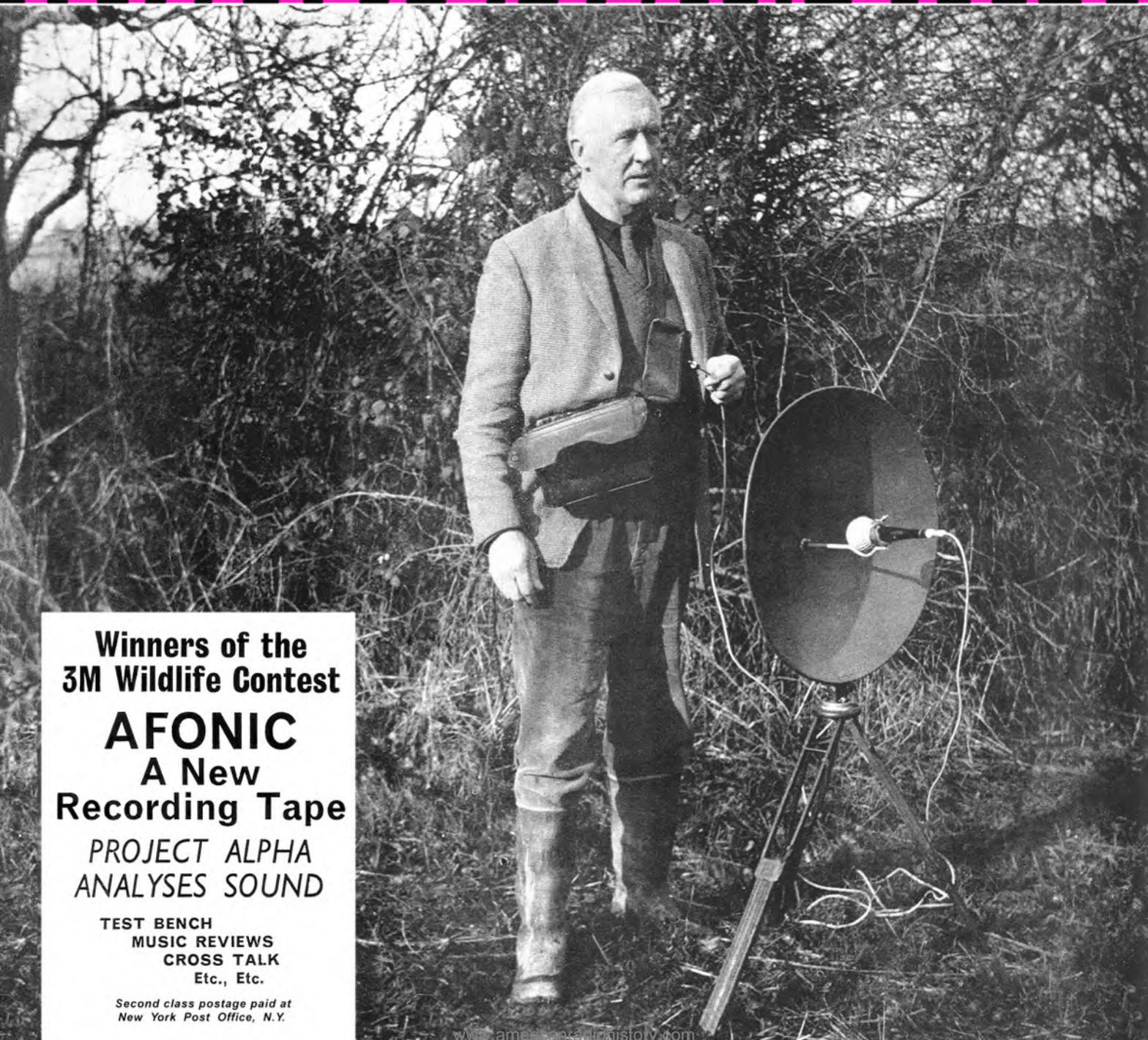


APRIL 1969

TAPE

RECORDING MAGAZINE

2¹/₂



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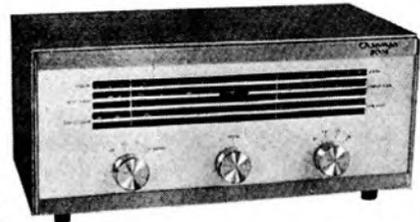
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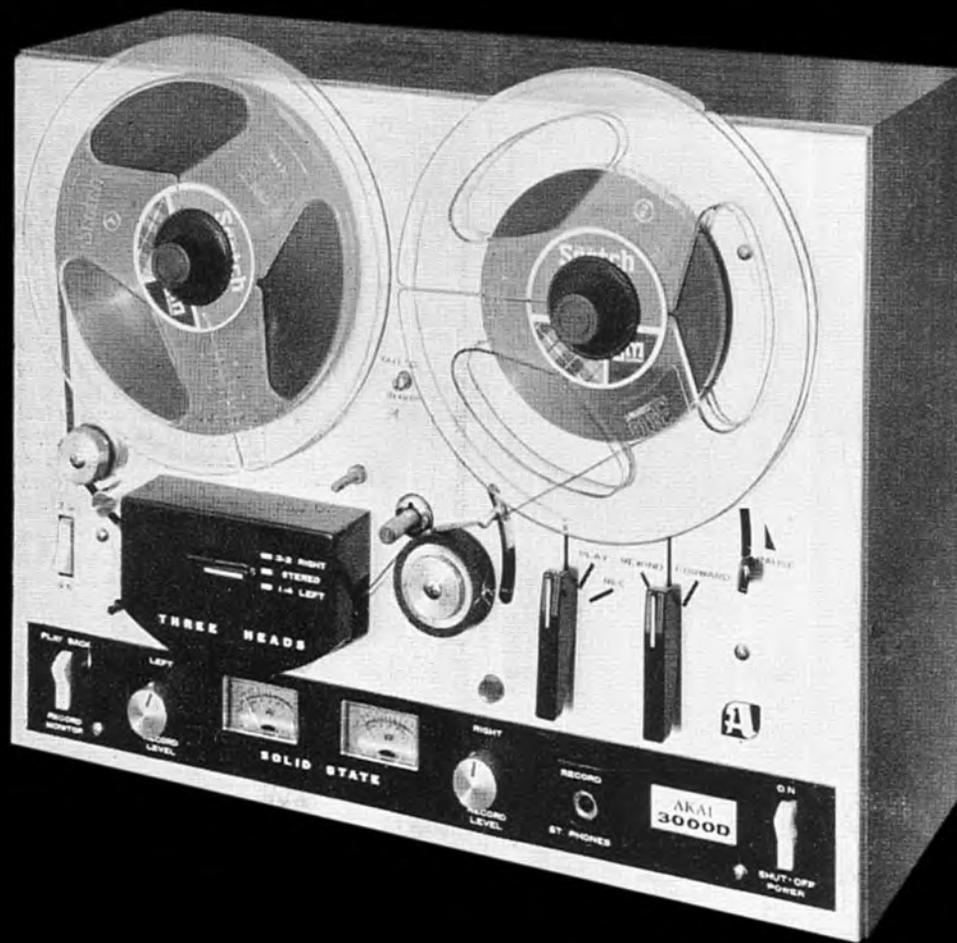
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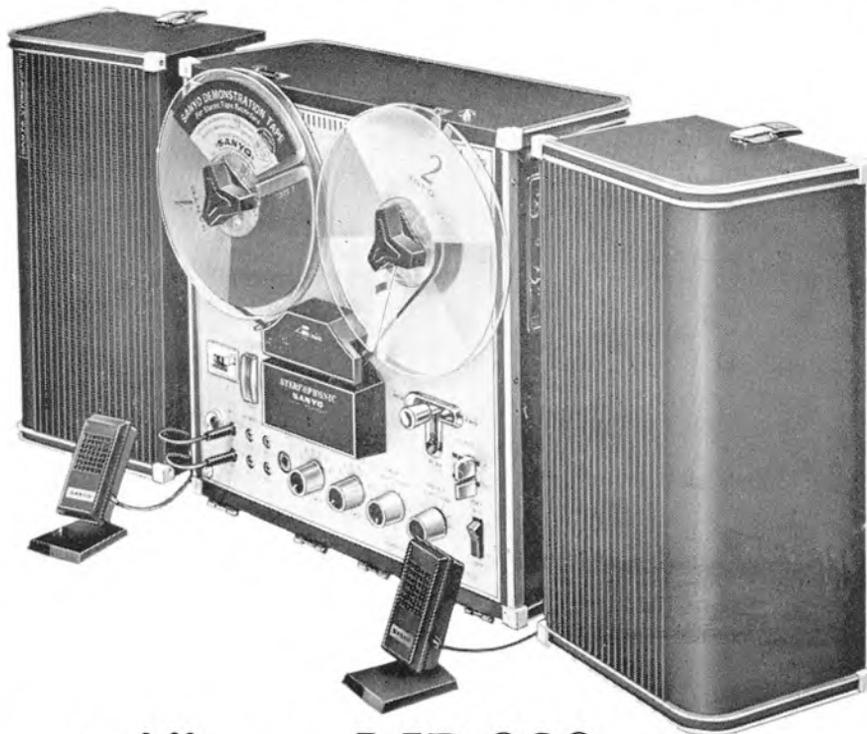
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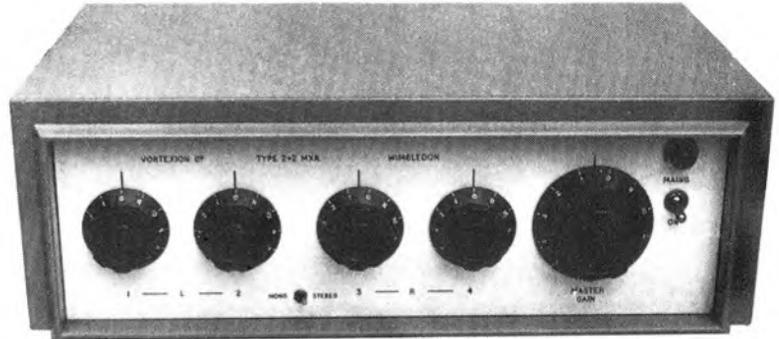
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TAPE RECORDING MAGAZINE

Incorporating TAPE RECORDING & HI-FI MAGAZINE and STEREO SOUND MAGAZINE

Vol. 14 No. 1 January 1970

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FRONT COVER PHOTOGRAPH: Our accent this month is on outdoor recording, so we feature one of the class winners in the 3M Wildlife Tape Recording Competition. He is Mr. Wylie-Moore from East Sussex, a landscape painter by profession. His winning entry was of a vixen barking—a recording that was taken almost by accident. The full story about this and other entries appears on Page 121 this month. Equipment shown in the photograph includes: Uher portable recorder, Grampian parabolic reflector and Grampian DP4 microphone fitted with windshield.

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Back numbers, if still in print, are available, at 2s. 6d. per copy.

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Tape trends and tape talk

By Douglas Brown

AN OLD FRIEND and professional colleague of mine, Lord Ritchie-Calder, has just taken up a new appointment as the chairman of the Metrication Board. With his team he will supervise the total conversion to metric weights and measures in this country over the course of the next five years.

We are going to have to buy our beer by the litre and our potatoes by the kilo. But, much more important to my readers; we are going to have to fall in line with those Continental tape recording manufacturers who, in the past, have had to pander to our national idiosyncrasies to the extent of producing special models and special literature for Britain.

We've just got used to using Hertz, rather than cycles per second. Now we should begin to start thinking in terms of 19 cm/s (centimetres per second), instead of 7½ ips. And so on.

And beware! Not in every case shall we be able to use straight conversion: our so-called quarter-inch magnetic tape is nothing of the kind—it's 0.247 inches wide, and that's easier to express as 6.25 millimetres, surely?

* * *

BRITISH RAIL have long been enthusiasts for battery portable recorders. They are used in many freight marshalling yards to record the loading of wagons as they are shunted into sidings. And now, it seems, they are being used by some ticket collectors to note details of tickets.

A correspondent in a daily newspaper reported the other day that he had heard a railwayman dictating these details into his machine. "When he had finished, I asked if I might record a brief message to the effect that a passenger to Lancaster should not be made to wait for an hour and a half for a connection to that important university city," the correspondent wrote. "Courteously but firmly the guard explained that this could not be done, since his machine was for 'statistics' only, and he described to me how a mighty official of British Rail would sit in the seclusion of Paddington playing back the tape to himself."

I can't help feeling that British Rail might benefit a good deal—and their officials have a much more interesting time—if they allowed some of their staff to carry machines for passengers' views only.

TIME ALONE sorts out a lot of problems.

I remember all too much fuss over the years about what amateurs might or might not do in the way of recording off the radio; and even about how far journalists might or might not go in advising amateurs about what they might or might not do!

Now I see one of the biggest manufacturers is taking large advertising spaces in the popular press to announce: "This radio turns into a recorder at the touch of a button."

But still there is caution in the copy-writing. Still there is no clear indication that this machine will record your favourite radio programmes. Copyright is the problem, of course. The advert had its own built-in (but presumably unconscious) comment on this situation: its main slogan was "FANTASTIC!"

Anyway, one thing the imposition of purchase tax on recorders has done. It has given the British customer the combined radio-recorder, available in most other countries for years past.

* * *

SOME RECENT CONCERTS of electronic compositions in London have worried the music critics. I sympathise with them. I am not sure by what terms of reference one can try to measure this new artistic form. When a microphone picks up the sound of pages of a book being flicked by the fingers, what critical judgment is possible?

On the other hand, some most interesting and important experimentation is going on, particularly in the combination of live performers and taped music or effects. Electronics have already had a profound effect on pop music and I foresee them adding a new dimension to classical composition, too.

* * *

AN ORGANISATION calling itself Possum is helping severely disabled people to make good use of tape recording. The name derives from "Patient Operated Selected Mechanisms." The organisation has developed and supplies (often under the National Health Service) a Selector Unit which enables those who are paralysed or otherwise immobilised to operate recorders, typewriters and similar machines.

Possum is a non-profit-making concern and I'm told they will welcome information about recorders with a high degree of remote control built into them. The address is 63 Mandeville Road, Aylesbury, Bucks.

AFONIC—A NEW TAPE FROM EMI

HAYES, Middlesex, is an industrial suburb of London. Here amongst a proliferation of modern factory buildings is the nerve centre of part of the great E.M.I. organisation. We went to Hayes to discover the real meaning underlying a new word that is about to appear in our technical vocabulary. We were curious to discover just what Emitape mean by "Afonic."

The definition of Afonic is quite straightforward: derived from a Greek root it simply means "no noise." Was it in a flush of over-enthusiastic optimism that Emitape adopted this trade name for their completely new generation of magnetic recording tapes? Perhaps we could be excused a slight raising of the eyebrows when the meaning of the word was made clear.

Secure in the knowledge that "a rose by any other name, etc., etc.," we started discussing the problems of tape specifications, testing and use with the Emitape engineers. Unlike the implied claim for the new tape we created a great deal of noise; in fact we were still arguing on abstruse but fascinating academic points of technical definition when we realised with regret that if we didn't leave pretty quickly we should find ourselves working the night shift.

Reporting for *TAPE Recording Magazine* we have visited many factories and talked to many engineers; never have we had such interesting discussions or learned so much as we did at Hayes. Our talks covered three main topics. Firstly the absorbing subject of standard methods of measurement which might be used to evaluate audio tape. If this sounds rather dull then the fault is entirely ours. In fact it is a highly complex matter which vitally concerns not only manufacturers of recording tape but also the companies who make recording equipment, and, of course the people who use that equipment.

Next we talked about Afonic tape. It was stressed that this product bears no relation whatsoever to anything produced by Emitape in the past. It is something quite new, designed specifically for use on domestic recording equipment to a



A small corner of the test area at the Emitape works, Hayes. Here engineers use the new Afonic tape on a wide range of ordinary domestic tape recorders under very much more severe conditions than would ever be encountered in the home. Application testing, as it is called, extends to cassettes and cassette machines

specification that is claimed to be superior in many respects to that of any other tape made today anywhere else in the world.

Lastly we were conducted through the extensive test laboratories so that we could see for ourselves what Emitape claim to be a revolutionary approach to tape testing by a manufacturer. Obviously there is far too much to discuss fully in this one single article. It is therefore hoped that we will in the near future be able to publish our own independent evaluation of the new Afonic tape and then at a later date we will set out the arguments for and against the various measurement standards which will include a plea from the heart for the adoption of one universal standard throughout the industry. No single agreement could bring more substantial immediate benefit than the clarification of the present confusion that wastes time, energy and money apart from making it more difficult for the amateur enthusiast to use his equipment under optimum conditions.

But for the moment let's just consider a little of the Emitape philosophy and some of the ways in which they have evolved this new product. It was soon apparent from our conversation that the technicians

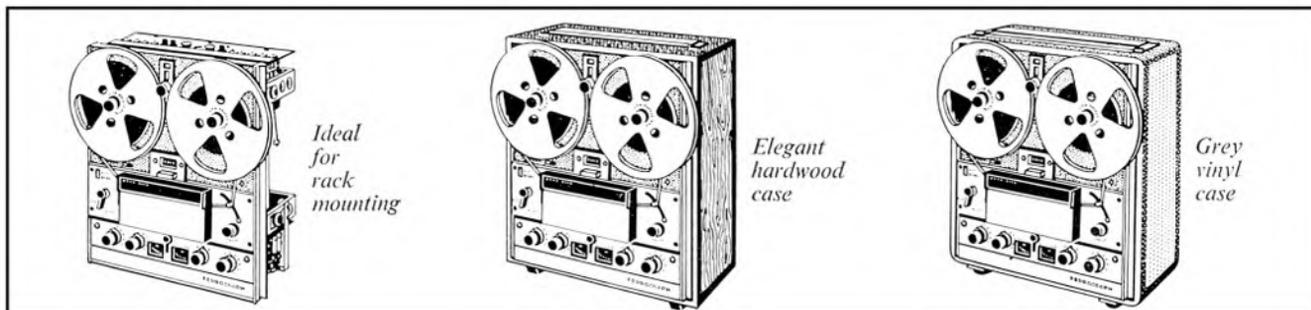
at Hayes not only know precisely what they expect the ideal tape to do, but they also have some very original ideas on how to achieve that end. Whilst agreeing with us that the function of magnetic audio tape is merely to serve as a medium in the reproduction chain—whose sole end product is sound produced through a loudspeaker and whose efficiency should be primarily judged by the quality of that sound—they hastened to add that a number of other very important factors have to be taken into account. There are the obvious ones of size, overall thickness and coating thickness. These must be right, and just right, otherwise the tape will not ride properly through the mechanism and poor quality will result. As consumers we tend to take these things for granted, but in fact they are subject to the most rigorous checking with sophisticated precision instruments.

Having got that right, there are a whole host of other far more subtle qualities in a really good tape and some of those mentioned we had not come across before. Take noise for instance. It is accepted that noise level (background hiss) recorded

Please turn to page 123

Ferrograph New Generation Series 7-





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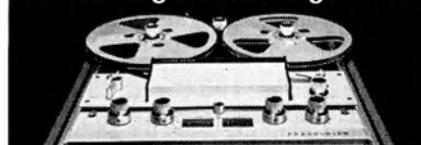
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TO find the biggest studio in the world we have only to open the door and step outside. Here in the great outdoors we shall find an endless multitude of sounds—most of them ours for the taking without any worries about copyright.

An interest in open-air recording does not preclude an equal interest in the more conventional indoor work with music and musicians; neither does it mean an exclusive concentration on either natural history in general or birdsong in particular. The business of the sound recordist is to deal with the recording of sound; differences of origin require only modified attitudes and techniques but they are all part and parcel of the same subject. And at this time of the year, with what we hope will be the pleasures of Spring weather to enjoy, who would exchange the open air for the narrow confines of an indoor studio?

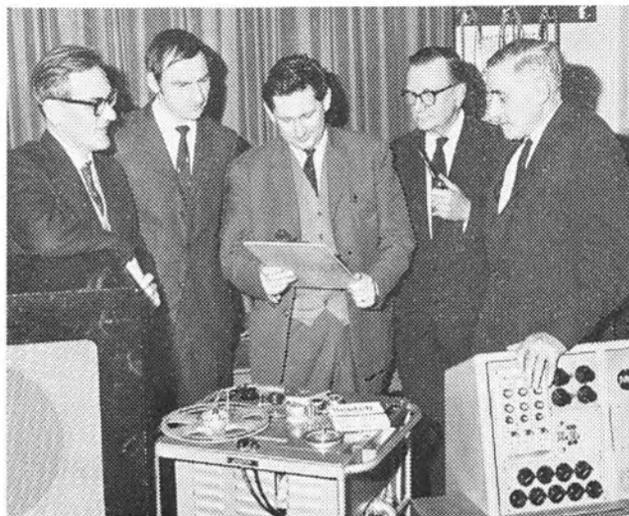
There is a natural and understandable interest in the outdoor recording world in attempting to give permanence to the elusive sounds of wildlife. The difficulties are enormous, and this in itself represents a worthwhile challenge. Even within this one field there is scope for an enormous diversity of effort—a fact that was proved by the more than 150 entries received for The 3M Wildlife Tape Recording Competition. This event was organised by The 3M Company, manufacturers of Scotch recording tape, in conjunction with the Wildlife Sound Recording Society, and it had to deal with entries ranging from recordings of an unhatched oyster catcher chick to a wasp eating jam.

Judging the tapes was an unenviable task. For nearly nine hours the panel listened again and again to the wide variety of wildlife sounds captured in field, wood and hedgerow by competitors living as far distant as the Shetland Isles, Devon and Caernarvon.

Most popular of the three classes proved to be that for individual species of birds, which attracted 68 entries. The winning tape was submitted by Magnus Sinclair of Haroldswick, Shetland, who took his Fi-Cord 202 out at five in the morning on the Isle of Unst to record a family of curlews. Runner-up in this class was Reginald Tassell, a blind entrant, of Huxham's Cross, Darlington, Devon, who used a Uher 4000 Report L machine with Grampian DP4 microphone to record a raven's call. Highly commended was David Page, of Morley near Derby, who used a Nagra III recorder to capture a lifelike sound picture of several pairs of lapwings in the Isle of Skye in May of last year.

In the class for mammals, reptiles and amphibians, the winning entry came from Norman Wylie-Moore, of Heathfield, East Sussex, who set out to record a nightingale singing on the edge of a copse

THE BIGGEST STUDIO



Judging of the 3M Wildlife Tape Recording Contest took place at the BBC studios, Bristol, on January 13. Checking the points scored are, from left to right, Richard Margoschis, tape editor Wildlife Sound Recording Society and author of our monthly "Nature Notes," Roger Burrows, secretary WRSR, Phil Hobson, senior research specialist 3M Company, and Desmond Hawkins, controller BBC South and West and vice-president of the WRSR

near his home and came back with a first-class recording of a vixen barking her way through the trees. A photograph of Mr. Wylie-Moore in action appears on our front cover. Runner-up in this class was Mrs. Anne Dunn of Ashurst, Southampton, who was up at 7 a.m. to record a grey squirrel swearing at a cat in Bournemouth. The judges commended Mr. J. H. D. Hooper of Staines, Middlesex, for his ultrasonic recordings of four different species of bats, made with a Uher coupled with a Holgate ultrasonic receiver.

The third class—for rarities, embracing both rare species and recordings of species not regarded as rare themselves but of which sound recordings are rare—produced recordings of stridulating bush crickets, a crane, a wasp preening, an earthworm moving through the soil and the call of a snowy owl. Winner was Keith Briggs, of Barnoldswick, Colne, Lancashire, who set up his Tandberg recorder close to a nest of choughs in a North Wales slate quarry, switched on, and left the scene. He returned to find he had a fine recording of the parent birds returning to the nest to feed their young.

Runner-up was a two-man team—Jack Skeel and Brian Bourne of Puckley, Ashford, Kent—who recorded, through an eighth-of-an-inch hole in the shell of an egg, the cheeping of an unhatched curlew chick, to the background of one of the parents calling overhead. Commended was the winner of the bird class, Magnus Sinclair, for his unique recording made on the Island of Fetlar in the Shetlands, of the first pair of snowy owls to nest in Great Britain.

Winners of the 3M competition will receive their awards—trophies and spools of Scotch recording tape—at the prize-giving to be held at the British Institute of Recorded Sound in Exhibition Road, London, on March 20. The presentations will be made by the well-known naturalist, Peter Scott.

This very excellent competition is going to be held again this year. As an added incentive a special prize award of a really good field tape recorder will be given for the tape judged best from the various section winners, together with the title "Tape Recordist of the Year." It is also planned to include a section for

Please turn to page 132

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on a tape is a function of tape oxide and the electronics of recording equipment. This may be improved if the tape carries a heavier signal in relation to background noise, or a specific low noise oxide tape such as Emitape Afonic is used. It is suggested at Hayes that another form of noise will originate from the signal being "amplitude modulated" as the tape passes over the heads in the sound channel.

Now this is an extremely interesting theory which they use to explain the rather weird phenomenon that some recording enthusiasts encounter occasionally. Every once in a while a recording sounds unexpectedly good. The sound has an unusual clarity and sharpness so that the muddiness of instrumental tones from an orchestra are completely eliminated. Why should this happen? At Emitape they believe that the "woolly" quality of many recordings is caused by what they describe as "modulation noise." This takes the form of a variation of output resulting in a rather subtle form of mid to low frequency noise. One type of modulation noise is claimed to be generated by amplitude modulation of the recorded signal. A reason for this is irregular contact between tape and head surface. They extend the argument by suggesting that one way of overcoming it is to use a tape constructed to resist this effect, and that is precisely what Afonic tape is said to do.

Fascinating, isn't it? They have many words of wisdom for the amateur enthusiast. Their one desire is to destroy for all time the absurd myth that frequency response is the be-all and end-all of any tape or tape recorder specification. As we have said so many times this is a most disastrous fallacy. Certainly frequency response should not be ignored but the output at, say, 20,000 Hz., is much less important than the recorded distortion and the signal-to-noise ratio.

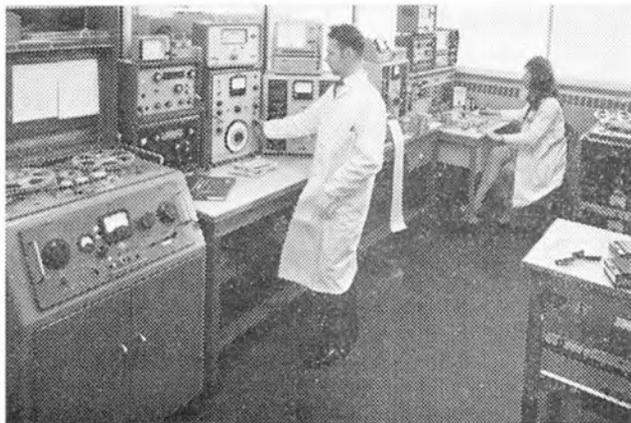
There is an optimum working condition for any given tape used on any given machine. This is arrived at by adjusting the bias level so that when a 1,000 Hz. tone is recorded the output from the replay amplifier falls slightly below maximum. Now the amount by which the output falls is critical and the recommendation for Emitape is to adjust the bias for a decrease in amplitude of 1 dB in the signal referred to tape speeds of $7\frac{1}{2}$ ips and 15 ips. At $3\frac{3}{4}$ ips Emitape engineers recommend the minimum bias current necessary to give maximum output at 1,000 Hz. It is equally important to use a 1,000 Hz. tone in the setting up process—if one used, say, 10,000 Hz., a wrong result would be obtained.

Recording equipment that does not provide for an adjustment of bias levels

should be accurately set for this optimum condition by the manufacturer; where the variable bias facility is incorporated it is a simple matter for the owner to do the job himself.

In common with other modern audio tapes Afonic is of relatively high coercivity requiring a slightly higher level of bias than was commonly used in the past, so it is suggested that owners of older machines without variable bias facilities should request a reputable service agent to check the machine and carry out any adjustment that might be needed. This is not a difficult job and should not involve considerable expense.

Quality testing and control is an important stage in the production of Afonic tape. The young lady technician is using the specially designed 2-micron head assembly on the test rig to check optimum bias and response figures



In their approach to the problem of how to test magnetic tape that will be used on a wide range of domestic machines, Emitape engineers have shown a commonsense attitude which has produced a brilliantly simple answer. First it was established that the record/playback head in modern domestic equipment now used a gap length as tiny as 2-microns. This is very much smaller than the gap used in most professional machines and is certainly smaller than the gaps in the heads of any existing test equipment. So they concluded that the only valid results would be obtained by using a head with a 2-micron gap length.

Unfortunately the domestic heads already commercially available were found to be neither sufficiently accurate nor sufficiently resistant to wear to ensure consistent results over a long period of use. So a special head assembly was designed and manufactured for the Emitape test bed. Costing several hundred pounds it is claimed to be the only one of its kind in the country. Through its use the engineers are able to establish precise figures for frequency response, noise and bias values. This jealously guarded head assembly lies at the heart of the Afonic testing routine.

Down at Hayes they are always very conscious of the fact that meticulous scientific measurement against their standard 2-micron gap head is one thing, but actual use under domestic conditions is

quite another. Consequently in one corner of the test area they have assembled dozens of different kinds and makes of domestic tape recorders. These are used to carry out all manner of practical tests.

One group of machines is constantly running backwards and forwards to check the resulting wear on domestic heads. Other machines are being continually fast-wound to see if any spooling problems arise, and that old bogey of tape squeak is carefully watched by checking the playback efficiency of Afonic tape on a whole range of different makes and models. One of the objects of this "application testing" is to establish just

how the new tape will react under the worst possible conditions it is likely to meet. So besides using some very good domestic equipment the technicians are also anxiously trying to find the very worst machines that are available to the public. And if the tape transport system of a new model happens to be rather less efficient than its predecessor they are absolutely delighted!

With all this thoughtful care devoted to quality control it is difficult to visualise a faulty spool of tape coming out of the Hayes factory. With any high volume production there is always a slight risk that occasional small variations in quality might arise. In the unlikely event of your being dissatisfied Emitape are always pleased to investigate and sort out problems to ensure that your recordings are up to optimum standard. They cannot be fairer than that!

We were sorry to leave the Hayes factory because in our discussions with the Emitape engineers we found we were talking to enthusiasts rather than employees. They are very proud of their new product and as we left their parting shot to us was, "... and don't forget it's the best tape in the world." Well, we shall be forming our own opinions on that in the very near future but until then we can only confirm that the impression we received was of a sincere endeavour to produce a quality product that will stand up to any comparison anywhere.

FREEDOM is a funny word. It is used to describe an abstract condition which most of us believe we enjoy. Probably we don't even think about it. Giving no more than an occasional thought to those unfortunate individuals who by accident of birth find themselves to be outside the jurisdiction of Her Britannic Majesty we come to think of freedom as something essentially British.

It comes then as something of a shock to learn that a piece of legislation at present before Parliament has been described by a very responsible and presumably clear thinking citizen as "a surreptitious piece of prohibitive nationalisation monopolising in advance every conceivable form of communication".

This comment was made by Mr. John Gourst, Secretary of the Telephone Users Association, and it referred to Clause 24 of the Post Office Bill. Apparently Clause 24 would give the GPO exclusive rights to convey sounds, visual images and signals by means of "electric, magnetic, electro-magnetic, electro-chemical or electro-mechanical energy outside private property". In other words the GPO would be given monopolistic rights not only over all present means of communication but also over virtually all future inventions in this field. It would most certainly give the Postmaster General absolute power over the uses to which you put your own tape recording equipment and your tapes whenever they leave the security of your own private dwelling house.

This is an intolerable state of affairs. It is doubtful whether even the most authoritarian dictatorship in the world exercises such control in times of peace. The arrogance of politicians who smugly arrogate to themselves such sweeping powers to infringe our personal liberty is truly incredible.

This is not merely a matter of party politics. It is no more than a matter of chance that the bill has been drafted by a Labour Government. Politicians of all shades of political opinion have always shown themselves eager for power—power over the actions of the ordinary citizen. They forget they are the servants of those citizens not their masters.

The implications of Clause 24 cover a very much wider field than tape recording. Many other harmless domestic and industrial appliances would be embraced by its sweeping provisions, including baby alarms, lifts, internal telephones, burglar alarms, remote control of machinery, model boats, etc., etc. The list is almost endless.

What does a Government Department do once it has acquired control of certain activities? The obvious answer is it restricts them—without restriction there can be no control—and the instrument of restriction is the licence. If this bill goes

CROSS TALK

By Audios

on to the Statute Book in its present form the GPO will have the right to impose licensing restrictions on all these activities, apart of course from those it particularly dislikes which it could prohibit altogether. What a sweet and lovely thing is freedom!

Of course we are told that the wording of Clause 24 is purely routine and that the GPO will never invoke its powers in the way we suggest. If it doesn't intend to use them why does it want them? Are we children that we can permit a presumptuous bureaucracy to acquire the right to order our lives in this way on the strength of a promise that if we behave ourselves we shall not be spanked with the big stick it has fashioned for itself? Like water liberty evaporates if left exposed and unattended for too long. It is up to all of us to protest in the strongest terms against the callous impudence of those who would drain away our freedom of action to leave us stranded and shipwrecked on the rocks of petty controls. Perhaps the hope and glory of this land of ours are today less bright than once they were; certainly the freedom looks like being a deal less.

* * *

WITH the revelations of Sean Bourke appearing in a Sunday newspaper the dramatic escape of George Blake from Wormwood Scrubs Prison is again in the news. This time the story is in the form of a "step by step how I did it" account by Bourke which is said to be based on a tape recording of the two men's clandestine conversations conducted by walkie-talkie radio.

The whole makes an astounding story. Apparently Blake had one of the pair of walkie-talkie units inside the prison and Bourke used the other from outside the building. He is said to have taken the precaution of recording the conversation as an insurance to protect himself against any possible future accusation that he was working for Soviet Intelligence. What a fantastic story of intrigue and determination. The central character, Blake, does not come out of it very well. The picture painted of this dangerous traitor is of a somewhat slow-witted ineffectual individual. If the story is true—and there seems no reason to doubt that either these conversations or something very much like them must have taken place—then Bourke is one of the calmest customers I have ever heard of.

Just imagine yourself sitting in an old

secondhand car outside the prison or in a bare hostel room discussing the details of an escape plot with a prisoner in his cell whilst coolly recording the conversation on a portable recorder. What a nerve! Since Blake was not to know of the recording excuses had to be made to stop the radio transmission whilst the tape was turned over. Had these events been fiction we should have laughed away their improbability. But this was real life and the stakes were high. I cannot help wondering if by any chance Sean Bourke studied his recording technique by reading "TAPE Recording Magazine." I somehow find that to be a rather unpleasant thought.

The only "secret" recording activity with which I have been concerned related to the playing back of a recording of a tapped telephone conversation as evidence in the divorce court. My job was merely to be responsible for playing back the tape to the judge.

When the time came the tape was so badly distorted the judge couldn't make out a word that was said and so I had to clamber up on to his platform with the machine and play it back again right beneath his ear. Even so the recording was largely unintelligible and I doubt if it made the slightest difference to his opinion of the case. Presumably Sean Bourke went about his task in a more competent manner.

* * *

THERE has been a remarkable upsurge of interest in electronic and experimental music in London recently. Following the personal appearance of Stockhausen at performances of his own works earlier this year we have recently had what the *Daily Telegraph* describes as a "marathon of music and tape" at the Commonwealth Institute followed by a Concert of Electronic Music at the Queen Elizabeth Hall.

It is coincidental that works of this kind should be given a series of public performances just at the time that we in *TAPE Recording Magazine* have begun our own exploration into this fascinating field under the guidance of Cyril Counts. Those of us who dare to dabble in what we think are advanced forms of artistic expression expect to meet with a lack of understanding and even ridicule. When an idea has been around for long enough for everyone to thoroughly understand and feel familiar with it then it is no longer advanced—the mind that conceived it will by then have moved on to tackle other new problems in other new ways.

So before dismissing such works as artistic swindles I do like to stop and ask myself whether the blame might not be mine rather than the composer's? Where does the obligation lie? Is the composer obliged to speak to me in terms that I can comprehend in my own language, or should I make the effort to understand the new language with which the composer is trying to say new things? To my mind there is no doubt whatsoever where the answer lies. Whether the communication be in music, graphic arts or any other medium the artist has an absolute right to use his own language; deny him that and you deny him the means of expression. Once we accept that then the obligation to understand is laid squarely on our own shoulders. Plus, of course, the indisputable right to turn away and tell the artist to go and jump in the lake if we feel so inclined. Has there ever been at any time a great artist who has not had that said of him and his work?

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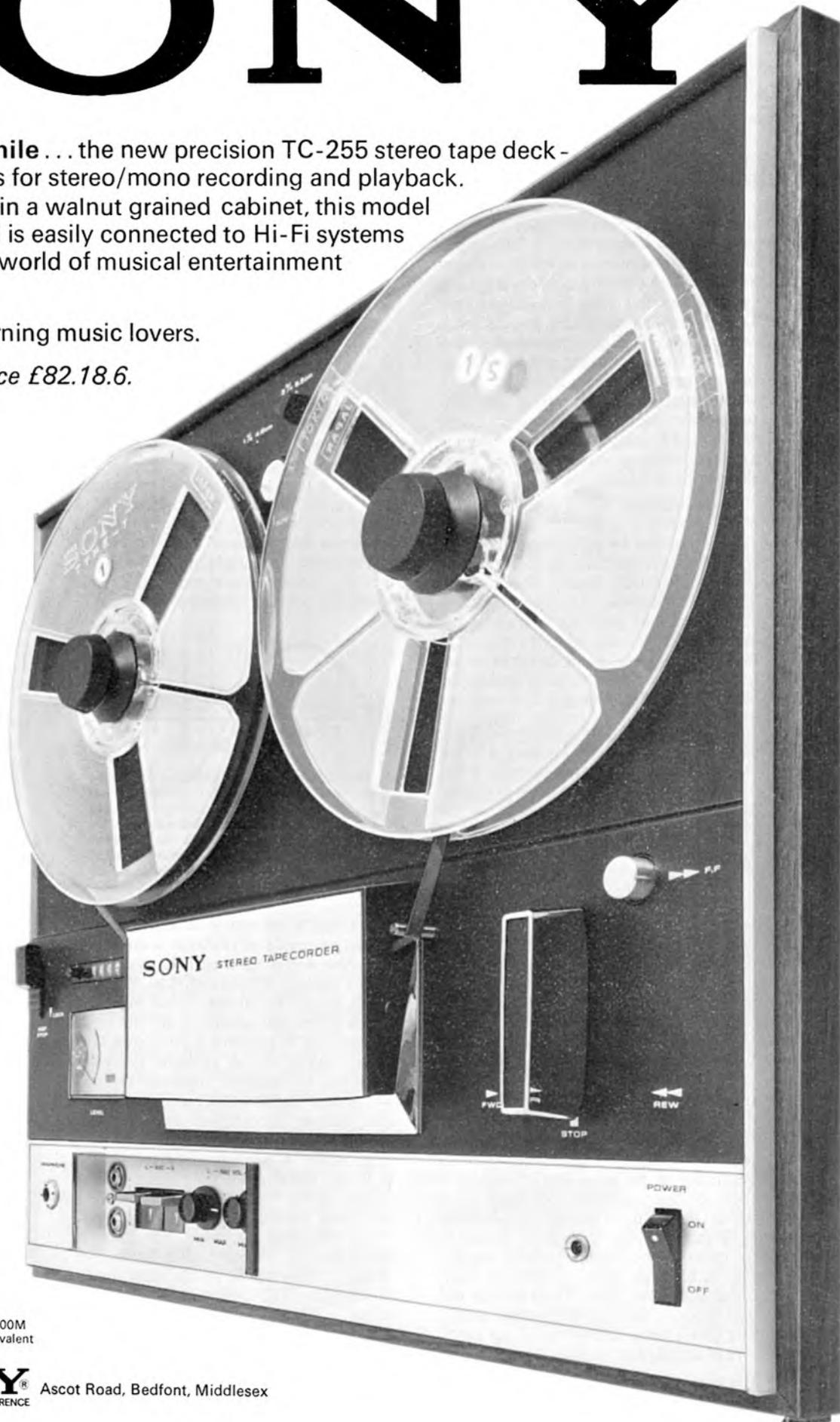
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Reel Capacity	7" or smaller
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Signal-to-noise ratio	Better than 52dB
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Harmonic distortion	Less than 1.8% at 0dB line output
Level indication	Dual VU meter
Fast forward and rewind time	Within 2 min. 30 sec. (1,200' tape)
Inputs	Microphone input jack: Sensitivity -72dB (0.19mV) Impedance 600 ohms Auxiliary input jack: Sensitivity -22dB (0.06V) Impedance approx. 100K ohms
Outputs	Line output jack: Output level 0dB (0.775V) Impedance 100K ohms Headphone jack: Output level -28.5dB (0.029V) Impedance 8 ohms
Dimensions	15¾" x 7¼" x 13½"
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PROJECT ALPHA

By CYRIL CLOUDS

PART TWO OF OUR EXPLORATION INTO ELECTRONIC MUSIC

motion each executes its own periodic motion and in doing so exhibits a successive displacement. The nature of the motion of this displacement is termed sinusoidal and is represented by the sine waveform as shown in Fig. 1.

Ancient and modern

This diagram represents one complete cycle of the wave form in terms of time and amplitude. Another example of this type of simple harmonic motion is that produced by a pendulum. A tuning fork is an example of a sound source which generates almost pure sinusoidal tones, that is, tones which exhibit the smooth wave motion of each harmonic of a complex sound. A similarly pure tone is produced by the sine wave feature of a sound generator and is called a sine tone. In this way the sine tone constitutes the newest and, at the same time, one of the oldest means of entering an understanding of the structure of sound. For it is, in certain ways, analogous with the monochord, the one-stringed instrument with which the Pythagoreans determined and measured pitch. A demonstration of this analogy will illustrate the manner in which the harmonics of a specific sound are arrayed and will suggest the manner in which sine tones can be used as elements for building sounds. The analogy begins with the legend of Mercury and the invention of the lyre.

Mercury was said to be walking on the banks of the Nile, when he found the eaten-out shell of a tortoise. Scooping the back shell clean he strung three strands of ox-gut across it, measuring each strand so that the second was two-thirds, and the third half of the length of the first string. He plucked the strings and found that the interval between the first and second strings was a fifth, between the first and third an octave. The intervals were those related to the first three partials of a vibrating system, its fundamental pitch and the first two harmonics.

The legend goes no further but one step would have taken Mercury to the dis-

constituents of timbre in relation to time and suggest how these can be used to arrive at a specific type of sonic motion.

Definition of sound

Sound is produced by the rapid periodic increase and decrease of air pressure which is set up by a vibrating system. All sounds have properties which determine their character and differentiate them, in varying degrees, from each other. These properties—pitch, amplitude, timbre, duration—are directly related to properties associated with the increase and decrease of pressure which a vibration initiates. The pitch of a sound is related to the number of pressure (wave) oscillations (cycles) which occur in a given time. It is referred to as frequency and measured in cycles per second, called Hertz (Hz). The amplitude or intensity of a sound is related to the amount of pressure increase and decrease which occurs within each oscillation. A large pressure increase will produce a loud sound, a small one a soft. Timbre, which is a major factor of a sound's character, includes both previous properties but is more generally related to the degree of complexity of the structure of a sound source and to the mode of vibration which generates a sound.

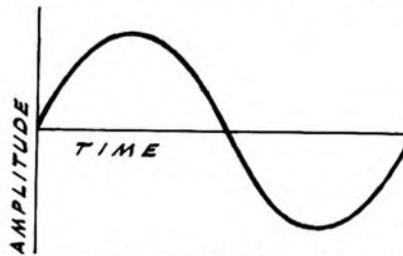


Fig. 1. The relationship between amplitude and time is shown in the diagram of a single cycle of a sine wave. Variation of time produces variation of frequency (pitch)

A string is the source of vibration of a violin; one mode of vibration is the action of a bow across the string, in association with a method of fingering. The vibrating structure of a clarinet is an enclosed, nearly cylindrical column of air; the mode of vibration is pressure applied to a reed at one end of the air column. These are examples of complex vibrating systems, which most sound sources are. They therefore behave in complex ways and the pressure waves produced by their vibration display a commensurate complexity. A string vibrates not only along its full length, giving its fundamental pitch, but also along smaller parts of its length, and these vibrations represent an array of accompanying sounds called harmonics. Similarly, a column of air has many modes of vibration. The oscillations of each harmonic, however, produce simple sounds and exhibit a simple, smooth wave motion. The particles of air within this wave

THE changes that have taken place in music have opened it to many modes of composition. This opening out is a measure of the changing interpretation of the world and of our relationship to it which I wrote about in my previous article. A discussion about the application of electronics to the composition of music will reflect the variety of directions which creative work is taking in all fields.

There is no single approach to the subject. It is new, therefore fully dynamic, multi-faceted, non-academic. This is the situation of music as a whole. It is a situation in which composers are making many types of structure. The desire to discover new modes of composition has led to a concern with the inner nature of sound. Types of musical process and motion can follow from this so that a work or set of works demonstrates aspects of the properties of sound. The articles which follow will concern themselves with a genuine investigation of these properties and relate them to electronic functions.

In dealing with an "aspect" one does not deal with a simple or single thing. Aspects are rich in their implications and connections. It will soon be clear how intimately related all aspects of sound are. This could not be otherwise. Given a single source of vibration (sound) all its aspects are functions of that source. In the same way the composition of music itself, and our responses to it, are aspects of our own understanding.

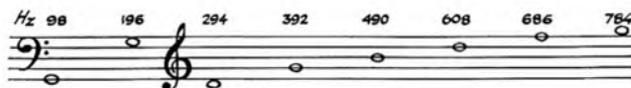
The equipment which forms the basis of this inquiry is in itself simple. During the twenty years in which electronic music has been composed electronics have progressed and the facilities available for the processing of sounds have multiplied. In addition, the introduction of voltage control has made it possible to control many procedures by automatic devices. However, the basic sequence—sound source to magnetic tape—is fundamental. I shall deal with electronic applications (to composition) in terms of this primary sound to destination sequence: a sound generator and a tape recorder, using the Heathkit sine-square wave generator, model AO-IU, and a Telefunken Magnetophon 250. With this sequence it is not, of course, possible to achieve the range of sound transformation, the variety of attack and decay characteristics available to more complex equipment. But these minimal technical facilities are well suited to an investigation of the properties of sound and they contain sufficient variables with which to set up a variety of sounding systems. With the sine wave generator, for instance, one can set up timbre models, that is, build up simple or complex combinations of sine tones. These articles will lead to a discussion of this process. I shall first give a brief description of the structure of sound, deal in more detail with the

PROJECT ALPHA

continued from previous page

covery of the monochord. He would have found that, on the longest string, he could, with one change of order, simulate the relationships exhibited by the three separate strings. By making it vibrate along its full length it would sound its fundamental tone. When touched at its mid-point and vibrated along half its length, its first harmonic, the octave, would sound. By touching it two-thirds along its length and vibrating the remaining third, it would emit the third harmonic, an octave and a fifth above the fundamental tone. If the string were further divided into four, five, six etc. segments, it would emit its higher harmonics. In this way the monochord demonstrates the structure of a string's vibration: that it vibrates along its full length and also along two, three, four, five etc. segments of its length and that the frequencies of the harmonics produced are multiples of the fundamental. Fig. 2 shows this structure in terms of a fundamental, G, and seven of its harmonics, together with their frequencies in Hertz (cycles per second).

Fig. 2. The first note, G, is the fundamental. Those following represent an associated harmonic series



One further step and the full nature of the monochord reveals itself. This is to make the string vibrate freely and to carefully listen to its vibration. It will emit its fundamental tone and, within its vibration, depending on practice and concentration, its first three odd-numbered harmonics, 3, 5, 7, can be perceived, the third harmonic more perceptibly, perhaps, than the others. This, at the same time, demonstrates a further property: that the harmonics have different amplitudes. Put in its simplest form, therefore, the difference of quality between two sounds, between, for instance, a violin and a clarinet, derives from the presence, in each, of its specific array of harmonics, together with their relative intensities. This array is commonly referred to as the spectrum of sound, applying a word which is used to describe

aspects of the frequencies of light. For myself, I prefer to coin a word such as "audium," related to hearing, but shall retain the more common term in these articles. The use of "spectrum" does, certainly, relate sound to a common field of frequency in which light displays the high and sound the relatively low frequencies.

The sound spectrum

A spectrum of sound can be shown graphically by means of a spectrogram. This presents, in terms of a frequency versus amplitude diagram, the specific array of frequencies within a sound, together with their relative intensities as shown in Fig. 3.

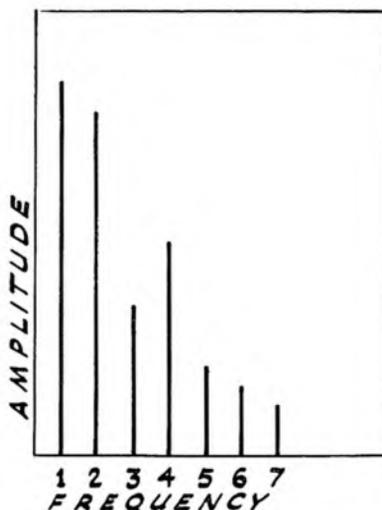


Fig. 3. A possible relationship between the amplitude (intensity or loudness) of seven frequencies forming the lower part of a sound spectrum

In the diagram the vertical bars, with their equal spacing, represent the order of frequencies, from the fundamental, which are present in a spectrum. The length of the bars indicates their relative amplitudes. An unequal spacing would represent the presence of non-harmonic partials which, in many cases, differentiate "noise" from what is thought of as "musical" sound.

Sound spectra vary in accordance with the nature of their sources. Some spectra present a full array of harmonics, others only the odd-numbered ones. It can be noted here that the particular electrical function of a square wave generator produces only the odd-numbered harmonics.

The spectrum changes with every note an instrument plays, for a change of pitch means a change to a new fundamental

tone and its accompanying harmonics. The lower the fundamental the more harmonics a spectrum will contain. The timbre of an instrument therefore presents changes throughout its range. This accounts, for instance, for the pronounced change of timbre a clarinet displays between its lower and upper registers. Also, a spectrum changes throughout the sounding of a single pitch. A violinist, for instance, could not, however much he tried, maintain an absolutely uniform pressure on a string with his bow, and this would be only one of the playing requirements for a uniform spectrum. Similarly, a trumpeter cannot maintain an absolutely uniform pressure of air. A sustained note, therefore, would present a spectrum which changed minutely at every instant of playing.

This concern with the basic constituents of timbre is intended to demonstrate that an entry into the structure of sound reveals the nature of a process. This process can be imitated and expressed by the sine wave generator. In short, I wish to show that an imitation of nature need not consist only of a depiction of its outer forms but can also indicate its inner processes. By means of the frequency dial of a generator any audio-frequency can be located. A sine tone of some frequency can be recorded and, using the sound on sound feature of the recorder, sine tones which are multiples of the first frequency can be added and their amplitudes varied in accordance with a spectrogram. In this way it is possible, theoretically, to synthesise any specific sound. The square wave form can also be used as the basis of a synthesis, for it already contains an array of odd-numbered harmonics.

It should be said, however, that to simulate a known spectrum is not a simple procedure, for the properties of sound display so many variables. Not only must each harmonic be given its correct relative intensity but the phase relationship between each sine tone, that is, the amount of displacement of each wave form in relation to the others, would have to be determined. In an instrumental sound these are determined automatically by the unitary nature of the vibrations. To achieve these phase relationships when combining sine tones presents a particular difficulty. A further difficulty would be the simulation of the transients of an instrumental sound which, with the equipment mentioned, would present an insoluble problem. However, the attempt to simulate instrumental sounds should not become a primary purpose. The sine wave generator in association with the square wave form, can be used to synthesise aspects of a sound's structure. Timbre experiments can also be made with combinations of sine tones which present ratios not associated with the harmonic ratios of instrumental sounds.



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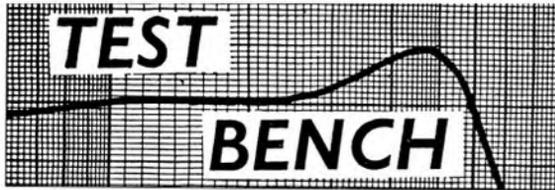
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RANK BUSH MURPHY TP 60



INVESTIGATED BY R. HIRST AND D. KILICK

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Tape Cartridge: Philips Compact Cassette only.

Tape Speed: $1\frac{7}{8}$ in. per second.

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Recording Level: Manual or automatic adjustment.

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Signal-to-Noise Ratio: Better than 40 dB.

Wow and Flutter: Less than 0.35 per cent.

Microphone: Dynamic, with remote control. Impedance 10,000 Ohms.

Loudspeaker: Dynamic, $3\frac{3}{8}$ in; impedance 8 Ohms.

Power Output: 500 mW (music power rating).

Semi-Conductor Compliment: 7 transistors and 2 diodes.

Auxiliary Input Socket: Impedance 1 Megohm.

Auxiliary Output Socket: Impedance 8 Ohms.

Dimensions: $2\frac{3}{8}$ in. high x $5\frac{1}{2}$ in. wide x $9\frac{5}{8}$ in. deep.

Weight: 4 lb. 6 oz.

Recommended Retail Price: £27 15s. 8d. including purchase tax.

Accessory mains power pack £5 5s. free of purchase tax.

Distributor: The Rank Organisation, Bush Murphy Division, Power Road, Chiswick, London, W.4.

RANK BUSH MURPHY TP 60 TEST CHART

Frequency Hz	Overall Response dB	Signal/Noise Ratio dB	Distortion
60.....	-4.0	52	2.5%
100.....	+2.3		
250.....	+1.2		
500.....	+0.2		
1000.....	0		
2000.....	+0.2		
4000.....	+1.9		
5000.....	+2.0		
6000.....	+1.9		
7000.....	+1.2		
8000.....	+0.4		
9000.....	-1.8		
10000.....	-6.4		
Wow and Flutter	0.28%		

Overall Response dB	Signal/Noise Ratio dB	Distortion
-4.0	52	2.5%
+2.3		
+1.2		
+0.2		
0		
+0.2		
+1.9		
+2.0		
+1.9		
+1.2		
+0.4		
-1.8		
-6.4		
0.28%		

NOTES.—The Overall Response figures relate to record and playback.

For Signal-to-Noise Ratio the tape was recorded at peak level and then the input signal was removed from the record amplifier, but see text for further information. By reference to the signal level recorded and the resultant tape noise, the noise voltage was read off, with the tape still in motion (see text). Distortion is quoted against a 1,000 Hz signal recorded at the correct maximum level as indicated by the manufacturers and the figure is an R.M.S. value.

Wow and Flutter is also R.M.S., the test frequency being 3,000 Hz. Test equipment used includes: Bruel and Kjaer Signal Generator, B & K Frequency Analyser Type 2107, B & K Level Recorder Type 2305, Marconi Distortion Factor Analyser and Gaumont-Kaylee Wow and Flutter Meter.

IN selecting our review machine this month we decided it would be appropriate to investigate one of the lightweight portable Compact Cassette models. These equipments have become increasingly popular for outdoor recording, but amongst enthusiasts there has always been a slightly dubious feeling of scepticism. We all know that cassette machines are ideal for portability and convenience, but what about recorded quality? Those of us used to working at $7\frac{1}{2}$ or even 15 ips regard a tape speed of $1\frac{7}{8}$ ips as unworthy of serious consideration. With these thoughts in mind we began to take a closely critical look at the Rank Bush Murphy TP 60.

Based on the Philips transport system for use with Compact Cassettes, it is a battery portable powered by four 1.5V dry cells. Like other recorders of this type it is $\frac{1}{2}$ -track mono, but thanks to the compatibility of the tracking configuration it will reproduce a true mono programme from any Compact Cassette recorded stereo, including pre-recorded Musicassettes.

The results of our laboratory investigation might well cause some raised eyebrows. There were some anxious moments when it was thought that our test equipment must be faulty. A good deal of time was wasted checking and re-checking to make quite sure that every possibility of

error had been eliminated. The figures published are guaranteed to be accurate for the machine tested, and we have no reason to suppose that a random selection of others would not give equivalent performance.

It is not our usual custom to make such a statement at the beginning of a review. Our figures are always checked most carefully and presented in such a way as to convey what we sincerely believe to be an honest and unbiased evaluation. But if we had not seen with our own eyes and heard with our own ears we should have been inclined to doubt the findings in this particular case.

Please, therefore, accept our assurance that there has been no mistake.

Turning first to frequency response, it must be mentioned that our quoted figures are "overall" (that is record/playback) only. Because there is no published standard (other than that laid down by the Philips organisation) in the form of calibration cassettes it is not possible to investigate "playback only" against reference tones. The manufacturer's claimed response range is 100 to 5,000 Hz without any tolerances being quoted. When faced with such figures it is hardly surprising that sophisticated enthusiasts turn the other way with a slightly disgusted curl of the lips. The true state of affairs is shown in our table. The response is sensibly flat within 2 dB over the range from 100 to 9,000 Hz. These figures are rather better than some open spool mains machines running at 3½ ips.

When we come to signal-to-noise ratio the reader's credulity is going to be stretched to the very limit. As we said before, there is no mistake. Operating from the four small 1.5V dry cells the inherent tape and system noise was a fantastic 52 dB down below peak signal as indicated on the built-in meter. We didn't believe it ourselves; 52 dB is around the theoretical best that can be obtained from valved equipment, regardless of price. The TP 60 is, of course, a fully transistorised device, but even so. . . . ! There are many high-class standard mains machines costing well over one hundred pounds that are not ashamed to claim such a figure for open spool operation using full-width tape and running at 7½ ips.

We have pointed out before that one way to get an inflated signal-to-noise ratio is to accept relatively high distortion. By putting more signal on the tape (which must cause distortion to deteriorate) an improvement in relative noise levels is inevitable. So we fully expected a distortion reading of something in excess of 5 per cent. We were quite wrong. Once again the TP 60 produced what we can only describe as an absurd result—2.5 per cent! For a long time we have advocated the adoption of a standard of permissible distortion for top-grade equipment—a hi-fi standard if you like—and we have taken this as being 3 per cent or under. Some quite expensive machines only just manage to meet this stringent requirement. Yet here is this little portable cassette turning up with a distortion of 2.5 per cent. It is incredible, but true.

There must surely be a fly lurking somewhere in this fascinating pot of ointment? It was almost a relief to discover one weak link. All our measurements up to this point had been taken with the machine operating from the four

1.5V dry cells. The drill was now repeated, but this time the Rank Bush Murphy recommended power pack was used to eliminate the batteries. A small metal box, it is fitted with a mains lead on one side and a long wander lead complete with special connecting plug on the other. When the plug is inserted into the appropriate socket at the side of the machine the batteries are cut out and 6V DC is fed in.

The use of this accessory has an immediate effect on noise levels. Instead of 52 dB we now had a cyclic variation in noise between 38 and 46 dB with a periodicity of about three seconds. This was found to be due to a beat note between the recorded and the playback hum occurring when recordings made under mains power were reproduced in the same way. We shall comment further on this effect in the user investigation section of this review.

Speed stability, particularly in the short term, is always suspect in ultra-slow-speed operation, so we paid special attention to wow and flutter measurements. Our published figure of 0.28 per cent is a reasonable average. It is a fact that individual cassettes will themselves alter the wow content, and so our findings cannot be taken as definitive. Variations will also occur at different places along the length of any given tape: beginning, middle and end. A similar effect is usually noted on open spool equipment. Once the wow rises much above 0.3 per cent it can be objectionable as it will be audible in the sustained notes of a musical programme, so our best advice here is to check cassettes carefully before taking any important recording. Provided one takes this precaution the speed stability should be wholly acceptable for any but the most critical applications.

As the machine is fitted with an AGC (automatic gain control) we had a look at this feature to see how useful it might be. The instruction booklet recommends that it should not be used for recording music, and we established the reason for this. The attack time is in the order of two seconds—much too slow to prevent considerable distortion. On speech the AGC was wholly satisfactory so far as intelligibility is concerned, but slight distortion could not be avoided. Manual operation of the gain control is therefore recommended for all purposes other than dictation.

Our final laboratory check was on the power available from the output socket. With an eight-ohm load this was measured as around 250 milliwatts RMS (total harmonic distortion 5 per cent) giving approximately 500 milliwatts of peak power. So far so very good indeed. Next we pass to user comments.

The appearance of the TP 60 follows

the general lines of other machines of this kind, and as such will be so familiar as not to warrant detailed description. An important difference is in the manner the tape transport is controlled. Instead of a single small "joy-stick" type lever this machine has an array of substantial press keys on the forward edge. Positioned in such a way that they can be used with the machine placed horizontally on a flat surface or, equally well, when suspended on the shoulder strap provided, they operate the functions: Fast Rewind, Record, Stop and Cassette Release, Playback and finally Stop. The Record key is bright red in colour and as a safety feature to prevent accidental erasure it must be used in conjunction with the Play key. When the Stop key is depressed the mechanism comes to a halt, but if depressed vigorously to its fullest extent it also partially ejects the cassette, making it very much easier to take it out of the machine.

A small Peak Level Meter also serves as Battery Level Indicator; unfortunately it is placed on the upper surface of the deck so that it is not visible when operating from the shoulder. When used in this way the whole machine must be tilted upwards to bring the meter into view. This meter is really too small and not very easy to read, but it is extremely accurate. As it is not lit it would be impossible to see in the dark without the help of a torch or other light.

An edge-type rotating wheel serves the double purpose of Gain Control on Record and Volume Control on Playback. When in the Record function it can be turned to its maximum position when a slight click will be heard as a red mark comes into view to indicate that the AGC is in circuit. In this condition the meter reading can be ignored as all levels are adjusted automatically.

A row of sockets housed on a recessed panel give Line In and Extension Speaker Out, together with Microphone and Remote control. On the opposite side is the socket for connecting the output from the mains power pack. Four 1.5V dry cells are neatly stored in a completely detachable container built into the underside of the machine; inserting the container makes the necessary electrical connections.

The whole is housed in a very strong simulated hide case with shoulder strap and pouch containing microphone and connecting lead fitted with croc. clips. One small point about the case. It is provided with a strap at the side which we first took to be a carrying handle. This strap is not intended for that purpose—if you try to carry the machine in this way the press-stud will fly open and the whole thing will drop. It is put there so

Please turn to page 132

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TEST BENCH

Continued from page 130

you can thread the accessory pouch on it. We threaded the pouch on the shoulder strap (which is usual) and then looked blankly at the other fitting wondering what on earth it could be for. The instruction book doesn't say, but now you know—and we had to be told too!

Somewhat dazed by our technical researches we could not resist trying one very dramatic user test first. Taking a really top quality pre-recorded Musicassette we inserted the connecting lead provided into the External Speaker socket and took the croc. clips to the terminals at the rear of a very large full-range speaker enclosure. Nothing in between at all. The amplifier in the TP 60 was to drive the speaker.

If the RSPCA learn about this we shall probably be arrested for cruelty to dumb animals. As it turned out, not-so-dumb. In terms of both quality and quantity the sound from that speaker was so good as to seem to be preposterous. It shouldn't happen—but it did! Mind you, the results would have been different if we had used one of the very small and very inefficient modern enclosures, but given reasonable efficiency it is amazing what volume can be obtained from a fraction of a Watt of power. Certainly all one would need for any medium- to large-sized room.

Next to check on the noise level we reproduced a tape where the recording had been interrupted by erasure. At comfortable listening level for the programme the following blank portion of tape produced an almost inaudible hiss. With the volume control on the machine turned up to maximum the only change was an increase in the hiss level, but at this setting audio output would be much too high for comfort. This is what a good signal-to-noise ratio means in practical terms—almost silent background—and that is what the TP 60 will give.

Listening via the built-in speaker is, of course, a different matter. Just over 3½ inches in diameter it does not pretend to give very much quality. Nevertheless, it did produce a reasonably pleasant, if somewhat thin, sound. But the beauty of this machine is to be able to take full advantage of its superb quality by using a good external speaker. Then it really comes into its own.

We tried recording and playing back with the machine in various positions; finally we allowed it to run whilst swinging about. Only with deliberately excessive movement could we make the slightest impression on its performance, and then it was only, as might be expected, a tendency to wow. If you must stand on your head when you record then this is the cassette machine for you.

In view of the criticism from the laboratory of the power pack we tried it out and found that our subjective observations confirmed the technical findings. We would use it only as a means of saving battery power on playback; there is no point in spoiling that beautiful signal-to-noise for the sake of a few coppers when recording. By the way, a full set of batteries only costs about half-a-crown and as the claimed life is some ten hours the user can decide for himself whether the power pack is really worth while. If the machine is to be used continually for playback, particularly for long periods of time, then it would be a useful accessory; if you are going to do a lot of recording then we would sooner spend the money on batteries.

When thinking about using cassette equipment for creative recording we know quite well that editing is impossible. The normal procedure is to copy from the cassette on to ordinary tape back at base; it is then the ½-inch tape that is cut and joined. Many enthusiasts have been discouraged from doing this because of the weakness of the copying process. Noise from the cassette machine will be transferred across and quality will be poor. Up until recently this was indeed the case, and although one would use a battery portable for certain jobs the original tape was always edited on a standard machine to avoid quality losses. With the TP 60 this problem has been almost totally removed. Remember its noise level is so low it might even be lower than that of the mains machine on to which you are copying. So for this application it is absolutely first class.

But quality live recording calls for the use of a quality microphone. At an all-in price of under £30 we hardly expect to get a studio microphone thrown in, and of course this is another weakness. The instrument provided is quite adequate for speech, but when used for music it will not do justice to the machine. The impedance at the input socket is 10 kOhm, so it should be a simple matter to match in an existing microphone of good quality.

The prospect of experimenting along these lines is so intriguing we have asked the manufacturers to extend their loan of the equipment so that we can investigate its possibilities further. We should like to couple up a condenser microphone (cost over £100!) and see what happens.

Summarising the TP 60 we can say that it outstripped our expectations in so many ways that it leaves one desperately short of words to adequately describe it. Sufficient to say that within its small bulk it carries a quality potential that in many ways matches some of the best domestic open spool equipment on the market. A truly remarkable midget that can perform a man-sized task.

THE BIGGEST STUDIO

Continued from page 121

junior recordists, probably with a cassette recorder as the main prize. Full details will be announced later this month at the prize-giving for the 1968 competition.

By its very nature The Wildlife Tape Competition had to restrict itself to recordings of the sounds of nature. However worthwhile such endeavours might be they represent only a tiny fraction of the potential sound sources of the outdoor world—and in fact the concentration on wild animals and birds is a somewhat narrow view of nature. There is a great deal of "nature"—and noisy nature at that—in any agricultural livestock market although none of it would qualify for entry to a wildlife contest. The sound of gently falling rain with church bells and occasional barking dog in the background is part wild, part domestic, and part artificial. Properly done it could be regarded as an interesting recording, highly evocative of the English countryside.

In the realms of the purely mechanical there are the many forms of transport and their associated noises. Now that fire-engines are losing their bells in favour of sirens we have a changing scene marking progress from one phase to another. Have you recorded it?

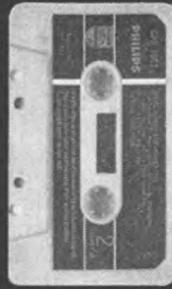
Contests like the 3M Wildlife Tape Competition are a valuable contribution to outdoor recording. Because this work is so highly specialised it presents a forbidding prospect to the newcomer. Do please remember that the list of winners is the equivalent to a Roll of Honour of the elite; for the rest of us there is at least as much pleasure and interest to be had in taking a portable machine out of doors. It is here we could find true satisfaction without necessarily having to suffer frustration as well.

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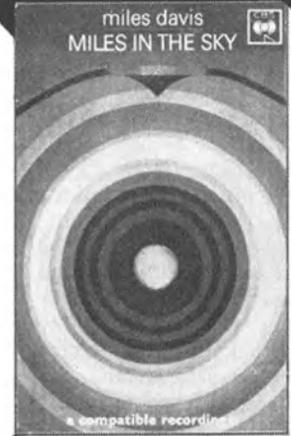
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NATURE NOTES FOR APRIL

By Richard Margoschis

A FEW days before writing these notes I was involved in the final judging of the Wildlife Sound Recording Competition sponsored by the manufacturers of Scotch Tape and supported by the Wildlife Sound Recording Society. Having also done some pre-judging I have heard every one of the 150 entries, some of them as many as four or five times, and from this work I have gleaned a lot of information about the way the entrants make their recordings and the equipment they use. The machines ranged from the sophisticated Nagra, used at 15 ips, to the very small cassette machine running at $1\frac{1}{8}$ ips and using a track width less than one quarter that of "big brother", both machines featured in the final judging and both tapes failed because of content.

From the cassette came a recording of a willow warbler singing near a stream, the balance was wrong but the judges accepted it as a good recording of the bird and were somewhat surprised when told of the machine used. A beautiful quality came from the Nagra but the recording was eliminated, very near the end, because again the judges felt the balance might have been better.

The most popular machine was undoubtedly the Uher 4000 Report L; though it did not feature in the three prize winners it was in at the bitter end. Two of the prize winners were made on Fi-Cord 202s and the third on a Tandberg Series II, with the good old Fi-cord IA producing the runner up in Class 3.

In each section it was necessary, in the final selection, for the judges to consider not only quality but also very fine points of content, such as an unusual vocabulary or elements of behaviour of the species. In other words, a good story or theme which made the recording more than merely a flat reproduction of sound.

From this brief analysis I think the first lesson to be learnt is that whilst the

machine is the most important piece of the recording chain it is not the be-all and end-all; it must be used correctly. Secondly, particularly in competition work, the content of the recording is most important.

Let us give some consideration to the recorder. Accepting that it must be battery operated, easy to use and so on, its principle work is the faithful recording of what we hear. I say *recording* because most portables have small speakers and what they record will be better reproduced on other equipment. What must it be capable of recording? To answer this we must consider the dynamic range of birdsong and other natural sounds. There is very little content below 1 kHz and the majority of power in birdsong lies between 2 kHz and 5 kHz which is, in fact, in the frequency band to which the human ear is most sensitive. It is the higher frequencies which are likely to be more troublesome. In general there is a big fall-off above 8 kHz but it is not a complete cut-off and some birdsong goes considerably higher. Some checks that I did recently with a wave band analyser indicated, for instance, that the songs of the Robin, Skylark and Wood Warbler all contain elements up to 16 kHz, and I suspect that harmonics go up to, and perhaps above, 20 kHz.

The reproduction of such frequencies is inevitably tied up with tape speed used as well the kind of machine, and there is no doubt that for quality reproduction a minimum tape speed of $7\frac{1}{2}$ ips is necessary. However, the specifications of many machines operating at slower tape speeds indicate that they can handle frequencies up to 7 or 8 kHz and as the majority of birdsong and mammal noises come within this range they can produce acceptable recordings.

It all depends on what you want; do you want very high quality for scientific and similar purposes or do you want to make natural history recordings for your own pleasure and satisfaction? If the latter be the case I should have no hesitation, after pointing out what I have said above, in recommending even the small cassette machine; it has much to commend it from a weight and ease of operation point of view. It also has the virtue of being within the price range of young people; if with such a machine they take up the work as a pastime they might later aim at something better. I should like to see more youngsters doing this. Remember what I said at the beginning, recordings from machines at both ends of the price range were in at the final judging.

If you are at all interested in this branch of your hobby but have not actually made a start, now is the time to do so for April will give much opportunity for learning to handle your equipment.

MUSICASSETTE

REVIEWS

EL BANDIDO. Chaquito and the Quedo Brass. Fontana Living Presence Stereo LPC 13006. 55s. 11d. including purchase Tax.

If it's a little light-hearted musical fun you're after then look no further; this is for you. Superbly recorded this is one of the very best Chaquito albums I have come across. The mood of the collection has even been caught in the sleeve notes which are written in a humorous pidgin-English to describe the continuative theme of a hasty retreat from the "lead poisoning" of Texas. It's a pleasure to join the Bandidos as they dodge the bullets.

Their journey takes them through: *O cangaceiro, Cuando vuelve a tu lado, Guanatanamera, South of the Border, Adios Marquita Linda, Mexican hat dance, Mexican marathon, La golondrina, Summer Samba, Perfidia, Belles of Acapulco* and *Adios*.

All very pleasant and relaxing. Personally I find that too much of the latin idiom becomes tiresome, but in this album there's enough contrast to sustain interest throughout. Apart from which we have a strong underlying feeling of "We're-all-having-a-good-time-together" and this contributes to the enjoyment. Side two is a little more restrained than the first, and that's a pity, but apart from that one comment there is little to criticise. It all goes with a swing, and is helped by the generally excellent recorded quality. Recommended as a fine example of the art of Chaquito.

THE BAROQUE BRASS. Fontana Living Presence Stereo LPC 13004. 55s. 11d. including purchase tax.

The declared intention of this Musicassette is to present a collection of pop numbers (together with one classical inclusion) performed by an ensemble of Baroque brass instruments plus harpsichord—and piano!—arranged in pseudo-classic pseudo-pop style. Described in the sleeve notes as "refreshingly different" I will readily grant the difference—I have never heard anything like it before—its ability to refresh depends on the sensitivity of the listener.

On side one we have: *Day tripper, My favourite things, Aria* from Suite in D, Bach, *The green leaves of summer, I've grown accustomed to her face, Trains and boats and planes.* Turning over we find: *A taste of honey, Wives and lovers, Here there and everywhere, Walk on by, Hello goodbye* and *The trolley song.*

I am not in any doubt about my own opinion of this enterprise. To my ears this is the most objectionable, tasteless and offensive recording I have ever had to endure. A monstrous hybrid, it makes me think of the ghastly consequence of some mad professor's experiment to create human life in the test tube. It has all gone wrong. Instead of a radiantly beautiful new creation he has turned out a mis-shapen gobble—a cretinous paraplegic half-wit that should have been quietly disposed of at birth.

Continued overleaf

BAROQUE BRASS
from overleaf

I suspect I have made my feelings only too clear. But at the same time I would defend to the death the right of musicians to experiment in this way. We must have new and original approaches to musical problems. Sometimes such efforts are brilliantly successful, as with the Swingle Singers. Unhappily the endeavour of The Baroque Brass is equally abortive. Sorry—it not only doesn't come off but for me the cassette arouses feelings of aggressive resentment. And there's something very odd about the recording, too. Perhaps the pop treatment was extended to the artificial reverberation; whatever the cause there is some very muddy sound here and there with individual instrumental tone masked in a bundle of noise.

Sorry but The Baroque Brass never got off the ground. Playing around with classical style calls above all else for sensitivity and good taste. This collection is chiefly remarkable for its lack of either.

SOUSA SPECIALS! The Band of the Scots Guards, Director of Music Major James H. Howe. Fontana Living Presence Stereo LPC 13005. 55s. 11d. including purchase tax.

Recording a military brass band is not easy. The problem is one of local acoustics. Intended primarily for outdoor performance it never sounds quite right under confined indoor conditions. The character of the sound is changed. Here we have a famous band playing some well-known Sousa marches and the compromise arrived at by the engineers is unusually fortunate. Whilst escaping from the deadness of the open air they have achieved just enough reverberation to brighten up the sound without bringing individual instruments too much into the foreground.

The difficulties of recording in the open are truly formidable, but I can't help thinking that it's a pity the producers didn't take a chance and have a go. Against a backdrop of rustling leaves, twittering sparrows and the subdued roar of London traffic this recording would have had an individuality all of its own. Is any record company courageous enough to try it? Many amateurs have taken such recordings "on the quiet" and these tapes have a nostalgic sense of location and occasion that is quite lacking in a studio performance.

Repertoire includes: *George Washington bicentennial march, The Loyal Legion, The Royal Welch Fusiliers, Anchor and star, Esprit de corps, The crusader, A century of progress, National Fencibles, The Salvation Army, Atlantic City pageant, The wolverine, The pathfinder of Panama and Guide right.*

Recording on side one is very good, but on side two there is some rather unpleasant distortion in the percussion department which spoils an otherwise clean album. It could be that this is a fault in the review copy only, so I suggest intending purchasers should carefully check before buying.

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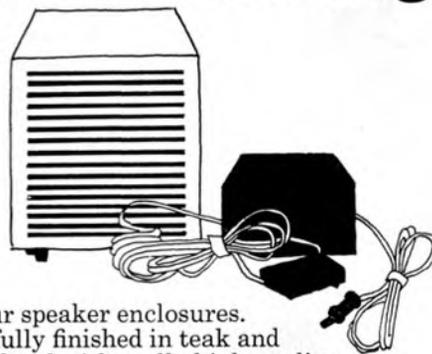
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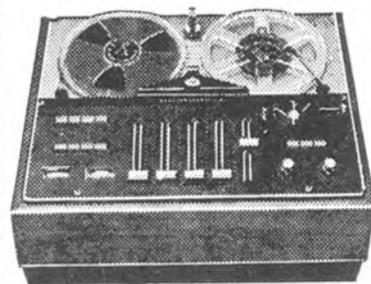


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