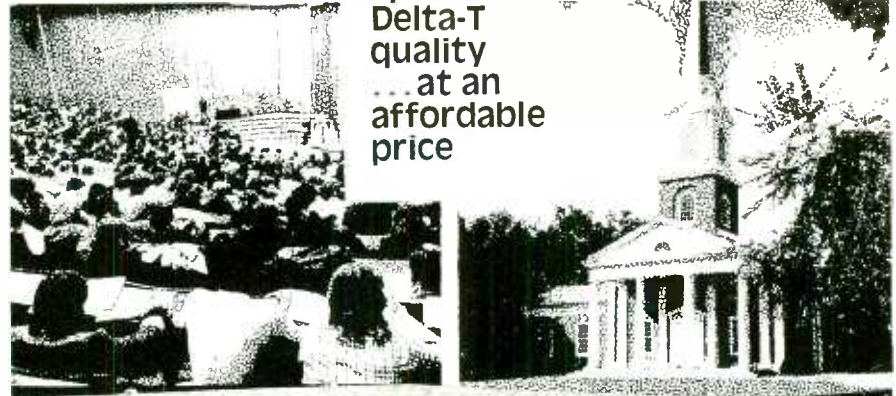
There had been problems earlier in the week. In fact that's an understatement. Putting on a Floyd show isn't just a question of getting the equipment from A to B, setting it up, running a sound check, rehearsing and checking tickets at the door. If it were, the world would be a more relaxed place for men like Brian Humphries, Robbie Williams, Graeme Fleming, Seth Goldman, Phil and Nigel Taylor—the hub of the Floyd technical empire. When you've been in their game for as long as they have, you learn about the need to do sensible things like take the flywheel off an 8-track recorder that was designed to sit stationary in a studio, not bounce round Europe in the back of a truck. You learn to cope with emergencies, like the di feed from either the acoustic guitar or the keyboard developing a crackle halfway through a number on stage, as it did on Saturday night. You carry spares of everything around with you; which is why, for instance, the Brenell 8-track sits waiting with spare backing tapes in case the Otari develops a problem (which, incidentally, it so far hasn't). You can even learn to cope patiently and put on a smile when journalists like myself put silly questions and then ask how the answer is spelt.

Despite phrases like 'predictable', 'nothing new' and even 'a bore', used by the critics after Wembley, there is no doubt that the world of entertainment would be a sadder place without Floyd-style extravaganzas. Viewed dispassionately, it is in fact a somewhat ridiculous situation. Four (plus an extra two) musicians stand on the vast stage like pygmies, dwarfed by a jungle of technology put together and operated by 30 technicians. The live sound made on stage is mixed with pre-recorded material to replicate commercially available originals. The

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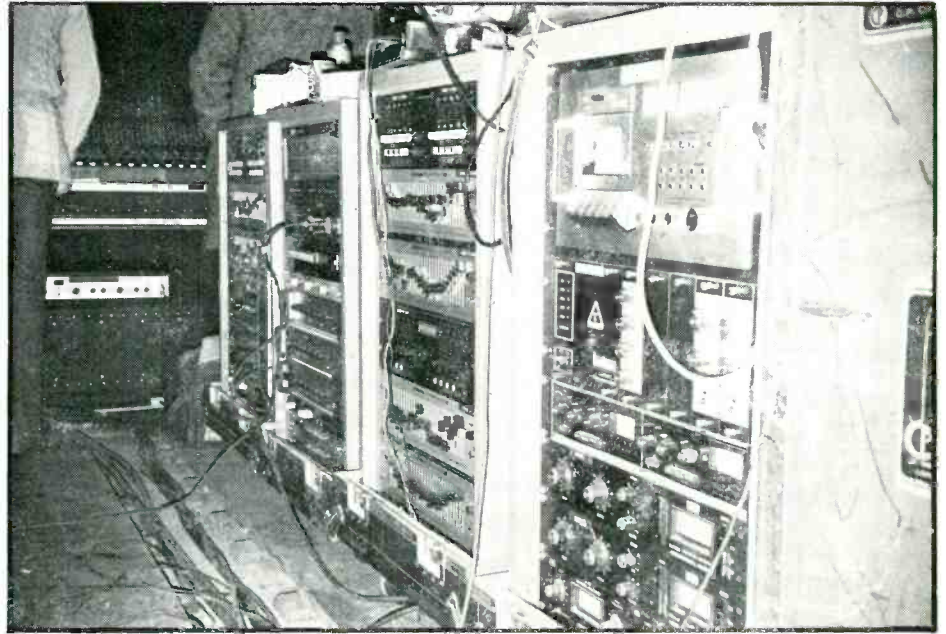
IF PIGS COULD FLY . . .

precision timing involved makes improvisation, and certainly a whimsical change of programme, out of the question. If you closed your eyes (and on the first nights ignored the buzzes) you might almost be at home listening to one of the group's recordings played on a loud hi-fi. But if you open your eyes there's all that spectacle to behold. The spectacle is, as often as not, the

only thing visible, with the band lost in darkness. During the concert this prompted an irreverent thought: has the band, perhaps, gone home? More to the point, was there any point in their turning up in the first place? Think of all the effort and heartbreak and hassles that could have been saved if the engineers had brought along a mint disc copy of *Animals* and *Wish You Were Here*, and played one half of each through the stereo pa and quad stations while

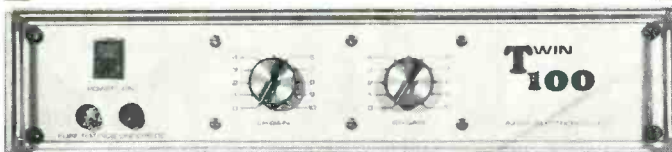
their colleagues lit the fireworks, inflated the inflatables, showed the films and released the dry-ice; no need to bring along the Midas consoles and all the studio gear; no need to worry about stage mics and monitors; and as a result none of those operational hassles. There is only one reason why it wouldn't work . . . no audience would turn up. I certainly wouldn't—although to be honest I really couldn't say why.

Adrian Hope ■



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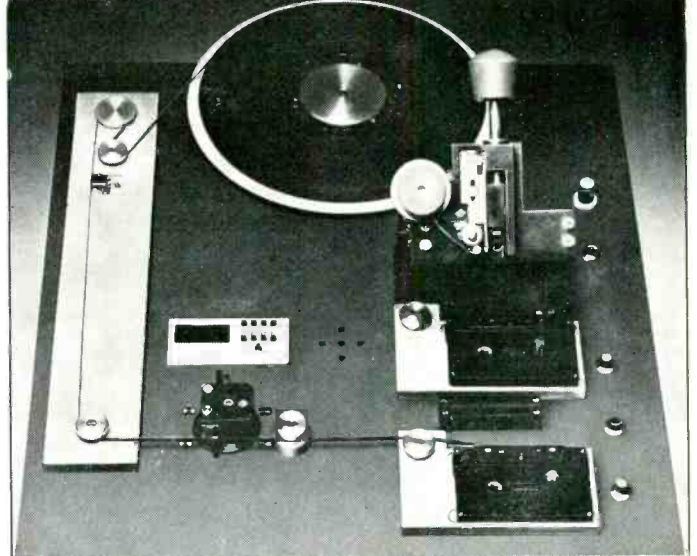


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super agony

■ Sadly, there are some things that even the Pink Floyd (and their engineers) can't bargain for, as they agonisingly found out at the recent series of concerts at Wembley. What happened has been widely reported in the popular and musical press, and it almost resulted in the week's concerts being called off. Ironically some of those reports have been sufficiently inaccurate to risk making life more, rather than less, difficult for the Floyd in future—and for that matter any other groups putting on similarly theatrical concerts.

A day before the shows began, the Greater London Council exercised its right to send in inspectors to check the concert arrangements for safety. Since a young girl was crushed to death at a David Cassidy concert a few years ago, the GLC has insisted on making the grant of a pop concert licence conditional on adherence to various safety regulations. These cover crowd control, sound level and fire hazard, plus health risks from special effects. With commendable open-mindedness, the GLC revised its original restrictions over sound level (perhaps as a result of pressure from the industry) and has caused relatively few problems for groups in this respect. But in other areas, notably provision of stewards for crowd control, the GLC has proved a stickler, and laid itself wide open to the criticism that the Council Authorities are unable to distinguish between a Floyd or Santana audience, which is far less unruly than a Prom audience, and the kind of screaming mob that tries to tear souvenir strips off David Cassidy or the Rollers.

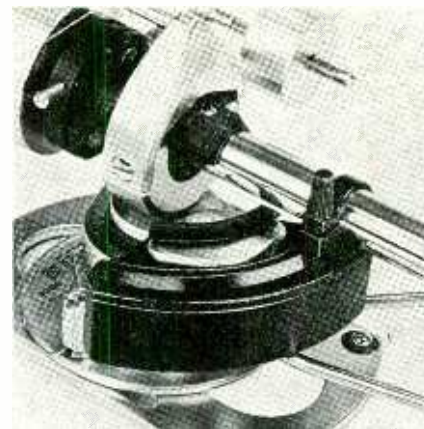
The GLC is also a stickler on electrical safety and the use of lasers. (A prosecution for the alleged misuse of lasers during The Who concert at Charlton last year is still pending at the time of going to press.) It was on the matter of emergency lighting and electrical safety that the main problems arose at Wembley for Pink Floyd. The GLC insist on emergency lighting which meets BS 5266 and provides a minimum light of 0.2 lux at any point in the hall during the concert. If the emergency lighting available in the hall is diffuse then there is no need for any sector of the audience to have more than 0.2 lux, and if there is a disaster (be it a bomb, an electrical fire or whatever) the whole audience can still see sufficiently well to get out of the hall. But if the lighting isn't diffuse, then some sectors of the audience are going to be far too brightly lit (if everyone is to have a minimum of 0.2 lux).

According to the GLC this is what happened at Wembley. The available emergency lighting was too bright, and would have wrecked the Floyd act. The GLC bent the rules and the shows went on with dimmed lighting. But it didn't stop relations with the GLC turning sour. On the one hand, there's Floyd and the crew struggling to put together a show to be proud of, and on the other hand there's the GLC worrying about safety and appearing to create difficulties. After some hassles over the strength of the pig-carrying cable, the crunch came when the GLC inspector pressed the

requirement that any metal work which carries mains cables must be earthed. The Floyd engineers only found out what this meant in practice after the first night (Tuesday) show had been marred—some would say ruined—by mysterious buzzing of the sound system. After spending the whole night after the Tuesday and Wednesday shows meticulously checking through every item of Floyd sound gear, the engineers finally found—virtually by chance—that earthing wires had been attached not only to all the scaffolding around and on the stage, but also to that which carried the quad stations around the hall.

On the quad stations the wires went from the scaffolding to the mains supply boxes. On the remainder of the rig there were earthing wires jumping like strands of a cobweb from here to there and back again. If whoever wired the arrangement was trying to create hum loops, they couldn't have done a better job. Hardly surprising, after this discovery relations with the GLC turned distinctly nasty. The story went to the national press, and campaigns were launched for a repeal of the GLC pop safety code. By this time Floyd were off up north to Stafford for more concerts, and planning the next leg of the tour in the USA. For Floyd and their crew, Wembley, or at least the first two buzzing nights, could only be a sad memory. From Thursday it had been all right on the night. What really grieved them was not so much the fact that the GLC had put all the earthing wires on and created hum loops, but that they had not told anyone what they had done.

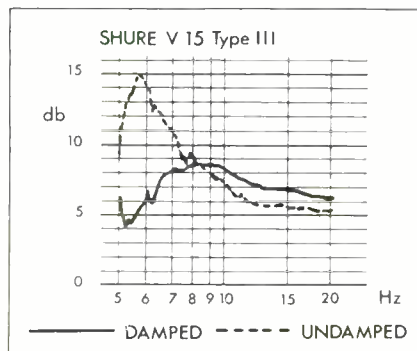
There was in fact a good reason for this. It wasn't the GLC who put the earthing wires on, as anyone in the national press could have found out by phoning the GLC instead of campaigning for the decapitation of their inspectors. When the GLC licenses a pop concert, the licence is granted to the management of the venue, and any breach of that licence results in a prosecution of the licensee. This is why Charlton Athletic Football Club and not The Who or the promoters are being prosecuted for alleged breaches of the safety code governing laser operations during The Who concert. Any prosecution resulting from the Floyd concert would have involved the Wembley management, not the Floyd. So when the GLC insisted that all the metal scaffolding that had been erected to hold the Floyd's equipment must be earthed—or else—it was the Wembley management who the GLC regarded as responsible. Doubtless for their own reasons, the Wembley management have refused to make any statement on this. But the GLC have categorically stated that their engineers never attached a single earthing wire (indeed, they're not equipped or entitled to do any such work). It is also a fact that the Floyd engineers stumbled on the earthing wires only by chance after stripping down the entire sound rig. The inference is plain—that the Wembley management attached earthing wires as required by the GLC, but then neglected to tell or show the Floyd engineers what had been done. ■



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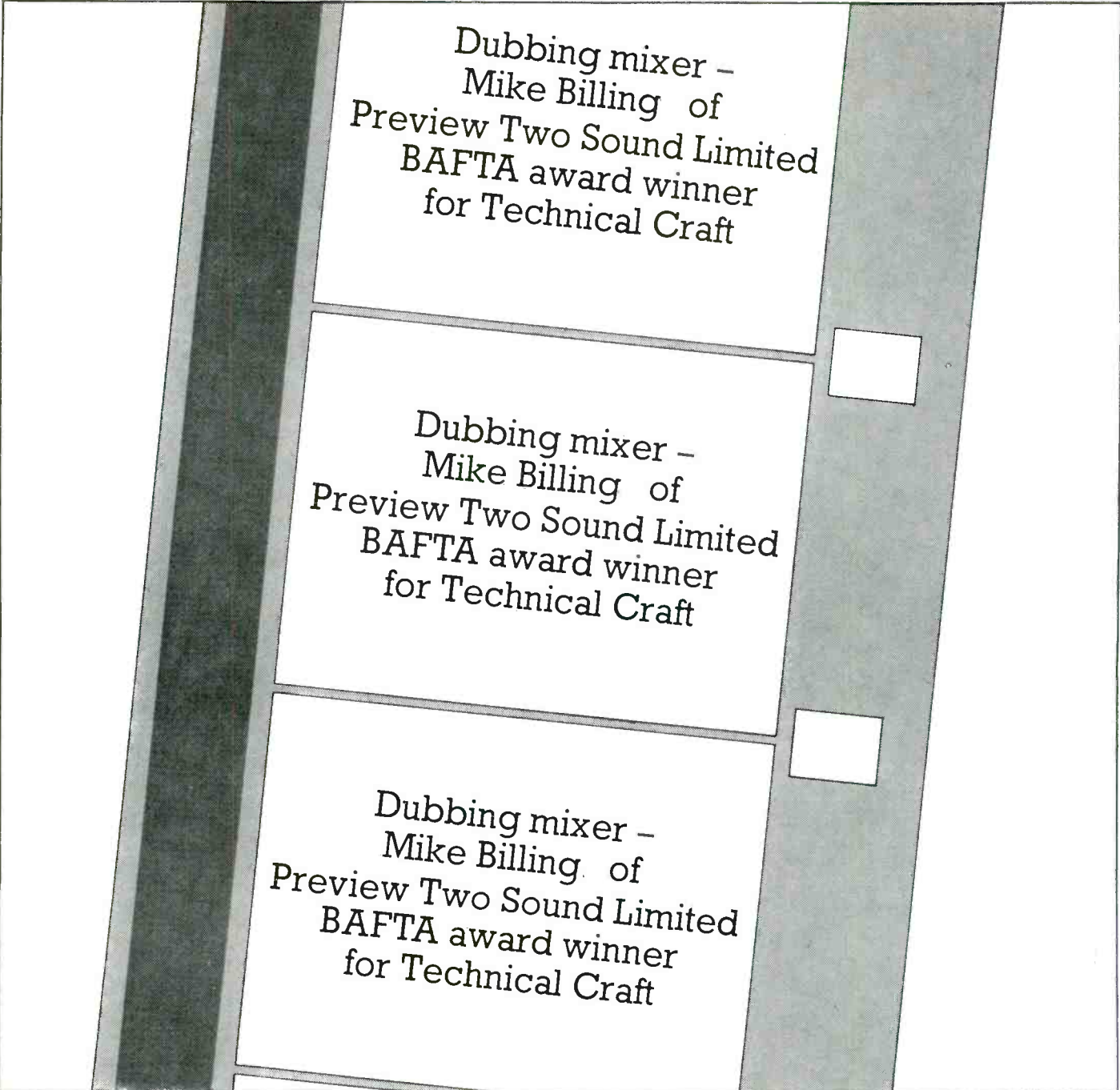
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Discotechnology

Keith Bloomfield

Discotheques are nothing new. The 'pleasure dome' concept dates back to antiquity, but the sudden emergence of a discotechnology is the prime reason for the pre-eminence of the contemporary discotheque.

THE DISCOTHEQUE REVOLUTION is being waged on a worldwide basis. So strong has been the popular response, that an industry has arisen to equip, service, and capitalise on the large sums of money being spent on the pursuit of pleasure.

Every bar owner with a pair of turntables, a cheap mixer, an amplifier and speakers, and a reasonable record collection is re-christening his establishment a discotheque. But background music, heavy on the low end, doth not a discotheque make. For the record companies to supply music that will succeed in a discotheque environment and appeal to the buying habits of a discotheque audience, they must understand the context in which their product will be employed.

Brooke Kennedy, Associate Editor of *Discothekin*, the international discotheque magazine, recognises that a discotheque is an assault on the senses; discotechnology has put environmental control into the hands of the disc jockey. By manipulating the environment, a dj maintains a powerful hold on the discotheque audience. And in many ways, he becomes a performer in his own right.

The dj has a number of variables to fiddle with. Coloured spotlights, strobes, laser effects, and neon sculptures can be adjusted by the dj or by a lighting technician. Discotheque lighting is often modulated by sound level or frequency. These automated systems circumvent the dj. At a few discotheques and clubs the olfactory nerves are tickled by the introduction of exotic and tantalising scents injected into the ventilating system. The taste buds are satisfied by the discotheque's own special 'cuisine', and our ears are bathed in non-stop music—music that often tops the 120 to 125 dBA.

The dj or 'spinner's' main job, aside from the regulation of these other environmental elements, is to keep the music going. But the job is much more involved than simply keeping vinyl on the turntables. The name of the game is 'blending'; djs can blend or mix in a variety of ways. By 'chopping' two songs, the dj follows one song immediately with the next, without missing a beat. With a 'double butt,' a dj plays the instrumental break twice by jockeying between two turntables playing the same record. Each of these methods achieves a different effect.

Prior to his present position, David Todd, Discotheque Coordinator for RCA Records, spent six years as a spinner at a number of New York discotheques and clubs. He points out that some of the best djs mix so that 'people feel the music change, instead of hear it change'. It's conceivable that a song is remembered not on its own merits, but because of a dj's expertise at chopping or double butting its position between two other songs, or because of its interplay with the lighting. The emphasis is on the overall effect of the mix and not on its constituent elements.

Discotechnology has learned its greatest lessons from radio broadcasting and concert sound. Dependability and ruggedness are the prerequisites for discotheque equipment. Dj mixing styles require turntables that reach maximum speed within a fraction of a turn; high-torque turntables have been used in

broadcasting for years and the carry-over was a natural. It's interesting to note that while some radio stations have completely abandoned the use of turntables in favour of the easily sequenced instant-start cartridge machines, the discotheque dj would feel constrained if he was relegated to play each song from the beginning. Though most djs don't realise it, trackability is an important consideration in choosing the right arm and cartridge. The average dj will be satisfied if the bass thumps through, and the arm doesn't bounce off the record during the loudest sections of a song.

Discotheques have become a powerful tool for the introduction of new records—some record companies have even produced special discotheque versions of new releases for the sole use of djs. Salsoul Records issued an extended-play 45 rpm version of *Ten Percent* by Double Exposure. This 'Giant 45' was actually a 30 cm disc cut at 45 rpm. The increased diameter and speed permitted Salsoul to provide a disco-style mix that was longer than the original album cut, and some four to six dB louder. So successful was this promotional experiment that the disc was released commercially as a collector's item. Other companies have subsequently released 'Giant 45s' and discotheque mixes of their new material. A low-mass consumer oriented arm, tracking at $\frac{3}{4}$ to 1 gram, would probably find a record cut at this higher velocity and level unmanageable—hence the mandate for more accurately tracking arms, and cartridges that will perform at greater stylus pressures without gouging the grooves of the records they play.

The demands made of a discotheque mixing console are much the same as those made of a broadcast desk. The programme sources are seldom more than two turntables and a microphone. In some circles, it's considered gauche for a dj to use the microphone to talk over the beginning of songs, whether it's for the purpose of introduction or to contribute a dj-type witticism. An open-reel tape or cassette machine is sometimes used as an additional source to provide the dj with the opportunity to refill his 'milk' glass.

Provisions for cueing are an absolute necessity. Headphones are often dispensed with for the ease of a single earphone cup, held to the ear only when actually cueing. Vu meters seem to be a rarity on custom-built discotheque consoles: but if the mixer is a bastardised pa console, who knows what goodies there might be—gain controls for each source and a master gain controlling the line level to subsequent equipment seem to be standard. A number of units have controls for equalisation. The majority of djs spoken to, prefer to leave eq controls in the flat position and rely on a graphic equaliser to tune the room.

The blending that is inherent in the disco mixing style is often achieved through the use of a sliding fader wired as a balance control. A nimble-fingered dj could easily turn up one rotary fader while he turns down the other, but the sliding fader doesn't require the same degree of dexterity to accomplish the same effect. It's often preferable to circumvent the fader and use the gain controls assigned to each source. It must be remembered that

when the sliding fader is used, the mixer output is equal to either the A or B source levels or a portion of the A + B signal, depending on the fader positions. Since the output can never be greater than the level of one of its sources, some djs feel hampered by such equipment because they can't effectively chop or doublebeat their material.

Signal processing accessories are an abused luxury. When used correctly, a graphic equaliser can do marvellous things for the sound of a room that would ordinarily be considered acoustically poor. It's unfortunate that bass-hungry djs are given access to equipment which they then readjust to their own taste. All too often, rooms are tuned devoid of people; when a crowd fills the place, the dj is confused as to why it doesn't sound as good as it did when he set the system up originally.

Reverberation, phasing, and flanging are the types of effect most consistently profaned. When judiciously applied, reverb can unquestionably tighten up the dynamics of an otherwise inferior sounding system. But when overdriven or applied by the ego of the dj, a reverb unit will demonstrate its effectiveness by diminishing the size of an audience. Phasers and flangers are essentially recording tools—they have no place in a playback system, except in the hands of the most expert dj. When used in conjunction with creative turntable techniques, the results are sometimes spectacular. In inexperienced hands, they are excellent at generating negative reaction from the audience and confusing the more intoxicated dancers.

The most enterprising use of an add-on seems to be the application of rhythm and percussion generators. These are usually the kind of vco's used in electronic organs and synthesisers. When set to syncopate with, or to counterpoint the beat of a song, the finished product is often quite an experience. This little black box is only a point of departure for the creative dj.

Amplifiers and speakers should obviously be considered as a unit. Discotheque operators seem to flock to the equipment that will look the most impressive, but might not satisfy the requirements of the physical environment of a club.

The major criteria to be examined are:

- a) Placement of speakers
- b) Ambient sound levels
- c) Budget

There is still a great deal of concern about the value of stereo playback equipment in the discotheque environment. Since stereo is a spatial phenomenon, the decision to go stereo must be dictated by the existing or proposed layout of the discotheque as a whole or of the dance floor area alone. Dancing couples do not make a habit of aligning themselves along the correct axis, in order to reap the benefits of a proper stereo image—this would require an exceptionally long and narrow dance floor. On the other hand, stereo might be appreciated by those not dancing.

Stereo implies pairs of speakers, but in some cases the best coverage of an area is not made by using speakers in pairs. They are often placed in corners (at floor and ceiling heights),

bordering the dj console, hidden in floors and ceilings, and even used as construction elements in walls. Djs look for acoustically uncoloured speakers and tend to gravitate toward studio monitor or concert-type enclosures. These include multiple-element cabinets, folded horns and multicellular arrays; and when space is a problem, designers are sometimes forced to revert to the good old dependable column speaker. Bose systems have proved popular in smaller clubs because their use of 'eight full range 4-inch speakers in an angled array controlled by an active equaliser' makes the most of sound reflecting wall areas and provides a crisp high end, an extended bottom, and a dispersion capability most appropriate to discotheque use.

Time to review. We've brought signal sources to our console; and routed our choice through an assembly of processing devices. We are now ready to fracture the fragile voice coils of very expensive speakers, and perhaps do permanent damage to the minds and bodies of the audience. But none of this will happen until we fit in the missing link—the amplifier.

Even without music, a group of people speaking to each other in conversational tones can generate a substantial level of ambient noise. And because disco music must be felt as well as heard, we must not only equal audience output, but surpass it. Even in a small club, the spl approaches 100 dBA. Crown, Phase Linear, and BGW have beasts well suited to perform under these conditions. Some clubs use stacks of rack-mounted amplifiers or split stereo units fed via a crossover network to bi-amplified multiple component speaker systems. The inclusion of a digital delay line in the distribution system at one cavernous discotheque enables the management to virtually eliminate an annoying echo, whilst also tripling the potential output of their already powerful installation.

By no means are all of the elements mentioned above included in every system, and this list of components is certainly not fully comprehensive, though by some standards it might be deemed a bit extravagant. The sound system is only one part of the discotheque environment—perhaps the most important, or at least the most vocal. Whether an operator is starting from scratch or converting an existing facility, money is the dominant factor. If a mobile dj earning, for example, \$200-\$300 a night in the US, carries an equipment investment of \$20-\$30 000 around with him in the back of his van, it must surely be a sensible investment to install a complete in-house system?

In expensing out the cost of a discotheque, there are no definitive rules of thumb—cost per watt, per person, or per square metre. But it's agreed that it takes more than an expensive setup to achieve a profit. While it might seem overstated, the success of a discotheque rests on the shoulders of its dj—the sound and lighting systems are merely instruments on which the dj plays. Record companies are becoming more appreciative of this fact, and as a result more cooperative and reliant on the dj's opinions. Some djs have become consultants to the vinyl giants and aided them in remixing and blending for discotheque taste and consumption; a few of the more talented have turned to producing. By rallying the energies of some of the nation's best studio musicians and arrangers, they've helped to perfect that genre of discotheque music called the 'Disco Sound'. Disco music has its roots in Latin and Soul music and is best characterised by its heavy bass lines, lush string arrangements and overall danceability.

Many observers of the discotheque scene, even those with vested interests, acknowledge that while disco music has done much to revitalise our faltering discotheques and stimulate the revolution we are now experiencing, disco music itself is merely a passing fad that will eventually be supplanted by another musical vogue. But the discotheques will continue to flourish as long as people need a place to meet, relax and dance. Restaurant and hotel chains have jumped on the bandwagon by converting their bars and nightclubs into discotheques. Peripheral industries supplying fashions and sundry accessories are making a killing in this burgeoning market.

Discotheques used to be a haven for the chic and the rich, but as recently as the last couple of years, discotheques have sprung up like weeds in a fertile meadow. Considering their diversity, it can safely be said that there is a discotheque to satisfy every musical taste. And as long as competent djs are around to spin vinyl, discotheques will continue to increase in popularity, acceptance, and numbers. ■



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Things of sound to come

Adrian Hope

Recording technology and techniques have progressed a long way from 'Mary had a little lamb'. What immediate possibilities are there for the future?

TO WRITE about the history of sound technology, and who did what first and when, can prove a difficult task. There is no definite reference source or tablet of stone on which all the firsts and their dates are engraved, and as often as not separate inventors in different countries are simultaneously working towards the same end. But to write about the future is even worse, because at best one can only guesstimate and any prophecies made are thereafter conveniently available for ridicule.

In looking to the future, it is valuable to look first at the past, which shows how a lag between research/invention and reduction to commercial practice is virtually inevitable. Sometimes the original idea is ahead of the technology needed to make it work; other times commercial considerations apply. More often than not it is a combination of both circumstances. Until the general public, or at least a specialised sector, is aware of the significance of a new invention—by virtue of its availability as a saleable product—there will be no queue to buy that product. But as often as not viable commercial production relies on heavy investment (as for instance is needed to produce an integrated circuit) and firms who are busy making money out of other thriving projects may very well be reluctant to invest in expensive development schemes to satisfy a market that does not exist. And it can be as exhausting and expensive to create a market as it is to create a product. In the studio field there is no better example than that of Ray Dolby's noise reduction system.

In 1955 the American Ampex Corporation filed a patent application on the first workable videotape recorder. Amongst the four inventors named was Ray Milton Dolby. It is not surprising then, that the series of the patent applications on noise reduction systems lodged by the same Ray Milton Dolby in 1965 were concerned primarily with video noise reduction. But in practice the reduction of video noise is more difficult to achieve than audio noise reduction. Furthermore, the increasing interest in multitrack tape machines during the Sixties led to a call for an audio-frequency noise reduction system. As a result Dolby *A* units were sold into studios round the world. At the same time the appearance of cassette tape on

the domestic market, with its reduced width and recording speed, created a further need for noise reduction, and the modified version, Dolby *B*, was developed. Even now there is still no sign of Dolby video noise reduction, or for that matter a Dolby disc noise reduction system. But the technology is available and commercial incentives, in the shape of competition from dbx-encoded discs and the need to reduce noise on mass duplicated video cassettes, are growing. It thus seems a reasonably safe bet to suggest that within a very few years we shall see disc and video equivalents of the Dolby *A* system.

Audio engineers should not at this stage fall into the trap of assuming that video technology does not concern them, for the two fields are growing closer together all the time. Already there are videotape machines in many homes and of the several video disc systems available, most are intended for domestic use. This development will affect the studio engineer on two counts. First, on the most obvious level, the time is now fast approaching when some domestic recordings will be released in video plus audio format, rather than as audio only. What today we can conveniently call the 'hi-fi enthusiast' will in only a few years' time be a 'hi-fi-and-video enthusiast', who will have his stereo surround-sound system linked to a videotape or disc player and colour tv set. Although it is unlikely that the public at large would ever wholeheartedly equate listening to a record with being able to sit and watch while listening, it does seem likely that in the interests of rationalisation future recordings may be audio-video compatible, so that anyone with the inclination to watch as well as listen to a recording can do just that. To return briefly to the past again, consider, for instance, how the once prevalent practice of issuing both mono and stereo versions of the same disc recording soon died out—it was, quite simply, far cheaper to issue a stereo, mono-compatible, recording. Even though it is probably only a temporary measure, in the UK EMI has moved on to a single inventory issue of all classical recordings in SQ quadraphonic, with the matrixed rear channels containing ambient information—the discs are thus

mono, stereo and quad compatible.

The other aspect of video technology important to audio engineers is bandwidth capability. At the moment audio freaks are enthusiastic about cassette and disc capability up to 20 kHz. To record extra channels of information on a conventional audio disc (using either the CD-4 or UD-4 quadraphonic systems which rely on a carrier tone at 30 kHz) strains disc technology to breaking point, and usually requires low-speed cutting. A videodisc (or video tape recorder, for that matter) offers a bandwidth of several MHz and makes such enthusiasms and strictures seem mildly ludicrous. With a video recording medium and multiplex techniques the audio engineer can load more channels of sound than ever before onto a single disc or tape. This opens new avenues for multichannel surround-sound reproduction, but at the same time raises the question of whether successful surround-sound reproduction really needs a large number of discrete channels for success. One school of thought claims that it definitely does not, and that the use of too many channels degrades the final effect.

At the present time the world listens—at home and in the studio—to stereo reproduction using the technique invented and patented by Alan Blumlein in 1931. By sitting in front of, and at a fairly tightly defined position between, two loudspeakers which are reproducing sounds with amplitude differences, the listener is rewarded with a front spread of sound. But only occasionally does the spread of sound move more than a little outside the arc defined by those loudspeakers. Much of the abortive work over the past seven years on quadraphonic systems intended to surround the listener with sound—rather than provide him only with this frontal spread—have been based on a false premise. It has been assumed that the frontal spread can be extended round the sides and to the rear simply by using four loudspeakers, one at each corner of the room. The fallacy of this is evident to anyone who turns sideways on to a stereo pair and hears the spread collapse, and would not have escaped Blumlein for five minutes. But it has been perpetuated by far too many people who should have known better. Amongst

122] ►



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THINGS OF SOUND TO COME

those who did know better has been the Ambisonics team of Michael Gerzon, Professor Peter Fellgett and John Wright, who—with NRDC backing—are developing a system which, it is claimed, will give a true surround of sound for a listener surrounded by several loudspeakers. It remains to be seen whether the Ambisonics team are able to produce in a room what they claim on paper. So far the only notable success in this direction has been achieved by JVC, who, by combining binaural (or dummy head) recording techniques with surround-sound loudspeaker reproduction, has achieved what other firms have so far failed to do. They have produced almost tangible phantom images in space around, behind and even slightly above the listener, without the need to wear headphones. The JVC *Bi-phonic* systems are openly acknowledged by the company to represent only one step along the long road to commercial viability, and for success require that one, or at the most two, listeners occupy a carefully defined position at the centre of four loudspeakers. But the results achieved so far point to where sound reproduction research is going next. Moreover the public is now ready for true surround-sound reproduction, a development clearly evidenced by the commercial failure of quadraphonics—which for the most part disappointed the listener—and the increased upsurge of interest in binaural or dummy head recording. (Incidentally the system for making binaural recordings was first patented in 1927, but was both technically and commercially ahead of its time.)

Thus, the eventual future of sound reproduction must surely centre around the situation where a listener hears sound emanating from an intended direction, irrespective of the direction in which his head and ears are pointing. To achieve this is currently a dream, but nevertheless a dream that someone, somewhere—be it Ambisonics, JVC or any other workers in the field—must eventually make come true.

Another dream that must sooner or later be realised, but which also stretches understanding and technology beyond contemporary limits, is that of watermarking recordings, and perhaps even preventing their illegal copying. It is generally recognised today that the piracy of commercial recordings accounts for considerable revenue losses by record companies and artists. At current studio rates, it is far cheaper to steal someone else's recording than make your own or buy it legitimately. EMI have launched a tape watermark system which may help counteract one aspect of piracy. According to the EMI system, the physical base material of a recording tape is magnetically watermarked during production, so that the true origin of that particular tape can subsequently be proved. But—and quite apart from other snags—this can only be of legal value where it is required to prove that a tape (for instance a cassette 'got up' to look like an EMI-branded tape) is in fact not what

it appears to be because it has no watermark. The real future lies in watermarking the recording itself, rather than the tape carrying the recording, so that it is possible to prove the origin of a recorded performance, irrespective of where it appears subsequently—for example, on a pirate tape, disc, or radio transmission. So far there has been no 100% workable and foolproof solution proposed that can place a mark on a recording to positively identify its origin, while remaining at the same time both completely inaudible even to the keenest listener—so as not to destroy legitimate listening pleasure—and resistant to the effects of deliberate tampering of the copy process itself; for example, resistant to high or low-level filtering or the introduction of noise. But such a system must eventually be devised. This still leaves, however, the real chimera—a system which will *prevent* the illegal copying of material. Although this at first seems an impossible dream, with so much money at stake and the rapidly moving pace of present technology, who is to say that a workable security system may not be developed in the future?

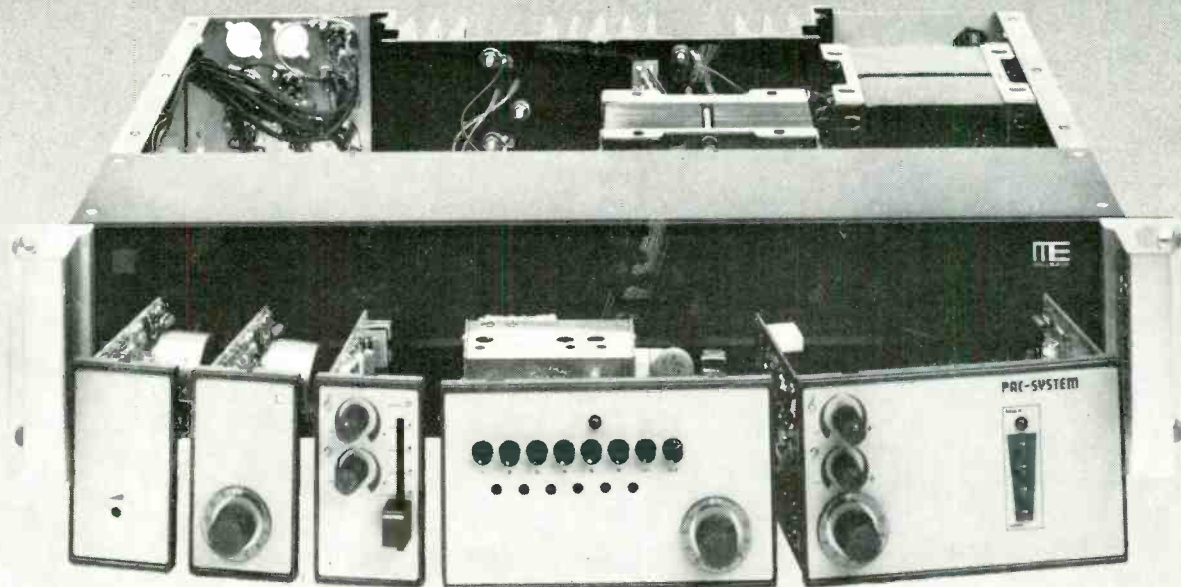
A simple answer, of course, would be for the software companies to move in the future towards the production of recordings which are so cheap to buy, of such high quality and so resistant to damage that there will be no incentive to pirate them either on a small scale domestic level or in bulk. But this would require a re-think on the financial position of the performing artist *vis-a-vis* the remainder of the population—sadly 1984 is less than a decade away in more ways than one—and necessitate a radically new approach to recording.

It is constricting for us to continue thinking of conventional tape and disc as the only possible recording media. There is no reason, for instance, why in the future new recording media should not be adopted, on the strength not only of their ability to record, but also their ability to withstand damage and perhaps even prevent piracy. After all, we are already seeing the introduction of one new type of recording technique in Japanese studios. Nippon Columbia has now released several hundred discs recorded with the pcm system, which combines video and audio tape technology. Instead of being recorded on to tape in analogue form, the audio signal is digitised and recorded on a 4-head 50 mm video tape recorder in binary code. On playback the digital signal is reconverted to analogue form for conventional reproduction. (An article describing the system was published in *STUDIO SOUND*, Oct '76.)

The results are impressive—the disc sound approximating that of a direct-cut lacquer or a dbx-encoded pressing. But in each case—pcm tape recording, direct-cut or encoded disc—the final product sold to the public is in analogue form. Inevitably the elegance of a digital final product, with its immunity to noise, damage and distortion, must eventually appeal to the public, record companies and hardware manufacturers alike.

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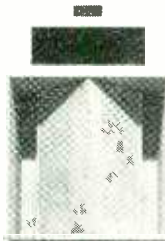
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THINGS OF SOUND TO COME

anti-copy coding could then be built into the new system format. It would, of course, require agreement all round. But as an alternative to state-subsidised artistry, and with so many manufacturers involved in the production of both hardware and software, the opportunity for a fresh start might well be welcomed in most quarters. Just as Philips only gave away free licences for their compact cassette system patents on the proviso that the specified mechanical dimensions and track formats were adhered to, so any future standard recording system could be licensed with anti-piracy measures in mind. Beware of the mental trap that produces scorn for ideas that seem outlandish by this year's standards.

A few years ago the prospect of unleashing on the public audio and video material in digital, rather than analogue form, would have seemed outlandish. But today we can buy a calculator whose digital circuitry has been reduced to such a stage of mass-produced integration, that while r and d costs can amount to many thousands of pounds, it eventually sells for only a few pounds. With the advent of microprocessors, computers are already moving into the home, some relying on digital programmes stored on standard cassettes. The Japanese company Matsushita has a working prototype of an audio cassette recorder that encodes still colour pictures signals in digital form, on the narrow and normally unused guard band down the centre of the tape. These are read out on replay into a memory and displayed on a monitor, with a fresh picture every few seconds.

But the disc, the reel of tape and the tape cassette are in themselves inelegant solutions to the encoding of digital material. The real future probably lies in a system such as holography, which is a classic example of commercial viability lagging behind original invention. The principle of holography was first patented by Denis Gabor and BTH in 1947. Not only was there little commercial incentive then for anyone to invest money in the proposed technique of diffraction photography, there was also no conveniently available sources of monochromatic, coherent light. It was with the development of the laser a decade or more later, that holography eventually became a practical proposition. Contrary to popular opinion, lasers are useful for other things than intimidating James Bond, and although the phantom photographic images that laser-holography can produce may be an exciting art form, real interest lies in the information storage capability of holographic carriers. Using optical methods it is now possible, for instance, to store information at densities of 10^5 - 10^6 bit/mm² and superimpose 500 holograms in a 1 cm thick crystal. Rotating data carriers, in the form of discs, with the information recorded in narrow, concentric tracks, are being developed, along with linear flexible stores. Largely as a result of the highly mathematical character of the available research reports, the concept of digitally storing audio material in a hologram has not yet captured the sound engineers' imagination.

Whether through holographic or magnetic bubble techniques, a combination of both, or something as yet undiscovered or even dreamed of, it seems a foregone conclusion, therefore, that future recording media will take the form of lumps, cards or slivers of solid material that are loaded into a recorder/player and remain stationary while scanned by a moving trace.

Although the next decade or so may see surprising developments in the reproduction of sound around the listener by loudspeakers, transducers of the type we know and love to hate today can have no real place in the eventual future. Almost certainly direct injection into the human body (comparable to the di of instruments into a console) must become available as an alternative to conventional speakers and headphones. Already work in this area is progressing as a means of giving the blind and deaf an opportunity to experience again the brain sensations normally associated with seeing and hearing. Digital di must be considered as the logical extension of a reproduction chain that gradually discards analogue techniques as unsatisfactory and restrictive.

By now it should be clear why I suggest that only a brave man or a fool would discount the possibility of future sound and vision recordings being manufactured, sold and reproduced in a form and manner wholly unrecognisable today. And this leads logically to what I think the most fascinating thought of all, which was prompted by a report carried in the popular press of a rather silly exercise whereby an audio cassette was buried in the cement pillars of a recently-built bridge.

The tape was intended as a 'time capsule' to give future generations insight into our twentieth-century way of life. Setting aside the purely physical question of whether a magnetic tape buried today would still be playable thousands of years in the future, we are left with the much more relevant question of how a future generation would know how to play a twentieth-century magnetic tape. Imagine ages ahead, excavating the remains of our civilisation and finding a Philips *Musicassette*. What would you do with it? More to the point, how much of what we have already excavated, for instance from the Pyramids or Stonehenge, contains material encoded in a format unknown to us today—unknown to us because the encoding technology belongs to an age long since forgotten, and we have not yet rediscovered the technology. While not suggesting that Fred Hoyle's 'steady state of the universe' theory need unduly concern studio engineers struggling to get a respectable tape down before lunch, such thoughts are occasionally worthwhile. They do, for instance, help put the present, seemingly all-important squabbles over recording, quadraphonic and broadcast standards in a more realistic perspective. They also help the engineer open his eyes to the possibility of future recordings being made in radically new formats. Such formats might be holography. Or they might be others at least as foreign to our minds now, in 1977, as Edison's 1877 experiments would have seemed to a court musician in 1777.

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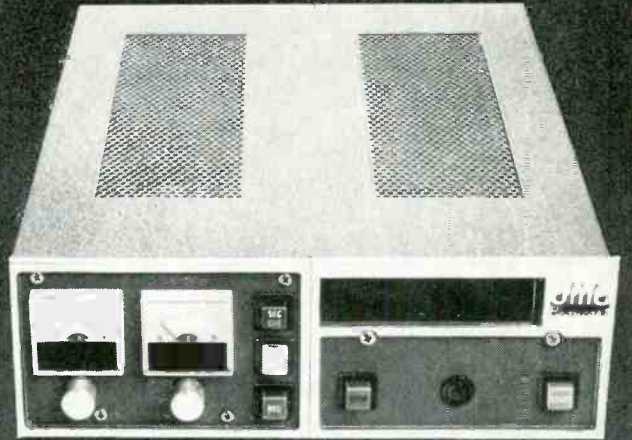
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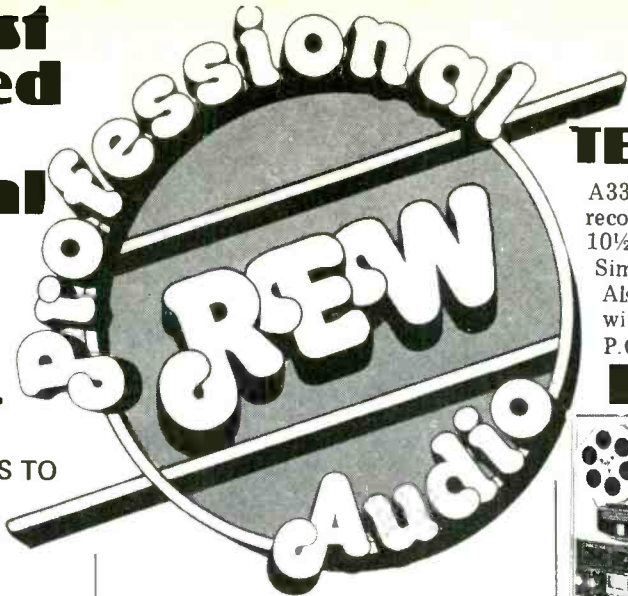


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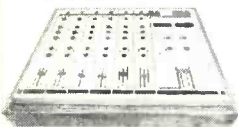
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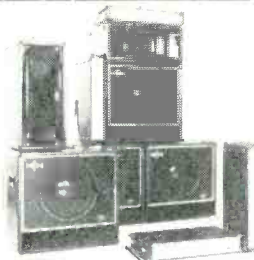


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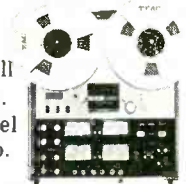
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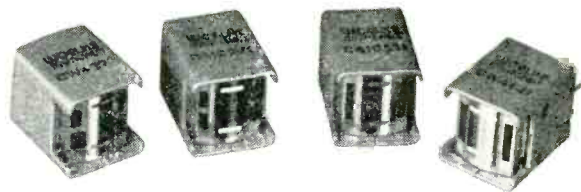
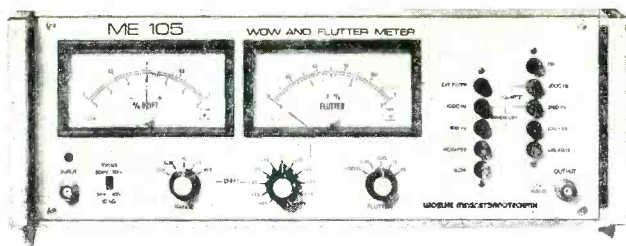
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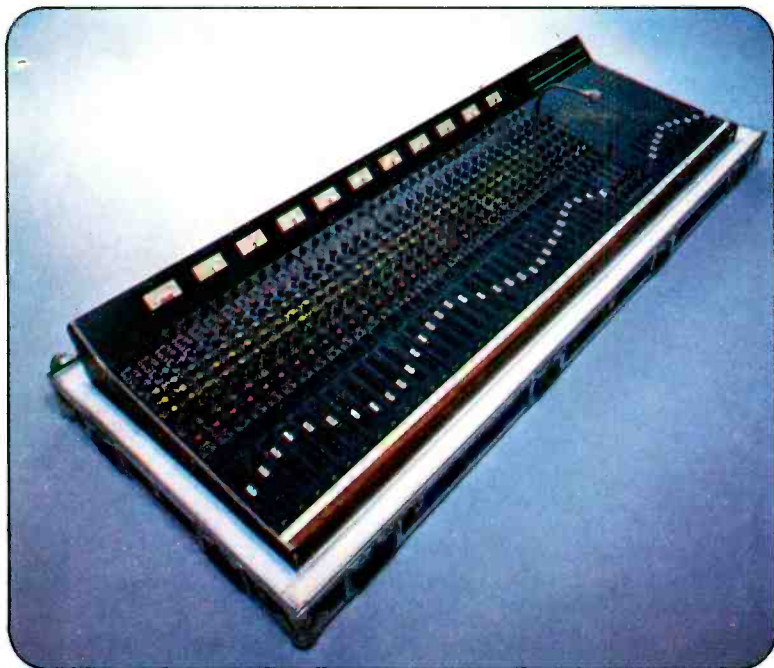
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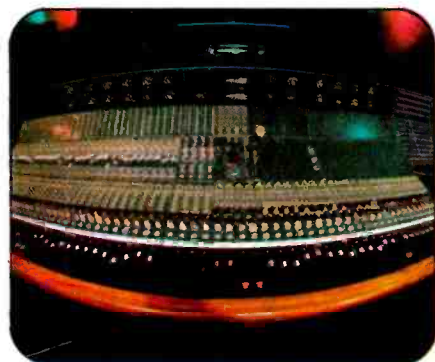
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