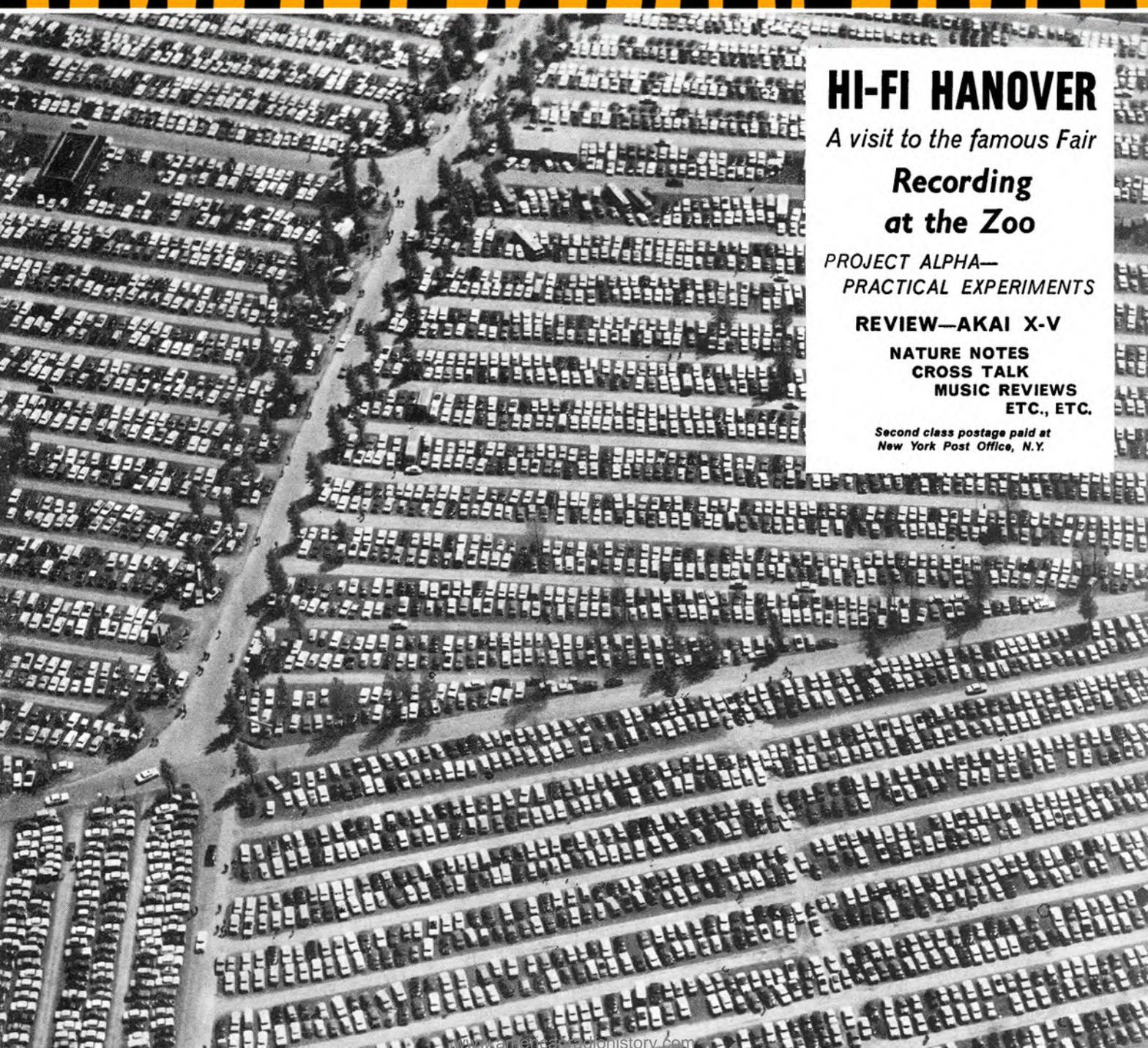


JUNE 1969

2¢

TAPE

RECORDING MAGAZINE



HI-FI HANOVER

A visit to the famous Fair

Recording at the Zoo

PROJECT ALPHA—
PRACTICAL EXPERIMENTS

REVIEW—AKAI X-V

NATURE NOTES
CROSS TALK
MUSIC REVIEWS
ETC., ETC.

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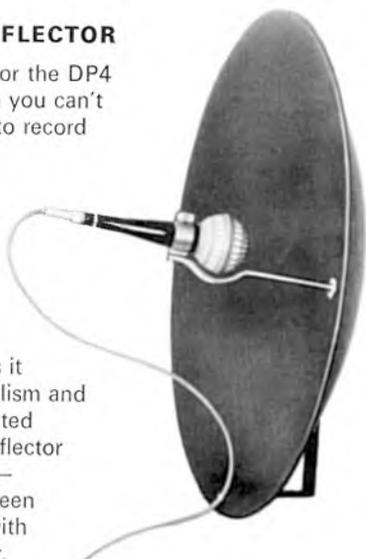


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Note: M=Mono, S=Stereo, BP=Battery Portable, 4=4 track, 2=2 track

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REPS R10 (M/4)	35 gns.	(Brand New)	79 gns.
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REVOX E36 (S/4)	69 gns.	FERROGRAPH 4/AN (M/2)	49 gns.
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- plus 1 New brushless motor
- plus 2 New 7" reel adaptor
- plus 3 New automatic volume control
- plus 4 New 4 watts solid state amplifier
- plus 5 And the Cross-field Head

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Lasky's Radio

LASKY'S RADIO ESTABLISHED 1936 YEARS



The 1969 edition of Lasky's *Audio-Tronics Pictorial* (celebrating our 36th anniversary) is now available free on request. The 16 tabloid format pages are packed with 1000's of items from the largest stocks in Great Britain of everything for the Radio and Hi-Fi enthusiast. Electronics Hobbyist, Servicemen and Communications Ham. Over half the pages are devoted exclusively to every aspect of Hi-Fi (including Lasky's budget Stereo Systems). Tape recording and Audio accessories.

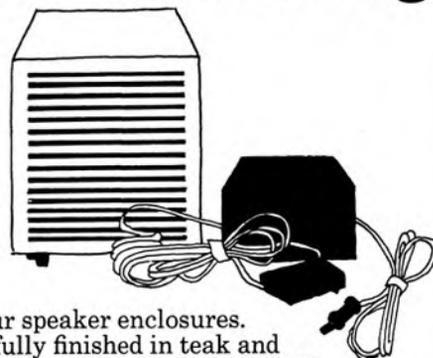
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Also, if you have a transistor radio, the Grundig mains power pack is a very useful battery saver.

It just fits in the space of a conventional PP9 battery so when your portable isn't going any place you can run it off the mains supply.

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- Ampex 800 Series Stereo
- Ampex 1100 Stereo
- Ampex 2100 Stereo
- *Akai 1710W Stereo
- *Akai 3000D Pre Amp Deck Stereo
- *Akai M.9 Stereo
- *Akai 1800 Dual-purpose stereo 8-track cartridge and tape recorder
- *Brenell Mk. 5/M Series III Mono
- *Brenell Mk. 5 Series III Mono
- *Brenell ST200 2Tr. St.
- *Brenell ST400 4Tr. St.
- Ferguson 3232 Stereo 4 Tr.
- Ferguson 3226 Mono
- Ferguson 3224 Mono
- Ferguson 3216 Mono
- *Ferrograph 713
- *Ferrograph 702/4
- *Ferrograph 722/4
- Fidelity Studio 4 Track Mono
- Fidelity 'Braemar' 2 or 4 Tr. Mono
- Grundig TK140 DL 4 Track Mono
- Grundig TK120 DL 2 Track Mono
- *Grundig TK245 DL Stereo/Mono
- *Grundig TR247 DL 4 Tr. Stereo
- Grundig 145 DL 4 Tr. Auto Mono
- *Grundig TK340 DL 4 Tr. Stereo/3 sp.
- Philips 4307 4 Tr. Single speed Mono
- Philips 4305 4 Tr. 2 sp. Mono
- Philips 4308 2 Tr. Auto
- *Philips Professional PRO.12
- Philips Stereo 4404 2 sp. 4 Tr.
- Philips Stereo Cassette 3312 with 2 sp.
- Philips 4407 St. 3 sp. 4 Tr.
- *Philips 4408 Prof. 3 sp. 3 Tr. Stereo
- Revox 77 Stereo Transistor

- Sanyo 801 St. Pre-Amp.
- Sanyo 929 4 Tr. 2 sp. Stereo
- Sanyo 939 4 Tr. 2 sp. Stereo
- *Sanyo 990 3 sp. 4 Tr. Stereo
- Sharp RD.706 2 sp./2 Tr./Batt. Mains
- *Sony 801 PA/Deck 3 sp. 4 Tr. St.
- Sony TC230W
- *Sony 335 Deck and Stereo Pre-amp.
- *Sony 255 Deck and Stereo Pre-amp.
- *Tandberg Series 6X Pr. A/Dk Stereo 3 sp. 2/4 Tr.
- *Tandberg Series 12X 3 sp. 2/4 Tr. St.
- Telefunken 200 2 Tr. Mono
- Telefunken 203 Stereo/Mono 4 Tr. 2 sp.
- Telefunken 201 Mono 4 Tr.
- *Vortexion WVB/7 3 sp. 2 Tr. Mono
- *Vortexion CLB/7 Stereo 2 Tr. 3 sp.
- Wyndor Vanguard 3 sp. 4 Tr. Mono

BATTERY PORTABLES

- *Philips 2205 Batt./Mains Cassette
- Philips EL3302 Cassette
- Stella 9112AT Batt./Mains Cassette
- Sharp 504 2-sp./2 Tr./Batt. Mains
- Sharp 505 Mono/Batt. Mains
- National 4 Tr./2 sp./Batt. Mains
- National Cassette Batt./Mains
- Telefunken 302 4 Tr. 2 sp. Mono
- Telefunken 300 2 Tr. Mono
- Uher 4000L 4 Tr. 2 sp. Mono
- *Uher 4200/4400 2/4 Tr. 4 sp. Stereo

MAINS POWER PACKS

- Philips Stella
- Telefunken 300 with cell
- Uher 4000 with cell
- * Microphone extra

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- Headphones by AKG, Ampex, Akai, Sansui, Nikko, Philips.

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Introducing the new MR 939 recorder with these outstanding features

- 7 watts per channel
- 4 tracks, 3 speeds
- Sound on sound
- Sound with sound
- Built-in public address system

Tape speeds
7½ ips (19 cm/sec)
3¾ ips (9.5 cm/sec)
1⅝ ips (4.8 cm/sec)
Wow and flutter
7½ ips: 0.15% R.M.S.
3¾ ips: 0.20% R.M.S.
1⅝ ips: 0.30% R.M.S.
Recording time
96 min at 7½ ips
(Stereo 1200ft. tape)
192 min at 3¾ ips
(Stereo 1200ft. tape)
384 min at 1⅝ ips
(Stereo 1200ft. tape)
Signal-to-noise ratio
45 db

Output power
Music power 7W x 2
Undistorted 4W x 2

Frequency response
7½ ips 20-20,000 c/s
(30-15kc ± 3db)
3¾ ips 30-13,000 c/s
1⅝ ips 30-8,000 c/s

Erase rate
65 db

Crosstalk
50 db (channel-channel)
65 db (track-track)

Output impedance:
Line out: 2 Kohm

Speaker out: 8 ohm
Headphone: 10 Kohm

Input impedance
Microphone: 50 Kohm
Aux: 100 Kohm

Weight
26.3 lbs (16.5 kg)

Accessories
Microphone x 2
Recording tape 7" x 1
Empty reel 7" x 1
Patch cord x 2
Reel stopper x 2
Splicing tape x 1
Microphone stand x 2

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RELIABILITY IS BUILT IN

See Sanyo at any authorised dealer. For further information write to: J. W. Coxley, Sales Manager, Electronic Equipment Division, Marubeni-Iida Co. Ltd., 164 Clapham Park Road, London, S.W.4.

ONE WAY TO SATISFACTION

4 TRACK STEREO/MONO

	Deposit		12 Monthly Payments		Cash Price	
	£	s. d.	£	s. d.	£	s. d.
Philips EL3312 ...	23	4	1	3	14	5
Philips 4404... ..	26	17	0	4	5	0
Ferguson 3232 ...	33	5	0	5	10	9
Sony MR-929 ...	33	4	9	5	6	10
Sony TC260... ..	33	0	0	5	10	0
Philips 4407... ..	35	15	10	5	13	4
Akai 1710W ...	37	15	7	6	2	1
Sony MR939 ...	38	13	6	6	2	3
Telefunken 204TS... ..	41	13	0	6	18	10
Grundig TK247 ...	45	10	9	7	2	4
Philips 4408... ..	46	19	5	7	8	9
Sony TC530 ...	49	12	3	8	1	8
Beocord 2000K ...	53	5	0	8	17	6
Beocord 2000T ...	55	5	0	9	4	2
National Console-Aire ...	61	16	8	10	5	4
Ferrograph 722/4... ..	65	3	1	10	15	0
Akai M9 ...	68	12	4	10	16	8

4 TRACK MONAURAL

Fidelity Braemar... ..	11	12	8	1	17	4
Ferguson 3226 ...	15	9	0	2	11	7
Grundig TK140 ...	16	10	1	2	11	1
Philips 4307 ...	16	15	3	2	13	1
Ferguson 3238 ...	20	12	0	3	5	0
Ferguson 3216 ...	22	16	0	3	12	2
Wyndor Vanguard ...	25	4	0	4	4	0
Tandberg 1541 ...	26	15	3	4	10	0
Reps HW10 4-T ...	28	16	9	4	11	2

STEREO TAPE UNITS

	Deposit		12 Monthly Payments		Cash Price	
	£	s. d.	£	s. d.	£	s. d.
Sanyo MR-801 ...	27	9	5	4	6	8
Sony TC355... ..	33	7	6	5	11	3
Akai 3000D... ..	35	0	3	5	10	7
Beocord 1500 ...	42	15	0	6	18	4
Ferrograph 702/704 ...	58	8	5	9	11	8

MAINS TWIN TRACK

Fidelity Braemar... ..	10	9	8	1	15	0
Ferguson 3224 ...	11	12	8	1	16	10
Grundig TK120 ...	14	0	3	2	3	9
Beocord 1100 ...	28	5	0	4	14	2
Brenell Mk. V/3 Std. ...	36	8	2	5	16	7
Brenell Mk. V/3 Mtr. ...	39	8	3	6	4	6
Ferrograph 713 ...	51	6	3	8	10	0
Ferrograph 713H... ..	53	14	6	8	17	6

BATTERY OPERATED

National RQ-113S ...	7	13	5	1	5	7
Philips 3302 Cassette ...	11	1	7	1	15	0
Sharp RD505 Bat./Mns. ...	13	12	8	2	5	0
Telefunken 300 ...	15	15	0	2	12	6
Sony TC210... ..	16	0	0	2	13	4
Telefunken 301 ...	17	17	0	2	19	6
Telefunken 302 ...	19	12	0	3	5	4
Sanyo MR151 Stereo ...	30	4	1	5	0	0
Uher 4000L ...	44	13	1	7	8	4

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TELEFUNKEN 300

★Telefunken 300TS Battery/Portable. ★5" Tape capacity. ★Volume and Stop/Start controls in handle. ★Complete with microphone. Reduced from 61 gns. **Our Price 45gns.**

TELEFUNKEN 301

Similar Specifications as for Model 300 but 4-track. Reduced from £70 17s. 6d. **Our Price 51gns.**

TELEFUNKEN 302

★4-Track. ★2 Speeds, 3½ and 1½ i.p.s. Reduced from £77 8s. 9d. **Our Price 56gns.**

TELEFUNKEN 203TS

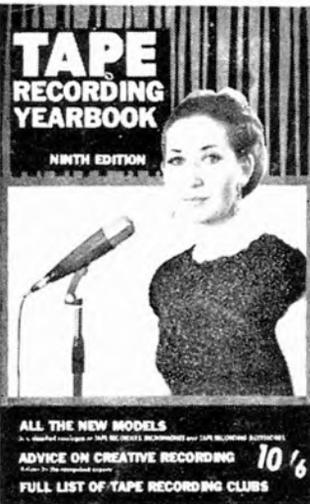
★Mono/Stereo. ★4-track. ★Sound-on-Sound. ★2 speeds, 3½ and 1½ i.p.s. ★Complete with TD21 microphone. Reduced from 86 gns. **Our Price 64gns.**

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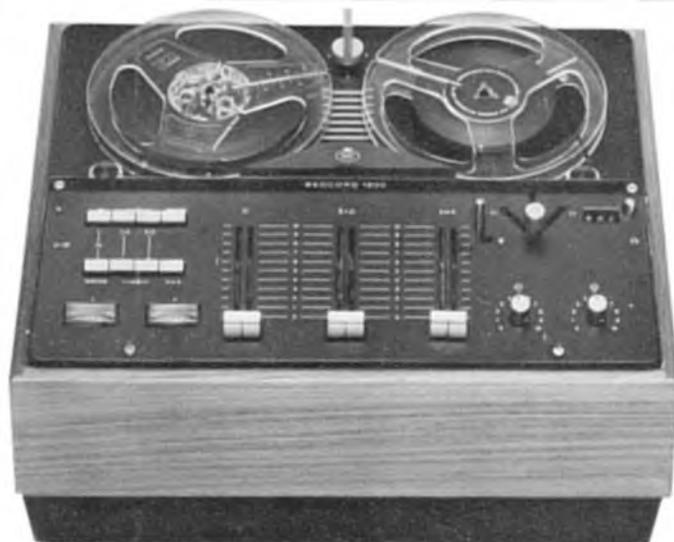
TAPE RECORDING YEARBOOK,
PRESTIGE HOUSE,
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A brilliant new stereo tape deck -the Beocord 1800

Made by Bang & Olufsen for those who consider design and quality before price.

Designed especially for use in conjunction with a high fidelity amplifier such as the Beomaster 1400 or Beolab, this new tape deck from B & O has an impressive specification. Available in twin or 4 track and finished in either teak or rosewood. The twin track model has an additional switched 4 track stereo head for the playback of pre-recorded 4 track tapes.



Specification (Exceeding the DIN 45.500 requirements)

FREQUENCY RESPONSE:

7½" per sec. 20-20,000 Hz
(± 2 dB 30-18,000Hz). DIN 45.500.
3¾" per sec. 20-15,000 Hz
(± 2 dB 30-13,000 Hz) DIN 45.500.
1¾" per sec. 30-7500 Hz
(± 2 dB 40-6000 Hz). DIN 45.500.

EQUALIZATION: DIN 45.513
1966-67 = NAB 1965.

SIGNAL TO NOISE RATIO:
achieved without the use of special low noise tapes
>60 dB for ½ track version
(¼ track version >57 dB)
unweighted (DIN 45.405)

CHANNEL SEPARATION:
Mono: >60 dB at 1000 Hz
Stereo: >55 dB at 1000 Hz

TAPE HEADS: specially developed hyperbolically ground.
Two track machine: 2t erase, 2t record, 2t replay, 4t replay.
Four track machine: 4t erase, 4t record, 4t replay.

WOW AND FLUTTER: (Measured according to DIN 45.506)
7½" per/sec RMS Value <0.07%.
3¾" per/sec RMS Value <0.11%.
1¾" per/sec RMS Value <0.18%

EXTERNAL CONNECTIONS: Inputs to three Channel stereo mixer for microphone, radio/gramophone and line. Outputs for headphone, line and radio.

SPECIAL FACILITIES INCLUDE:
Fast acting thyristor controlled auto stop.

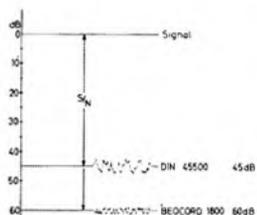
Three channel stereo mixer with split controls on each channel (6 inputs)

Separate headphone volume controls
Tape slack absorbers.

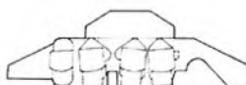
Push button selection of: A-B monitoring, sound on sound, echo, synchro play, mono left, mono right, mixed mono & stereo play.



Wide Frequency Response
7½" sec : 20-20,000 Hz.



Signal to noise ratio
60 dB on twin track version, 57 dB on 4 track. Results obtained without using special 'low noise' tapes.



Tape head bridge
Provides gentle tape handling with minimum wear to tape and tape heads (Tape heads are hyperbolic with a smaller contact face and a higher powered magnetic field for less noise)

Vortexion

This is a high fidelity amplifier (0.3% intermodulation distortion) using the circuit of our 100% reliable – 100 Watt Amplifier (no failures to date) with its elaborate protection against short and overload, etc. To this is allied our latest development of F.E.T. Mixer amplifier, again fully protected against overload and completely free from radio breakthrough. The mixer is arranged for 3-30/60Ω balanced line microphones, and a high impedance line or gram input followed by bass and treble controls. 100 volt balanced line output.

THE VORTEXION 50/70 WATT ALL SILICON AMPLIFIER WITH BUILT-IN 4 WAY MIXER USING F.E.T.s.



Size 14" × 11½" × 4½"
100uV on 30/60 ohm mic. input.
100mV to 100 volts on gram/auxiliary
input 100KΩ.

Weight 20lb.

100 WATT ALL SILICON AMPLIFIER. A high quality amplifier with 8 ohms-15 ohms and 100 volt line output for A.C. Mains. Protection is given for short and open circuit output over driving and over temperature. Input 0.4v on 100K ohms.

100 WATT MIXER AMPLIFIER. with specifications above is here combined with a 4-channel F.E.T. mixer, 1 gram, 1 tape and 2 mic. inputs with tone controls and mounted in a standard robust stove enamelled steel case. A stabilised voltage supply feeds the tone controls and pre amps, compensating for a mains voltage drop of over 25% and the output transistor biasing compensates for a wide range of voltage and temperature. Also available in rack panel form.

200 WATT AMPLIFIER. Can deliver its full audio power at any frequency in the range of 30 c/s-20Kc/s ± 1db. Less than 0.2% distortion at 1 Kc/s. Can be used to drive mechanical devices for which power is over 120 watt on continuous sine wave. Input 1 mW 600 ohms. Output 100-120v or 200-240v. Additional matching transformers for other impedances are available.

CP50 AMPLIFIER. An all silicon transistor 50 watt amplifier for mains and 12 volt battery operation, charging its own battery and automatically going to battery if mains fail. Protected inputs, and overload and short circuit protected outputs for 8 ohms-15 ohms and 100 volt line. Bass and treble controls fitted.

Models available with 1 gram and 2 low mic. inputs. 1 gram and 3 low mic. inputs or 4 low mic. inputs.

20/30 WATT MIXER AMPLIFIER. High fidelity all silicon model with F.E.T. input stages to reduce intermodulation distortion to a fraction of normal transistor input circuits. The response is level 20 to 20,000 cps within 2 db and over 30 times damping factor. At 20 watts output there is less than 0.2% intermodulation even over the microphone stage at full gain with the treble and bass controls set level. Standard model 1-low mic. balanced input and Hi Z gram.

ELECTRONIC MIXERS. Various types of mixers available. 3-channel with accuracy within 1 dB Peak Programme Meter. 4-6-8-10 and 12-way mixers. Twin 2, 3, 4 and 5 channel stereo. Built-in screened supplies. Balanced line mic. input. Outputs: 0.5 V at 20K or alternative 1 mW at 600 ohms, balanced, unbalanced or floating.

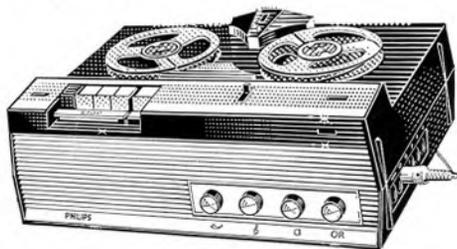
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TAPE

RECORDING
 MAGAZINE

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

Vol. 13

No. 6

June 1969

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COVER PHOTOGRAPH: It could be a close-up of a sophisticated integrated circuit—but it's not. It's a bird's-eye view of a small part of the car park at the world famous Hanover Fair, a visit to which is reported on page 191 of this issue. The size of this fair is so great it is difficult to visualise; we calculate that our picture shows some 3,600 vehicles but the total space provided for cars accommodates more than ten times as many—more than 40,000!

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Tape trends and tape talk

By Douglas Brown

ONE QUESTION constantly torments publishers of tape recording magazines, organisers of tape recording contests and manufacturers of tape recording equipment. Why, despite rising sales of tape recorders, cannot they speed up the development of enthusiasm for tape recording as a creative and artistic hobby?

This year's British Amateur Tape Recording Contest has attracted as many entries as any previous Contest—but no more. Yet the amount of publicity given to it, in virtually every journal covering the field, has never been exceeded. When, a few years ago, a committee representing the biggest manufacturers in the field raised a record fund and "went to town" on promoting the Contest, the entries did not increase at all.

And, as I have often commented here, all the efforts of the BBC with contests and special programmes, have produced so limited a response that the Corporation, quite understandably, have lost heart.

Are we to conclude that only a certain, relatively small, proportion of tape users will become real enthusiasts? If so, how do we account for what has happened in Czechoslovakia?

Domestic tape equipment became available there later than in any of the western European countries and for a long time the range available was severely limited. Yet flourishing clubs have developed in most big centres in the country and the Czech radio has transmitted regular programmes for amateurs for several years past.

Now I have news that, since January, Radio Prague has been broadcasting an "international programme" for sound and sound recording amateurs for 30 minutes every Friday and Saturday morning. The programme goes out in German, is announced as a co-operative effort with the Federation Internationale des Chasseurs de Son—the organisers of the International Recording Contest—and deals exclusively with problems, suggestions and news for tape recording amateurs. It can be heard between 11.30 and 12 noon on Fridays on medium wave 233.3m, 1286 kHz, and between 09.45 and 10.15 on Saturdays on short wave 31.56m, 9005 kHz and 49.55m, 6055 kHz. Reception is good, I am told, throughout central Europe.

If you have any contribution you wish to submit, the address is: Radio Prague, Magazin für Ton und Tonbandfreunde, Prague 2, Czechoslovakia.

* * *

THIS YEAR'S International Recording Contest will be staged in Copenhagen in October and the Danes, offered the opportunity to nominate a title for the "special theme" category, have invited tapes

about Valdemar Poulsen, the Danish inventor of magnetic recording, who was born 100 years ago.

Official title for the special category is: Valdemar Poulsen's Inventions.

British competitors are invited to submit tapes, not exceeding 15 minutes duration, to John Bradley, Federation of British Tape Recordists and Clubs, at 33 Fairlawnes, Maldon Road, Wallington, Surrey.

* * *

IF YOU are interested in recording plays, you should write for copies of two leaflets just published by Samuel French Ltd., 26 Southampton Street, London, W.C.2. One is called "Copyright and the tape recording of plays" and the title indicates the content, which is a very useful summary of the law.

One very pertinent paragraph tells us: "There is only one safe rule if you are giving a performance of any kind: don't try to determine for yourself whether the performance is public or private and domestic. Tell the copyright owners or their agents, giving them the full facts, before the performance takes place. If the performance is private and domestic you can expect them to issue a free licence for it to take place."

The second leaflet is a list of plays available for the use of recording amateurs, in respect of which Messrs. Samuel French are prepared to issue licences to record for play-back "in private, for purposes of private study, or by judges in a tape recording competition."

There are nearly 300 titles—sketches, one-act plays, plays for men only or women only or for mixed casts, and full-length plays—something for everyone.

* * *

AN EXHIBITION touching tape matters take a big stride forward this year: Navex 69—the largest audio-visual aids exhibition ever held in Europe—will be staged at Olympia from July 21 to 24. Several leading firms in the tape field are exhibiting. And one of the sessions at the associated conference will deal with "The use of cameras and tape recorders by children."

* * *

AND, talking of exhibitions, I hear this year's Audio Fair—also at Olympia—will be the biggest ever. Originally, it was thought it would be contained in the gallery, junior partner to the Photo Fair, with which it is associated for the first time.

Now the audio section looks like overwhelming the photo section; at any rate, it has spilled over from the gallery to occupy much of the ground floor. Congratulations to Cyril Rex Hassan! This year, for the first time, the public will have to pay to get in—4s. 6d. a head. And the Fair will open for six days.

WE TAKE A LOOK AT THE AUDIO EXHIBITS AT ONE OF EUROPE'S BIGGEST
AND MOST IMPORTANT TRADE FAIRS

HI-FI HANOVER

A T.R.M. REPORT

AS readers will know, the traditional British Audio Festival and Fair is undergoing a revolutionary change this year. Instead of being a single isolated event staged in a hotel during the early part of the year it will become part of the International Audio and Photo-Cine Fair to be held in the National Hall, Olympia, from Thursday 16th October to Wednesday 22nd October. One of the reasons behind this drastic change lies in the comparative success of Continental fairs and exhibitions. Sited in properly designed exhibitions buildings it was felt that they went about the task of display in a much more business-like manner than was possible within the limited confines of premises designed primarily to function as hotel accommodation. So to investigate one of these major foreign shows—and also to take a look at the kind of audio equipment being offered to enthusiasts across the channel—*TAPE Recording Magazine* paid a visit to the 1969 Hanover Fair.

First we have to get the scale of the Hanover Fair into perspective. More than 5,000 firms exhibit a multiplicity of products. A glance at the Fair catalogue confirms the vastness of the operation. It is printed in two volumes, contains more than 2,000 printed pages, is 3¼" thick, weighs nearly 4 lbs, and is provided with its own plastic case and carrying handles without which it would be quite unmanageable.

Each industry has its own exhibition area housed in separate detached "Halls" and the Fair has a complex system of inter connecting roadways, internal transport systems and all the services and amenities of a small town. As British visitors we could not help thinking how tragic it is that we in the United Kingdom do not have any comparable facilities. However it was encouraging to note that last year Great Britain was the fourth



At the end of a tree-lined avenue we found Hall 11 in which was housed part of the audio section of the Fair. Equipment for sound reproduction is playing an increasingly important part in world trade and so was prominently featured with other manufactured products of many great industrial countries.

largest foreign exhibitor but in 1969 we were second, with France in the lead.

Unfortunately our time at the Fair was strictly limited and so immediately on arrival we headed for Halls 11 and 11B which housed the audio section.

First impressions were of surprise; surprise that there was no attempt to differentiate between so-called high-fidelity equipment and "commercial" electronic goods such as small transistor portable radios, etc. Within the same exhibition area we found television sets (black and white and colour, with the latter creating the maximum interest) and a wide range of other electronic appliances. The overall

effect was entirely similar to the now defunct British Radio Show at Earls Court with a curious admixture of different products over the widest possible price range and with an infinite variety of performance standards. The individual stands varied in size from quite small to gigantic, and many of them incorporated self-contained, sound-proofed demonstration rooms.

We could not help noting that there was a lack of the rather delightful personal intimacy we have come to associate with our own Audio Fairs. Quite apart from the cosmopolitan coverage of the electronic industry one was also constantly aware of the fact that this was no more than a tiny corner of the Fair, which, with its bewildering complexity and magnitude, tended to dwarf everything else.

One of the first stands we spotted in Hall 11B was a joint effort by our old friends Rank-Wharfedale and Rank Bush Murphy. The sight of their name immediately gave one an involuntary twinge of patriotic nostalgia—it was almost like finding a piece of England in a foreign

Please turn to page 195



A corner of one of the two exhibition halls devoted to audio. When we were there it was so crowded with interested visitors we had some difficulty in examining the displays.

PROJECT ALPHA

By CYRIL CLOUTS

IN these articles my aim is to discuss aspects of the properties of sound, to apply what is discussed to processes of composition and to relate these to electronic functions and processes, using as a basis of this inquiry a sound generator and a tape recorder. In the previous article I dealt with the properties of a spectrum, the harmonic components of a natural or instrumental sound. I suggested how the building of a spectrum, using sine tones, can form the basis of a composition resulting in the formation of a continuous stream of sound, a particular type of sonic motion.

One of my intentions is to demonstrate that the changes which music has undergone have cleared the way for the expression of one of its primary capacities: the articulation of motion. To clarify this requires an extension of what I said in the first article. Music occurs in time and is, therefore, a sequential art. The manner in which sounds are made to succeed each other determines the types of motion which articulate the duration of a musical work. But restraints can be placed on motion. In classical music the manner in which sounds succeeded each other took place within a given musical language, governed by a concept of harmony related to a fundamental tone and the system of tuning in equal temperament. Sound sequence within this system followed a process of building periodic, uniformly metrical phrases closed by cadences and balanced by symmetries of repetition and development. It can be said that the notion of music as a type of structure related to architecture derived from the factors which resulted in the formality of the classical symphony: their fixed relationships of pitch (theme) and duration (rhythm) which governed every aspect of a work. The periodic phrasing allied to closed thematic procedure restricted motion to the role of a vehicle of this expression as one aspect of an "architectonic" structure. Music, in fact, has been thought of as fluid architecture and architecture referred to as frozen music.

This analogy was perhaps a reasonable one to make but it has lost its relevance and is now misleading. With the dissolution of the older procedures it is no longer relevant to apply notions associated with



The BBC Radiophonic Workshop does not produce musical compositions as "pure music" but it does engage in all the basic techniques and methods referred to in our Project Alpha series. Here we see Richard Mills (left) and Brian Hodgson comparing the lengths of two musical sounds on tape. Desmond Briscoe is seated at the mixing desk in the background. Complex equipment and special studio facilities are not required to undertake the experiments in composition and sound manipulation discussed by Cyril Clouts.

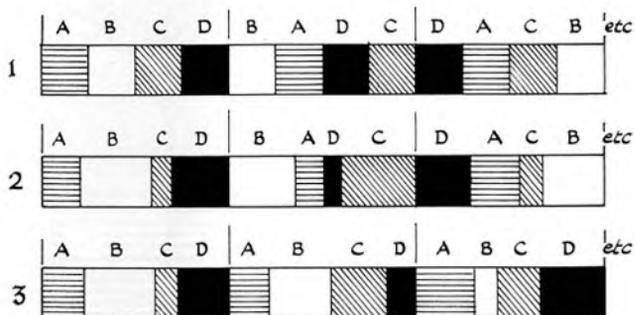
what is fixed and inert, such as the proportions of a building, to a process which moves in time. Music is clearly bound to bodily sensation and is therefore fully dynamic. Light is energy made visible; sound is energy made audible. I believe that the aural time-arts, such as music and poetry, release types of energy and awareness which cannot be caged in any notion of fixed structure.

Having broken with the older procedures, nothing can be taken for granted. Each composer has to find his own way of making sounds follow each other. This has led to a special concern with the very nature of sequence. One way with which I have been concerned for several years has been to consider ways of connecting

sounds in order to depict motion itself. The formation of a sound stream, which I have mentioned, constitutes one approach. In modulating the components of a spectrum along a chosen time-length by means of amplitude change and beat frequency, a stream of sound results in which the revelation of each component is the primary character of the piece: the articulation of time arises from the changing detail, no matter how small the change, which modulate the spectrum. This type of sound sequence is one which contains no attacks apart from the first one, though this can be reduced or done away with altogether by introducing each component from zero to the desired signal strength.

The seamless continuity of such a

THE TAPE RECORDER IS A CREATIVE TOOL — ALMOST A MUSICAL INSTRUMENT — IN THE HANDS OF EXPERIMENTAL COMPOSERS. IN PROJECT ALPHA WE SET OUT ONE MAN'S PHILOSOPHY AND PRACTICAL METHODS



The diagram shows the three suggested ways of juxtaposing four single sound spectra. In 1 we have all possible variations of connection between cut sections of equal lengths of the four spectra A B C and D in random sequence blocks. In 2 the lengths are unequal (random) and could be varied to stress individual qualities. The possible computations of such changing lengths are enormous. In 3 the procedure is as in 2, but a strict sequence of sounds is maintained, each block being made up of A B C and D in that order.

sound stream gives time for the contemplation of the inner motion of the components. This can be said to be related to a steady breathing and an awareness of breathing. As such, and as a "music" without attacks, it constitutes one of two extremes in the articulation of motion. The other extreme would be a music which consists entirely of sharp attacks. I have spoken previously of the similarity of a sound stream to the drones found in Indian music. Another connection can be found in the way a Japanese Noh actor moves from one position on the stage to another: all gestures are broken down into their components and result, for instance, in slow turnings of the body and the articulation of each separate action associated with walking. In this way gesture itself becomes something to watch and one result of this is the sense of contemplation which surrounds a Noh play.

The making of a simple sound stream in the manner I have suggested does not require any tape cutting. With the use of a single tape recorder all sounds have to be superimposed on the one tape. If the tape were cut at any point it is probable that an unwanted attack would be introduced. However, other types of motion using audio-generated sound will consist of sequences of separated sounds and therefore attack impulses. In this case, without the use of transient or impulse

producing circuits, the cutting of tape will become the primary process of composition.

Two factors will mainly affect the qualities of attack arrived at by cutting: (1) *The angle at which the tape is cut.* Three standard angles at which tape is cut are at 45° left of the vertical across the width of the tape, at an angle just off the vertical and along the vertical itself. When these tape cuts are applied to a sound of uniform pitch and amplitude, they will produce respectively sharper qualities of attack. The shape of each cut represents, in effect, a different growth pattern. The off-vertical cut is commonly used for sounds of high amplitude. This is because a vertical cut applied to loud sounds tends to produce transients in the form of "popping" sounds. These are associated with the sudden onset of the high amplitude as the cut passes the playback head at the higher speeds of 7½ and 15 ips. (2) *The combination of properties which are present in the sound to be cut.* The pitch of a sound, its amplitude, duration, timbre (harmonic components), all act as functions of the qualities of an initial impulse. In addition, the density, that is the number of individual spectra with their harmonics which a sound contains, will affect the attack. Each shape of cut will produce the particular type of attack associated with it. However, there

is a tendency towards an overall uniformity of attack quality which arises from the fact that the mode of producing the attack is the same in every case, namely, by cutting the tape.

This can result, though not in every case, in a type of uniformity of timbre between different combinations of sine or square waves. Such a factor can be used to advantage. It is reminiscent of the types of change within an overall uniform timbre which arise from the modes of vibration of an organ.

To arrive at qualities of attack different from those induced by shaped cuts on wave forms, experiments can be made by adding to a wave form extremely short tape lengths containing sounds produced by other means, such as wood clicks, guitar attacks, etc., recorded with the use of a microphone. One-sixteenth of an inch of one of these sounds at 7½ ips would be sufficient to vary the character of an attack and therefore affect the timbre. A further possible attack additive would be short lengths of white noise, the signal which contains an infinite number of randomly occurring frequencies across the audible spectrum.

Simple experiments should be carried out on single sine tones and sine tone combinations of varied amplitude to discover the particular types of attack associated with different tape cuts. It is useful to begin with a length of tape containing a flat uniform sound and to cut this into smaller lengths of half a second duration making, say, three pairs, each cut at one of the three angles. These can be joined to form a loop, using leader tape to obtain silence between each sound. The loop can be played back for as long as desired and in this way the particular effects of each shaped cut can be studied. This can be repeated with sounds of varying complexity. Further experiments can be carried out so that not only the beginning of a sound is articulated but its end as well; in this way simple sound shaping can be studied and differentiated.

An extension of experiments such as these can lead to the setting up of types of motion related to the process used for the making of a sound stream. One initial possibility would consist, for in-

Please turn to page 200



This is a page of hi-fi news.

Into the world of Hi-Fi, now and again there comes a product that represents terrific value to the enthusiast.

Such a product is the Grundig TK247 de luxe Stereo tape recorder.

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country. Their stand incorporated a compact but efficient demonstration room where the Wharfedale enclosures were put through their paces at regular intervals, and the interesting static display included what was for us a new piece of equipment from Rank Bush Murphy. Called the Discaset it comprises a combined portable record player and Compact Cassette player. Ordinary 45 r.p.m. gramophone records are "posted" vertically into a slot at the top and a sliding panel reveals the cassette transport system. Change from one medium to the other is effected by merely flicking a switch and the whole, provided with a carrying handle, was shown to reproduce satisfactorily in any position and even whilst being swung around. We regarded this appliance with mixed feelings of admiration at its ingenuity and horror at the prospect of unthinking persons invading the quiet of our countryside with screaming pop noises. It is sincerely to be hoped that owners will show some discretion when using what is obviously going to be an extremely popular means of sound reproduction. We are informed that the Discaset is now becoming available in the U.K. at a recommended retail price of under £25.

A glance down the list of exhibitors revealed many more well-known British names including Rola Celestion Limited, BSR Limited, EMI Electronics Limited, Garrard Engineering Limited, etc., etc. We apologise to those of our friends whom we did not have time to see.

Generally the equipment displayed did not reveal any remarkable differences as compared to that available in the U.K. We looked for, and found, examples of the latest trend in amplifier design towards so-called "multi-channel" models. This descriptive term does not mean that such an amplifier operates on more than two stereophonic channels but it refers to the splitting up of the audio signals into three separate frequency channels—low, middle and high—so that the individual outputs can be used to drive the three transducers of a conventional three-speaker system without the use of cross-over networks.

Advantages are said to be extreme clarity of sound with virtually distortionless reproduction. Snags are cost (for such a system you need to run three main amplifiers per stereo channel) extra bulk and the complication of properly balancing the final audio blend. Such a model was on show on the Sony stand, the pre-amplifier coded model TA-4300, and Sony U.K. Limited confirm that this is also available in Great Britain at a cost of £72 10s. It is recommended for use with the TA-3120 main amplifier of which three would be required per channel to obtain maximum advantage from the system, although the same pre-amp can be used with a

simple stereo pair of main amplifiers in the usual manner.

Both Sony and Sanyo were showing video tape recording units together with their more familiar audio products. On the BSR stand the UA 75 gramophone transcription unit was being demonstrated in spectacular fashion by reproducing grossly warped discs on two machines and also allowing a third to run with the whole box of tricks tilted to an angle of some 45°. We could not resist a rather smug smile as we watched this very dramatic *tour de force* because we first saw (and reported) the same thing at the British Audio Fair two years ago! Not that it is any the less effectively convincing at Hanover in 1969.

Naturally the home German manufacturers have some of the biggest display areas and Telefunken attracted a great deal of public interest. Most of this was centred on their lower cost tape recorders and what appeared to be an unlimited number of tiny disc reproducers. This firm's very aristocratic semi-professional recording equipment received much less attention from the visitors.

Also playing on home ground Grundig had one of the largest display areas together with a really excellent demonstration room. An unusual feature of the latter was its glass sides through which strolling visitors could see the audience as they listened with willing concentration. Sound-proofing was complete so none of the hubbub from the hall broke through into the demonstration area, neither could those outside hear what was going on inside. Another German firm, Sennheiser, were attracting a great deal of attention with their new stereo head-sets of unusual design and remarkably good audio quality.

Talking of headsets and design features the one product we saw at Hanover that really does incorporate a significant new development came from the Japanese manufacturer of National equipment. For a long time we at *TAPE Recording Magazine* have been reasoning that with the advent of extreme miniaturisation in electronics (which has now reached its peak with the integrated circuit) there might well be a case of providing individual listeners with their own personal amplifiers. The Japanese have been working along these lines and have extended the reasoning to produce what they describe as the Panasonic FM Stereo Headset.

When wearing this device the user immediately assumes a "man from Mars" appearance. Although very similar to conventional high quality cans in all other respects a short FM antenna extends upwards above each earpiece. The headband is only a little thicker and heavier than in ordinary headsets but it encloses a self-contained amplifier. A rotating control on the left-hand earpiece provides the tuning dial and a similar knob on the right gives

stereo balance. When wearing the Panasonic FM Stereo Headset the user is quite independent of any external connections and—delight of delights—he can listen in privacy without causing interference to other people. Assuming, that is, he can endure the inevitable comments about "little green men" that would be sure to follow him everywhere in Great Britain!

Audio quality is surprisingly good but not unnaturally the FM receiver is highly directional so the wearer has to rotate himself rather like a direction finder to obtain maximum signal strength. If worn out in the open whilst walking about this change in level could be most disconcerting. However such a device is only the first of what we have no doubt will be a range of highly personalised electronic equipments and we look forward to future developments in this field with the greatest interest.

It was with profound regret that we realised we should have no time to visit exhibits from other industries. However we could not resist just one look at a very large manufactured product that is perhaps even more futuristic than the Panasonic Headset. It was a flying saucer. Its brilliantly coloured disc stood squarely on the ground; another in contrasting colour was suspended at a height of some 50' from a gigantic crane. Believe it or not, it was being shown as a prototype of a house for the future. One ascended into the body of the "saucer" via a typical aircraft hatchway to find that the interior was one enormous circular living space with a fixed round table in the middle, clinical-looking dining chairs arranged around it and in an outer ring even more clinical "easy" chairs. With a small bedroom, smaller kitchen and tinier bathroom the whole offers highly original living accommodation for anyone with 100,000 DM, about £10,000, to spare.

Our BAC 1-11 aircraft of Caledonian Airways was waiting at Hanover Airport to bring us back to London. We had been very, very impressed with much of what we saw at the Fair and yet it was with some relief that we found ourselves in this superb British aeroplane for our journey home. The air hostesses in their tartan berets, uniform dress jackets complete with silver cuff buttons and kilts were so smart and yet so homely. One of them, a girl as beautiful as she was efficient, (and she was *very* efficient!) told us that her one desire was to make quite sure that she was working for the finest airline in the world. Somehow those few simple words made up for all our disappointment and resentment over not having an equivalent to the Hanover Fair in our own country. Many people will be echoing the sentiments of that delightful Scottish lassie when our own International Audio and Photo-Cine Fair opens its doors at Olympia next October.

NATO, RN, NASA, BBC, use Uher tape-recording equipment...



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HAVING just returned from my annual Easter camping expedition to the Peak district of Derbyshire I feel I am well qualified to talk on the subject of the great open air. If there was one commodity of which we were never in danger of lacking it was air. With ferocious intensity an ice-cold wind swept across the exposed hillsides making the canvas of our tent flap, crack and roar like a demented fiend. When walking it threatened to blow us off our feet, and on one of our (many!) rest stops I only just managed to catch hold of my heavy pack before the gale sent it tumbling down the mountainside.

Dressed like refugees from the Arctic wastes, our week-end was one long struggle against the elements. And on Easter Monday—glorious Easter Monday, one of the hottest on record—we awoke to an uncanny silence. The wind had dropped, the canvas was still and the world about us was strangely and oppressively quiet. Hardly surprising; we had awoken to thick fog!

Since wind is the greatest enemy of the outdoor recordist, conditions were at their very worst from that point of view. Traces of snow still remained, and the many mountain streams were swollen with the water of the thaw. Cascading down the hillsides, they set up a constant roar, rather like the distant rumble of London traffic. Against the brilliant blue of a cloudless sky it was all very beautiful, with the desolation of vast empty spaces bordered by the gracefully curving slopes capped with a fringe of purest white. If someone would tell me how to record the breathtaking beauty of such a scene I would be greatly obliged.

A purely visual experience such as this can inspire awe in the onlooker. Unfortunately, it cannot be represented in terms of pure sound. Most of my recordings were spoilt by wind noise across the microphone, but all of them present little more than a meaningless jumble of sound that will convey no intelligible impression to the listener.

The only satisfactory recording approach would be to use "indirect" methods, either by using sound as an accompaniment to still colour slides or cine photography or, alternatively, by recording a spoken description of the scene. This latter is, of course, a poor substitute for the real thing, and in any case would be extremely difficult to do. How to describe such unspeakable grandeur? Frankly, it defeats me.

But then this surely is one of the basic limitations of the medium. Just as a photograph of a bird or an orchestra is a poor substitute for hearing the real thing, so the kind of sounds I have mentioned are poor substitutes for the visual experience. It isn't that either photography or sound recording are better or

CROSS TALK

By Audios

not so good as each other, just that they are different and they do different things in different ways.

Perhaps the real answer lies in the fact that just as no pre-recorded tape or gramophone record is a real substitute for visiting the concert hall, neither is looking at a photograph or listening to a sound recording any real substitute for visiting such places oneself.

With such thoughts we returned home bringing with us a few photographs, a few recordings, but many, many happy memories.

* * *

***T**HERE are not many wealthy tycoons amongst my acquaintances, but I can claim friendship with one captain of industry. A rich man whose fortune has been won by perseverance and intellectual effort, he recently consulted me about the purchase of some audio equipment. The question he wanted me to answer was the old familiar chestnut: "What is the best tape recorder for me to buy?"*

There never was nor ever can be a correct answer to such a simple inquiry. So much depends on how the owner proposes to use his equipment. So my immediate reply (which is standard regardless of the inquirer's wealth) was: "What do you want to use it for?"

This conversation ran strictly according to form because his reply to me was equally universal. "I just want to dub from the radio and copy gramophone records."

Now my friend is a highly intelligent man of the world renowned for his business acumen and fair dealing. When I explained to him that he was proposing to commit an offence against the law of the land he was astonished. It had never occurred to him that his suggested copying of gramophone records would be illegal. And in all common sense why should it be? All he wanted to do was to transfer some of his cherished library of discs on to tape because he regards it as being a more convenient and safer method of reproduction. He wasn't stealing anything from anyone, he wasn't even depriving the gramophone companies of their royalties—he had already bought the records himself for cash. And as I had to agree, no one would be likely to be any the wiser if he was to perform this nefarious act for his own amusement in the privacy of his own home.

So out of this conversation there arose what I believe to be two very important points. First of all if a man of my friend's position is unaware of the legal restrictions imposed on copying gramophone records (in spite of the fact that a warning blurb appears on virtually every gramophone

record sleeve—few ever bother to read it) then how many less sophisticated persons are equally ignorant? The second point relates to his suggestion that he could still do what he intended to do and get away with it. Of course he can; and any sincere lawmaker will confirm the truth of the principle that laws that cannot be enforced are fundamentally bad laws.

* * *

IT'S easy to criticise manufacturers when one is not engaged in actually making anything but I can't help thinking that many British firms have too little understanding of the uses to which their goods are going to be put by their customers. This doesn't just apply to audio products but to a whole range of diverse commodities. Did the man who designed that pair of ultra-slim trousers ever trouble to put his legs into a finished garment and then attempt to sit down? It happens all the time.

I came across a case recently of a brilliantly designed and very versatile portable lantern. It could be used for a multitude of applications—until the bulb blew. Then the trouble started. After trying to purchase a replacement bulb in a number of shops and ending up equally frustrated in one of the biggest London stores I contacted the manufacturer by telephone. He had never heard of any difficulty in the supply of replacement bulbs. Probably no one had bothered to tell him. But he admitted that his firm had carried out no research to discover whether or not this particular bulb was readily available to the public. He was horrified when I told him it couldn't be obtained for love nor money and is now considering modifying the lantern to accept a bulb of standard voltage. But surely all that should have been done before the product was released for sale?

Similarly in the audio field I have recently been looking at some interesting new amplifiers. I have no doubt they are efficient and good value for money. But I had to point out that the provision of a couple of extra simple facilities would enormously increase their versatility and thus their usefulness to the purchaser. It hadn't occurred to the manufacturer that the consumer would wish to use the equipment in the manner I suggested. Once again lack of proper research. Still on the subject of amplifiers one firm is still marketing a model with dire threats in the instruction book that the output transistors will blow if a speaker of less than 15 ohms is connected across the output terminals. When I pointed out that even the "big boys" in the loudspeaker business were now rapidly changing from 15 ohms to 8 or even 4 ohms my protest was met with incredulity.

Surely it is time that we in this country set up an unbiased panel of experts to whom designers and manufacturers could refer before marketing new products? It would be so simple and would save so much frustration by the consumer and expense for the manufacturer. But perhaps this would be too simple a way to ensure that the public really gets what it wants.

* * *

A RECENT lady correspondent commented with charming naivety on our editorial in April describing the winning entries in the 3M Wildlife Tape Recording contest. Referring to Mrs. Anne Dunn of Southampton who was up at 7 a.m. to record a grey squirrel swearing at a cat in Bournemouth she asks with a wicked twinkle in her eye for details of the parabolic reflector that Mrs. Dunn must have used!

RECORDING AT THE ZOO

BY DENYS KILLICK



Our Fish Eagles finally co-operated and gave us an excellent recording.

THERE is something mysterious about the magic hour of dawn. Gradually the black velvet of night softens into an opalescent grey-blue, soon to be pierced by the rays of the rising sun. Early mornings are usually quiet, peaceful times. Even if the coming day is to be one of boisterous windy conditions its first hour of light has a tranquility that is only broken by sounds of the dawn chorus.

With traffic noise subdued the small hours of the morning are ideal for the recordist: All he needs is the will-power to make that decisive effort to get up out of a warm bed and start working. So when discussing some projected recordings at the Zoological Gardens, London, with Joseph Lucas, zoologist and Editor of the International Zoo Year Book, it did not take us long to decide that we should start work at dawn.

Special arrangements had to be made with the Zoological Society for us to take the recordings in the first place and for us to have access to the Gardens at such an unusual hour. We also asked permission to use a tripod and reflector, and we are indebted to the Society for their helpful co-operation.

Our equipment comprised a very sturdy photographic tripod, a Grampian parabolic reflector, and Akai X-5 battery portable tape recorder with microphone and

some spools of Scotch Dynarange 203 tape. With alarm clocks set for the unspeakable hour of 4.30 a.m. we retired to our respective beds, hoping and praying for a bright, still morning.

As we drove through the empty streets next morning we didn't exchange a single word; the windscreen wipers were switched on to remove the fine drizzle of rain obscuring our view through the glass. Overhead skeins of low cloud chased each other across an otherwise leaden sky. Of the sun there was not a trace. Comforting ourselves with the thought that even if our mission was to be a total failure at least our immortal souls would benefit from our courageous fortitude we arrived at Regents Park.

There is something almost ghostlike about an empty and deserted zoological gardens. Perhaps it is because one always associates such a place with a noisy multitude of visitors. The walkways stretched vacantly in every direction; an occasional animal sound broke the silence. Rain was now falling more steadily, blown by an uncomfortably strong wind directly into our faces. It was so cold that our hands seemed to be frozen to the metalwork of the tripod and reflector. Hardly the idyllic setting we had optimistically imagined the previous day.

The purist of wildlife recording would probably regard working with zoo animals

as cheating—rather like shooting a sitting bird. But if anyone imagines that merely because the inhabitants are neatly caged and labelled the recording of their voices is nothing but child's play then he is suffering from a very sorry delusion. As we now realise to our cost, good recordings will be obtained only through the exercise of patience and skill. We did not pretend to aspire to the latter, whilst the former rapidly dissipated against the onslaught of the inclement weather. However, having got so far we determined to

RECORDING AT THE ZOO

Continued from previous page



The Monkey Eating Eagle is a very rare bird indeed, and this specimen, alas, is now dead. A recording of its voice would have been of great value and interest and it could easily have been taken by any ordinary visitor during the bird's lifetime.

at least make a reasonable effort to obtain some of the sounds we wanted.

One of the first items on our list of required animal noises was the cheetah. There was no difficulty locating him in his carefully protected enclosure. In fact he was delighted to see us and came running across to introduce himself in the friendliest possible manner. Out came the microphone and with a separation of no more than an inch or two between it and the sound source we began to take our first recording of the day.

The sounds we had were genuine and authentic cheetah noises. We both knew it only too well, but it is doubtful if anyone else will ever believe us. Our friend the cheetah was so pleased to make our acquaintance he did nothing but purr, purr, purr. Rubbing himself up and down the wire netting of his enclosure he purred continuously for as long as we cared to record him. And as we walked away he settled himself down in his cosy wooden lair and we could still hear the deep throaty buzz of his purr in the distance.

Now I have recorded the purring of my own domestic tabby cat as he lay on the hearthrug in front of the fire at home. I'll swear there is no obvious difference between the sound of that recording and the one we made of the cheetah. Of course the larger animal has a deeper voice but it is doubtful if anyone other than an expert could tell which recording was which. Hardly a dramatic start to our adventure!

Personally I was sorry to leave the big cat. Such a graceful, friendly animal is a real joy to watch. All its actions are so reminiscent of one's own cat at home that it seemed impossible to think of such a creature as being potentially dangerous. But from him we had to turn to the birds of prey, and here began the most frustrating episode of the entire morning.

It was for this kind of recording that we had brought the reflector and so we proceeded to mount it on its tripod outside the fish eagles' cage. By this time it was raining quite fast. A damp, clammy silence spread like a suffocating blanket over the usually noisy cages of the big birds of prey. With the machine at the ready we stood wet, cold and dejected, mutely staring at the pair of fish eagles high up on their perch. They, equally dejected, dumbly returned our stony stare. As a trickle of icy rainwater ran down my back I looked hard into one of the great bird's beady eyes. He looked back, inscrutable and unflinching, supremely indifferent to our predicament or requirements.

There we stood in mutual silent regard of each other. Each with his private and unspeakable thoughts. Suddenly the sound of footsteps. Two more people were in the Gardens. Of all the walkways in the zoo they chose to pass along the one from which we were working. As they approached the microphone their footfalls rang out loud and clear. At the moment of maximum interference one of our misanthropic fish eagles opened his beak and let fly with his screaming call. As the footsteps faded away his beak clamped firmly shut. Did I really detect a gleam of triumph in his coldly calculating eyes, or was I just imagining it?

Another ten minutes of hopeless waiting and we packed up our equipment to



Eloquently expressing our feelings during the more unfortunate episodes of this expedition, the Sociable Vulture looks anything but sociable.

make our way to the Monkey House. As we walked away he lifted his head and screamed derisively after us. I am quite sure that second call was deliberate. There was no doubt at all that the score in the fish eagle game was 2-nil, with us on the losing side.

It was a relief to get out of the wind into the warmth of the Monkey House. We particularly wanted to record baboon sounds and there is a good selection of these animals at Regents Park. In addition there are many chimpanzees and other species, including a truly magnificent gorilla. There was plenty of noise too—unfortunately it was the thunderous clatter of the more active inmates drumming on the metal trapdoors in their cages and shaking the wire mesh at the front. When one monkey started to bang and clatter others would follow suit until the whole place was a bedlam of sound. Then quite suddenly it would all stop and peace would return.

Our baboons showed interest, animosity and a complete lack of understanding. Their typical cry is a dog-like barking sound but most of the barks recorded on tape were those made by yours truly in a feeble endeavour to stimulate a reply. Passing up in front of the line of cages we were delighted to see a couple of babies; sweet little creatures no bigger than tiny dolls they were full of life and fun, darting about their cages then clinging to their mothers and then back off on another tour of exploration. I could have watched them all day.

Further along was a pair of another species of baboon. These animals looked for all the world like a dear old lady and

Continued overleaf

gentleman. Their expressions were of senile dotage. They looked just like an elderly couple in the geriatric ward awaiting the arrival of breakfast. And when they talked to each other, as they quite frequently did, they sounded just like that too. With peculiar little half-squealed mutterings their conversation started, stopped, trailed away and obviously was about nothing at all in just the absent-minded vacant manner of the very elderly. A charming couple; I would have dearly liked to suggest that I joined them at their coming meal and I am quite sure their reply would have sounded rather like Spike Milligan in one of his more inspired moments.

But the general air of depression caused by the weather was undoubtedly affecting this cross-section of the monkey world. They none of them saw any valid reason why they should bother to humour the pair of unseemly humans who showed such an indelicate interest in their activities. As we left the Monkey House one of the baboons eloquently expressed his own feelings on the subject by pointedly turning his brilliantly coloured rump in our direction. So we returned to the birds of prey to start the second half of the fish eagle game.

I have more than a little sympathy for my friend the fish eagle. Perhaps he was repenting his callous treatment of us earlier that morning, or perhaps he was merely concerned that his reputation might suffer if he remained silent longer. After all his Latin name does include the word *vocifers*—a comment on the frequency and strident nature of his call—and now suddenly for us he proved the point by being truly vociferous. Here the Grampian reflector really did come into its own.

By this time traffic noise had built up into a steady roar and all around there was the continual chatter of house sparrows (of which we obtained some very excellent, if quite superfluous, recordings!) and the occasional blackbird and thrush added their songs for good measure. By using the reflector and carefully sighting it on target we were able to obtain a fully modulated recording of the bird's voice with all the other extraneous sounds held well down in the background.

When we played the first of these back we thought that ill fortune had again been playing us dirty tricks. At the moment the bird called the level of the recording on the tape suddenly and miraculously half disappeared. Was it possible that at the vital moment we happened to find ourselves working on a faulty section of recording tape? Quite nonplussed for the moment I could think of no other explanation until Joe casually mentioned that

the Automatic Gain Control on the machine had been switched into circuit. That, of course, was the answer. With the short, shrill, cry of the bird as the sound subject the AGC had done its stuff only too well. It took the first modulations at full level and then swiftly and smartly brought the whole thing under its iron control to fade gently down to what it considered to be a reasonable level. Equally promptly we switched the AGC out and took some more proper recordings. This was entirely our own fault because no AGC system is suitable for short, sharp, transient type sounds.

But our triumph of the day was recording the sound of another bird of prey, the caracara. We particularly wanted the call of this species for use on a gramophone record, but like so many of the inhabitants of the zoo they were in a state of depressed despondency, a feeling all too familiar to those of us who endure the cold of a wet April morning. But our salvation lay in the hands of a friendly keeper who was about to feed them with a pair of dead white mice.

As the two birds tore their prey apart they maintained an incessant chatter with each other, a noise not dissimilar to the rasping of a cardboard cigarette packet across the bars of their cage. For the sake of any of those evil minded enough to imagine that we might have cheated by doing no more than simulate the sound in the way described let me hasten to affirm that our recording was genuine.

Of course as the two caracaras began to chatter almost every inhabitant of the Gardens lifted its head and gave voice. The lions roared, the tropical birds shrilled and it is doubtful if a single species of British wild bird is absent from our recording. Once again however the reflector performed a noble task. On playback the required sound has a dramatic presence, almost as if the bird were in the room with the other zoo sounds subdued by twenty dB and more.

On the whole it had been a reasonably successful morning's work in spite of the adverse weather conditions. From our four hours spent in the Zoological Gardens we had obtained a total programme time of between 30 and 60 seconds, and we regard that ratio as satisfactory. Certainly it had been cold and damp but the sounds of the purring cheetah, our screaming fish eagle and our chattering caracaras more than make up for what after all was only a little temporary personal discomfort. We still have many, many more animals to record in the Zoological Gardens. Perhaps some of our expeditions will be more successful, others almost certainly less. But whatever the results I personally can think of no more pleasant or satisfying way of spending a cold, wet April morning.

stance, of synthesising four simple spectra and recording each for an identical duration. Each spectrum could then be divided in different ways, each shorter length given varied attacks and decays and the four arranged in a number of different ways of which the following are examples:

1. Each spectrum could be cut into equal lengths and all the possible variations of juxtaposition between them exploited.
2. Each spectrum could be cut into varied lengths and the same variation between them exploited.
3. Different lengths could be intercut, but in this case the same sequence of spectra used throughout. In each case, when all the lengths of tape have been used up the duration of the experiment would be completed.

For these types of motion it is at first helpful to build each spectrum with an identical array of harmonics based on the same fundamental. The components of each one can then be variously modulated by amplitude variation and beat frequency. The factor mentioned earlier which produces an overall timbre uniformity is useful here. It will act in a way which will blend the spectra so that the change from one to the other within the uniformity will produce a specific type of tension.

Further experiments can be made with loops of tape containing rapid sequences of sounds of uniform pitch, duration and amplitude, separated by equally spaced lengths of leader tape. With a sequence of this kind one begins to arrive at a way of articulating a spectrum by means of a system which contains types of resonance which tend toward effects of echo and reverberation. As a loop of this type plays its amplitude should be increased and decreased gradually and the result carefully listened to in order to note the effects caused by these changes on the rapid repeats. By ribboning sound in this way a type of motion begins to emerge which consists solely of attack impulses and this can be used as a means of examining and articulating the structure of motion. There arises the possibility of setting up a system in which two or more sets of uniformly spaced sounds, differently spaced in each set, can be intercut. Also two or more such sets can be superimposed so that rhythmic intervals are out of synchronisation to produce a more complex sound pattern. With this process a type of motion is arrived at which consists of a propulsive array of attack impulses, one of the two extremes of motion. The clearest and most powerful example of this is found in the drum musics of various parts of Africa. In the next article I shall deal in more detail with this aspect and with the systems I have just outlined.



NATURE NOTES FOR JUNE

BY RICHARD MARGOSCHIS

WHETHER you are a naturalist or not there is one annual visitor to this country whose call you should have no difficulty at all in recognising; who does not know the two-syllable call of the cuckoo? The bird arrives about the beginning of April and leaves around the end of September, the juveniles stay for some time after the adults have left.

The situation is very different with some of our smaller summer visitors, particularly the warblers. They have a much more pleasant and melodious song but to the untrained ear they are not so distinctive and therefore very much more difficult to identify, especially when you are unable to see them because of thick foliage.

Take, for instance, the blackcap and the garden warbler. The two species are about the same size and their movement is very similar, but if you could see them side by side you would note that one has a distinctive blackcap—no need to say which he is!

The problem arises when you are unable to see them, because, to the uninitiated, the songs can sound so much alike. Generally speaking the garden warbler uses longer song phrases and seems to be in a hurry to get them out, in fact, my wife always calls him "gabbler." The blackcap pitches his notes rather higher, but he is a bit of a mimic and so identification aurally becomes even more difficult until you are really familiar with the song of both birds.

I said earlier that you would have no difficulty in recognising the call of the cuckoo. In fact it is just about the easiest bird call to imitate and you would not be the first to be fooled by some youngster trying his skill as a mimic, a point which brings me to a technique that can be used to stimulate birds to sing.

The cuckoo is not particularly territorial in his habits but the warblers are, so are most of our song birds. They continually advertise the area in which they live by singing at different spots around it and in this way tell other birds of the same species to keep out. If they do hear another's song within the territory they will usually investigate and if their own song is insufficient to drive off the intruder then stronger measures may be taken.

The technique is to record the bird's own song and then replay it to him. This will often stimulate him to sing even better than he was doing before and probably bring him down to a song post very near to you. It must be done with great care, if the replay is overdone the bird will become very agitated and instead of singing will start emitting his alarm call. Once this starts to happen you should cease the practice immediately.

On one occasion I was sitting between two song posts being used by a whitethroat and made a recording of his song. When I replayed the recording the bird was quiet for a few moments and then started making his alarm call, flew across the recorder once on his way from post to post and on his return journey dive-bombed the machine! It was time to stop. On the other hand a blackcap, on the same day, answered his recorded song with a very good performance. Within a few minutes he was standing on the head of a friend who was with me, listened to his song and did not become at all agitated.

This is the sort of situation where it might be convenient to join forces with another recordist in order that two machines can be put into use, one for playing back and the other for recording. It is then possible to record the reaction of the bird to his own song.

From Africa I have heard a recording illustrating what happens when a lion's mating call is played to another lion—the recordists became rather worried when the lion came right up to their car to investigate the loudspeaker!

A friend of mine has been an ornithologist since he was a boy. That was some years ago and since then he has had a lot of experience in "ringing" birds of various species for scientific purposes. The birds are caught and a tiny ring carrying a number is attached to one leg; in this way the bird's movement can be traced if it is ever caught again or found dead. He tells me that often when he goes into a starling roost he knows, from what his ears tell him, that there is a bird which has been on the Continent

present because he hears the call of the golden oriole. The answer, of course, lies in the fact that starlings are excellent mimics. Incidentally, bird ringing cannot be done by anybody; although it is done voluntarily you have to be licenced.

This mimicry can be very misleading, especially to an inexperienced person who might take some time to realise that the miscellany of calls reaching his ears are all coming from one bird. Although the starling is, perhaps, the most persistent of mimics he is by no means the only offender; if, in fact, it is an offence for a bird to copy others. The reed warbler does it quite frequently and at times even the thrush will include notes which are typical of the song of another species, especially if they have a similar character to his own.

From what I have said above it is obvious that once a starling has learned another's call he can remember it and use it for long periods, but this is not the case with all mimics for some will copy calls of a neighbour for a while and then completely drop them.

I find that it is not always easy to recognise mimicry because to do so it is necessary to be very familiar with the normal song of the mimic and the species which you believe is being copied. It can make a very fascinating subject for endless recordings, especially if to start with you confine your study to a species with which you are familiar.

It can even offer some scope for experiment by making use of the technique of inducing a bird to sing by replaying to him his own recorded voice. Suppose, for instance, you have a resident starling who has the habit of including in his song a few notes of a blackbird. What would be the effect if you replayed to him the song of a blackbird, perhaps for a few minutes at a time over a period of a week or so? The idea also makes me wonder if it is possible to induce an individual of a species known to mimic others, but who has not been heard to mimic, to copy a recording by regularly replaying it in the vicinity of his song post? I have never heard of this being done and would be interested to hear from anybody who has.

One day last year I was sitting by a small lake in North Wales watching a pair of sheld ducks with ten ducklings and recording the contented "quack" of the parents when suddenly they both took to the air. They flew around in small circles, each making a loud "quack" of entirely different character from the contented one of a few moments before; this agitated call was taken up across the lake by the sharp "peep-peep" of an oyster catcher.

By this time the ducklings had completely disappeared into some reeds and turning my eyes skyward I saw the cause of the commotion—hovering nearby was a kestrel, with his eyes, no doubt, on the ducklings. A few moments later he had gone; duck and drake landed back on the water and ten little ducklings reappeared as if by my magic. Across the water the alarm call of the oyster catcher died away and suddenly I realised that peace had returned to this little lake amid the hills.

Simply because I had been sitting there—with no *real* objective in mind—I had witnessed an episode in the life of those ducklings. It might even have been my presence which resulted in the story ending with ten ducklings instead of nine; I don't know, but it is down on tape exactly as it happened.

I have already mentioned in these notes that week-end schools of interest to naturalists are run at Woodchester Park Field Centre, near Stroud in Gloucestershire. One of particular interest to recordists will be held during the first weekend in September and will cover natural history sound recording in general. The centre, situated in wonderful country, enjoys the use of a mile-long valley for natural history study and is particularly good for sound recording. Anybody interested can obtain details by writing to me c/o *TAPE Recording Magazine*.



FULLY GUARANTEED

Size Base	Standard P.V.C.		Long	
3"	150'	2/6	225'	3/3
4"	300'	4/3	450'	5/6
5"	600'	8/9	900'	10/3
5½"	900'	10/6	1200'	12/6
7"	1200'	12/6	1800'	17/9

Size Base	Double POLYESTER		Triple	
3"	300'	4/6	600'	9/3
4"	600'	8/6	900'	13/3
5"	1200'	15/9	1800'	23/6
5½"	1800'	19/9	2400'	29/9
7"	2400'	22/6	3600'	39/9

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Frequency Hz	Overall Response dB						Playback Only dB	Signal/Noise Ratio dB	Distortion	Crosstalk dB	
	7½ i.p.s.		3¾ i.p.s.		1½ i.p.s.	1⅛ i.p.s.					7½ i.p.s.
	Line out socket	Ext. Speaker Socket Tone control at zero	Line out socket	Ext. Speaker Socket Tone control at 9 o'clock	Line out socket	Line out socket					Line out socket
40	+2.0	+2.0	+2.2	+2.0	+1.5	+0.4	+1.0	42 (48)	3.5%	37	
50	0	0	0	0	+1.7	0	0				
60	0	0	+0.5	+0.5	+1.0	+1.0	0				
100	0	0	0	0	+0.4	+0.6	0				
250	0	0	0	0	0	-0.3	0				
500	0	0	0	0	0	0	0				
1000	0	0	0	0	0	0	0				
2000	+1.0	-1.0	+1.0	-1.3	+0.3	+1.1	+0.5				
4000	+4.0	-1.8	+3.1	-2.4	+1.1	-0.5	+1.0				
6000	+7.0	-1.8	+4.7	-2.0	+1.1	-4.5	+2.8				
8000	+9.0	-0.6	+6.0	-1.8	+1.0		+3.6				
10000	+12.6	0	+6.6	+0.3	-2.0		+6.6				
12000	+13.6	+1.0	+7.1	+1.7	-5.0		+8.0				
14000	+14.0	+1.3	+6.6	+2.6			+7.0				
16000	+14.0	+1.6	+6.1	+2.5			+6.0				
18000	+8.0	+1.6	0	+2.4			+5.0				
20000	0	-2.9					+1.0				
Wow and Flutter ...	0.12%		0.15%								

NOTES.—The Overall Response figures relate to record and playback, see text for further information. Playback Only relates to the reproduction of a 70 microsecond test tape at 7½ i.p.s. (I.E.C.).

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. 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 (see text).

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.

MANUFACTURER'S SPECIFICATION AKAI X-V

Tape speed: 15/16, 1⅞, 3¾, and 7½ ips.

Wow and flutter: Less than 0.15 per cent RMS at 7½ ips. Less than 0.17 per cent RMS at 3¾ ips. Less than 0.25 per cent RMS at 1⅞ ips. Less than 0.35 per cent RMS at 15/16 ips.

Frequency response: 40 to 20,000 Hz ± 3 dB at 7½ ips, 40 to 17,000 Hz ± 3 dB at 3¾ ips, 30 to 11,000 Hz ± 3 dB at 1⅞ ips, 30 to 5,500 Hz ± 3 dB at 15/16 ips.

Signal to noise ratio: Better than 50 dB (DC). Better than 45 dB (AC).

Input level: Microphone more than 0.1 mV. Line more than 60 mV.

Power output: 2 W maximum per each channel, total 4 W.

Equalisation: Correct equalisation for playback of tapes recorded to the NARTB curve.

Recording level indicator: VU meter x 2.

Recording system: 4-track stereo/monaural Cross-Field bias system.

Fast forward and rewind time: 90 seconds using 600 feet tape.

Maximum reel size: 7-inch reel (with optional 7-inch adaptor).

Head: Erase, recording/playback and bias heads.

Motor: Brushless micro-motor.

Speaker: 3-inch speaker x 2.

Transistor: Transistor x 30.

Power supply: DC (rechargeable battery, 6 V 2.6 AH), AC 100 to 240 V.

Dimensions: 5½ inches (H) x 11 inches (W) x 12 inches (D), case closed.

Weight: 12 lb. (without battery), 1.3 lb. (battery).

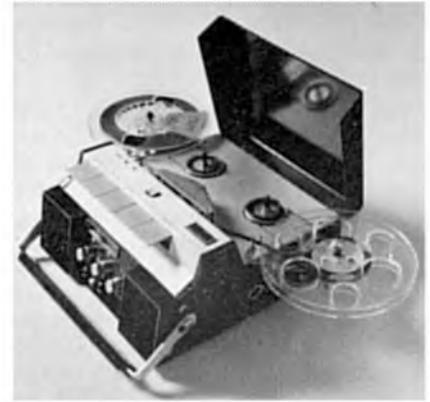
Price: Machine complete with 2 microphones, accessory cables, etc., £180 incl. PT.

Optional extras: Real leather carrying case with shoulder strap £17, including PT; 7-inch reel extension arm £10 9s., including PT.

Distributors: Pullin Photographic Ltd., Rank Audio Visual Ltd., P.O. Box 70, Great West Road, Brentford, Middlesex.



AKAI X-V



HAVING recently reviewed an ultra-lightweight low-cost portable machine, the Bush TP 60 Compact Cassette model, we now turn to the other end of the scale with a highly sophisticated battery/mains quarter-track stereo portable, the Akai X-V. Using the Cross Field Head system and costing £180 this machine must be regarded as one of the elite of its class, so it is only fair and reasonable that our technical investigation should be a strictly no-compromise statement of findings. With such thoughts in mind we began to run the rule over the X-V but very quickly found ourselves in difficulties. In order to be scrupulously fair we duplicated all our main tests. It was found that the machine performed well up to its specification when measurements were taken at the external speaker socket in the method recommended by the distributor, but when the same tests were done by measuring at the line out socket a totally different set of figures was obtained.

These two apparently contradictory results underline the difficulty of interpreting published specifications and, as we hope to make clear during the course of this review, the strange anomalies that can arise when relating technical measurements to practical user applications in the field.

Turning firstly to the frequency response table it will be seen that when operating at $7\frac{1}{2}$ ips with the tone control set at zero (maximum anti-clockwise position) the overall response record/playback is well within specification over the entire frequency range of from 40 Hz to 20,000 Hz. In fact from 50 Hz to 18,000 Hz the tolerance is plus or minus 2 dB instead of the 3 dB claimed by the manufacturer. So far so very good indeed.

Unfortunately if we now repeat the same process measuring at the line out socket we get quite a different story. Instead of the previous commendably flat response we now find that our curve is rising from plus 1 dB at 2,000 Hz to a maximum of plus 14 dB at 14,000 and 16,000 Hz. It was this set of figures that gave us cause for concern.

Similar differences are found between extension speaker socket and line output socket at $3\frac{3}{4}$ ips. When working from the speaker socket with the tone control adjusted to give a sensibly flat response at 10,000 Hz, that is in the "9 o'clock" position, we can again publish a set of figures better than those claimed. As might be expected the response rises at the line out giving a maximum of 7.1 dB above level at 12,000 Hz. At the two slowest speeds, $1\frac{7}{8}$ and $15/16$ ths ips., there were no problems and the quoted figures at the line out socket are well within the bandwidth and standard claimed for the machine.

To check the playback only response we used a calibration tape to the 70 microsecond time constant. Although it is claimed that the machine is equalised to NAB (50 microsecond) it was obvious from the curves already obtained that it would be inappropriate to directly relate the performance of this equipment to such a curve. The rising response from the line out socket shows a maximum deviation from level of plus 8 dB at 12,000 Hz. By relating these figures to the overall response measured at the same outlet it is possible to get a very fair idea of the relative amount of high frequency pre-emphasis induced at the record amplifier as opposed to the additional boost given by the equalisation network on playback. The interesting thing about these figures is that although they reveal what might be regarded from the purely technical point of view as a very wide divergence, nevertheless we shall see later in this review how such a situation can be turned to some advantage under the right conditions.

Measurement of signal-to-noise ratio also gave us some headaches. Because of the excessive high frequency pre-emphasis which must inevitably result in a preponderance of hiss in the basic system noise, we found once again we were faced with two apparently contradictory sets of figures. When measured at the speaker outlet with the tone control set for a flat response (maximum anti-clockwise) signal-to-noise was 48 dB when run-

ning on the internal rechargeable battery. This is within a fraction of the claimed 50 dB which would probably be reached if one used a "low noise" tape. It is quite obvious from the preceding figures that the noise level must deteriorate when measured at the line out socket and in fact the difference was 6 dB (representing unwanted hiss) to give a new reading of 42dB. Distortion at $7\frac{1}{2}$ ips on a peak signal of 1 kHz was established at 3.5 per cent and the cross talk between stereo channels was found to be 37 dB. Both these figures can be regarded as acceptable although they could not be said to be outstanding. Wow and flutter at $7\frac{1}{2}$ ips was shown to be 0.12 per cent RMS and at $3\frac{3}{4}$ 0.15 per cent RMS. Both these figures are better than the specification. The power output at the external speaker socket is claimed to be 2 watts maximum per channel but there is no indication as to whether this is RMS or Music Power. In fact according to our own measurement the output is nearer 1 watt RMS into an 8 ohm load.

After the complications of our technical investigation it was with some relief that the X-V was turned over for practical user tests. And in opening this section of the review we must comment most favourably on the excellent and very unusual packaging method used by the manufacturer for this machine whilst in transit. It arrived in a cardboard box. Inside that is found a substantial wooden frame. The machine itself is suspended from the frame by eight high tension springs—one from each corner—so that it literally "floats on air." It is difficult to imagine how any ill-treatment during transit could possibly damage the equipment. The springs have to be strong and a special tool is included to release them. Once the machine has been extracted and the springs detached the user can be quite sure that it will be in as perfect condition as it was when it left the factory. Such a method is ideal for a delicate piece of equipment that is intended for use in any part of the world under the most rigorous conditions; owners are strongly advised

Continued overleaf

to retain all the packing material in case it should be found necessary to transport the equipment over long distances by road, train or ship.

The weight of the machine, over 12 lbs. without the special rechargeable battery, is in line with modern development of good quality battery operated portable equipment. It is our opinion that such equipment is "transportable" rather than "truly portable" and we do feel that there is a dire need for a top quality really lightweight machine to replace the late lamented Fi-Cord 1A. Regrettably no manufacturer seems to agree with us and so we really cannot criticise the X-V on account of either its size or weight.

Much of this weight must be taken up by the extremely sensible and rugged casework which is strong metal instead of flimsy plastic. This machine has obviously been designed to withstand a really good bashing over many years of hard use. The transport system is controlled by five very large and substantial press keys marked Rewind, Record, Stop, Start and Forward. This labelling has been repeated on both the vertical and horizontal surfaces so that it is equally visible whether the machine is standing on a table or slung from the shoulder.

On the front vertical face are found a pair of rather small VU type meters (not illuminated and not very easy to read) and two pairs of double rotary control knobs, the lower half of which is the tone control and the upper half record gain and volume on playback. These knobs are the most awkward feature of the X-V. It is almost impossible to adjust the tone ring without also upsetting the gain. Much too fiddly for easy use in the field. The left-hand channel volume control knob also incorporates an amplifier On/Off switch and when turned to the On position a small battery level indicator displays the internal battery condition. This too is very small and the needle has only a tiny arc of movement and is not easy to read. It should be mentioned that there is no "amplifier on" pilot light and great care must be taken to ensure that the On/Off switch is turned to the Off position when the machine is not in use as otherwise the internal battery will be needlessly drained.

The speed-change switch is on the same control panel and offers a choice between 15/16ths, 1 $\frac{7}{8}$, 3 $\frac{3}{4}$ and 7 $\frac{1}{2}$ ips. Immediately below the two pairs of rotary controls are two standard jack sockets, one for each channel, with a slide switch between marked Microphone at the top and Line Input at the bottom. The remaining feature of the main control panel is a red pilot light labelled Charge and this illuminates when the mains lead is connected to an AC supply provided

the battery is below about 90 per cent of its total capacity. This warning light will continue to glow as long as charging takes place but will go out when the 90 per cent point is reached. The instruction manual stresses the fact that charging should continue for at least two hours after the light goes off. On the right-hand side of the machine is a standard five pin DIN receptacle for Record/Playback connections and at the side of this is a slide switch offering a choice between manual or automatic gain control. On the left-hand side are a pair of standard jack sockets, one for each channel, for external speakers with a slide switch between for muting, and at the rear is the AC input receptacle, voltage selector, remote control socket and AC on/off switch.

The hinged lid covering the top of the deck is good solid metal. Its advantage is that it will never break and its disadvantage is that it totally obscures the spools. The spools themselves are mounted on a pair of spring loaded hub retaining spindles which positively secure them in place whatever the position of the machine. The three figure rev. counter is also mounted on this upper vertical face which unfortunately means that the machine must be tilted during shoulder operation in order to read it. In our opinion it should have been sited on the main control panel.

A substantial fully detachable handle is provided and although the equipment can be carried with confidence and in some comfort by means of this handle it does tend to foul the shank of the microphone jack plug when this is inserted in its socket. It would have been so easy for the manufacturers to fit their microphone leads with right angled jack plugs which would have completely overcome this rather irritating little inconvenience.

A pair of internal loudspeakers are housed in slightly projecting nacelles, one at each end of the main control panel. These are tiny little transducers that are quite obviously not intended to offer either good audio quality or proper separation in the reproduction of stereo programme material. We suggest that those people who demand good quality loudspeakers on portable tape recorders should be sentenced to carry them 20 miles a day for one month. On second thoughts perhaps the death penalty is rather extreme!

No, in our opinion the speakers on the Akai X-V perfectly perform the function for which they were intended, that is they offer a lightweight monitoring sound source that is instantly available in the field at the flick of a switch.

Actual user tests were carried out under ideally practical conditions and part of our experiences are described in another feature in this issue under the title "Recording at the Zoo." On this and other

assignments we were able to get a very good idea of the advantages and disadvantages of this particular machine. But first we would like to emphasise what we consider to be the correct use for this type of equipment.

Essentially a battery portable (or as in this case mains/battery) tape recorder is a device for recording "in the field." By this we do not necessarily mean in ploughed fields although such locations would be included in the broader term. Battery equipment is properly used under conditions where it is either impossible or inconvenient to use a mains machine. This might be because mains power is not available (although this can sometimes be overcome by the use of a suitable converter) or it might be because the location is inaccessible to heavy mains gear. Yet again the mere ability to be self-contained with a recorder suspended from the shoulder and microphone in the hand makes it possible to record with ease and comfort when it would be impossible to be anchored to the great bulk of a mains machine. Typical of such latter situations is that arising when the recordist is walking round a large exhibition hall; there might be hundreds of mains power points in the building but he will end up with very much better recorded material using a portable than he would with standard gear. In our opinion the live recording of most types of music is a job for standard mains equipment. The exception is folk music type material which often has to be obtained in remote or inaccessible locations.

All this now brings us to a discussion on the possibility of turning to practical advantage the idiosyncrasies peculiar to the X-V. In ninety-nine out of one hundred field recordings one of the biggest problems facing the recordist is to reduce the amount of unwanted background sound. To do this he will often use a directional or hyper-directional microphone, preferably including some form of bass cut and possibly with a "presence lift" in the upper frequencies. The improvement that such deliberate tailoring of response can bring is often quite outstanding.

Now in the Akai X-V we have considerable high frequency pre-emphasis recorded on the tape. The actual figures can be obtained by subtracting the line out playback response from the line out overall response at any given frequency. At the most it will be around 8 dB at 16,000 Hz.

To avoid any misunderstanding we must state quite clearly that for the orthodox recording of musical programmes a truly flat response is the ideal to be desired. But the X-V is not in our opinion designed for such work. For location recording a completely different set of rules applies and the only real criterion is to

secure the required sound with plenty of presence and realism. It should be well in the foreground with a minimum of background interference. Without suggesting that this was the deliberate intention of the manufacturers we must point out that the response curves of the Akai X-V will tend to assist in producing this kind of recording. Signal-to-noise will be quite acceptable and the only thing to watch would be to avoid using a microphone with too much built-in presence lift as this might well give a harshly unrealistic version of the sound.

When we come to music recording and reproduction we can achieve a very commendably flat response on this machine as we have shown by using the external speaker sockets in conjunction with proper settings of the tone control, so there is no reason why the X-V should not also be used for home entertainment. It must be borne in mind however that although the tone control is what is commonly described as "top cut" only, there is in fact no cut in top response available at 7½ ips. since to pull the response down to flat it will have already been turned to its maximum anti-clockwise position. It therefore follows that using this machine it is not possible to correct harsh or shrill top response if this should be present in the loudspeaker. At the same time since the power output is low we would recommend using an efficient horn type enclosure which although costly is usually very smooth in the upper area.

The machine supplied for review was not equipped with a carrying case and shoulder strap. These are available in real leather as accessories but unfortunately are somewhat costly. We do regard them to be essential and it is perhaps a pity that the X-V is not complete with a cheaper case at an inclusive price. The accessories that are included: a pair of dynamic microphones, mains charging lead, pre-recorded stereo demonstration tape, empty spool, etc., enable the user to start operating the equipment as soon as he receives it. The microphones are naturally not of top quality—they never are when offered as part of a package deal with any brand of tape recorder—and we must say that we feel that the owner who is prepared to pay £180 for the tape recorder should also be prepared to spend £10 or £20 on the kind of microphones that would do justice to the machine.

We have three real criticisms of this equipment and they are fundamental to its design conception. Firstly we cannot help thinking how much more useful the X-V would be had the manufacturers chosen the speed sequence of from 1⅞ to 15 ips. instead of from 15/16ths to 7½ ips. The provision of 15 ips. would have put the machine up into the professional class, improved overall performance and

offered a very useful extra facility. The extremely slow speed of 15/16ths is only really suitable for recording long conferences or discussions and the extra programme time can be easily achieved either by using a thinner grade of tape or by acquiring the special accessory 7" spool carriers. By using these as outriggers one is immediately free from the limitation of the 5" maximum size and so longer programmes are easily accommodated. 15 ips. is not a speed that is often required on a battery portable but no juggling with tape or outriggers will give it to you if you haven't got it.

Our second complaint is in the use of the quarter track system. Since tapes recorded in the field are ultimately destined to be edited by cutting the advantages (in terms of tape economy) of the quarter track system do not apply. All our outdoor work with the X-V has been in mono and therefore on one track only for this reason. We would much have preferred this to be a half track machine although it is understood from the distributors that they have found little demand in the past for such a model.

Our third complaint is not really a complaint at all but a question. Are stereophonic recording and reproduction facilities really necessary in a battery portable? The fairest answer would probably be that at the moment stereo is not essential but in the future (if multiplex stereo transmissions are extended to all BBC stations) it might well be so. One reason for what must be admitted to be the rather high price of the X-V lies in the complex provisions for stereo-phony. One cannot help asking whether or not it would have been better to equip the machine with separate record and playback heads to permit after record monitoring in mono rather than offering the single record/playback head with full stereo facilities. These are somewhat academic questions but the potential purchaser of any portable equipment might well ask himself quite seriously what his own requirements are before he makes his investment.

Summarising the Akai X-V we can describe it as an immensely strong and therefore potentially hard wearing versatile stereo quarter track battery/mains portable machine. Its main usefulness is for field recording work and for this application the user must add to the purchase the cost of the shoulder slung leather carrying case. The unusual peculiarities of its frequency response could well be turned to advantage under many field recording conditions. Although not a machine that can be unreservedly recommended for all general applications it could in its own specialised sphere prove itself to be an invaluable and reliable working tool.

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OKLAHOMA! From the original motion picture. Capitol ZW 595, 7 $\frac{1}{2}$ ips, $\frac{1}{4}$ -track, Stereo. 101s. 10d. including purchase tax.

A little late in the day, perhaps, but better late than never. So here we go with the imported Capitol tape of Oklahoma!

This is unmistakably an older recording—the quality has that patina of age that nowadays seems to come with the passing of only a few years. Which, of course, just goes to show how significant is the sum total of the subtle progressions continually being made in the art of recording.

Side one gives us: *Overture, Oh what a beautiful morning, The survey with the fringe on top, Kansas city, I can't say no, and Many a new day.* On side two: *People will say we're in love, Poor Jud is dead, Out of my dreams, The farmer and the cowman, All er nothin' and Oklahoma.*

Somewhere there must be someone who has not bought this record, This, lady or gentleman, is definitely for you. There's not much I can say about it because it has all been heard so many, many times. Lately returned shipwrecked mariners will find it refreshingly new, but since I suspect they form a minority group of my readers it will be sufficient for me to note that the tape exists and remind those who haven't yet bought it that it still isn't too late to do something about it.

TONY BENNETT. I left my heart in San Francisco. CBS CQ 493, 7 $\frac{1}{2}$ ips, $\frac{1}{4}$ -track, Stereo. 101s. 10d. including purchase tax.

This is an all-American production, slick and trans-Atlantic down to the last note. Bags of artificial reverberation on the solo voice—so much that we have a nasty distorted bite to the sibilants. This lack of taste and restraint in the technical department leaves me in dull amazement. Do they really think this unpleasant effect is hi-fi? Maybe it is—to their ears. For me it's just a nasty noise that spoils what would otherwise be a pleasant, though unremarkable, album.

Tony Bennett, who presumably can't be blamed for production defects, gives us: *I left my heart in San Francisco, Once upon a time, Tender is the night, Smile, Love for sale, Taking a chance on love, Candy kisses, Have I told you lately, Rules of the road, Marry young, I'm always chasing rainbows and The best is yet to come.*

It's a pity about the heavy-handed engineers, because the Bennett voice is musically competent and the whole collection would have offered good listening had it been better treated. As it is I find the subjective effect to be harsh and tiresome.

VAUGHAN WILLIAMS. Symphony No. 6 in E Minor, and The Lark Ascending. The New Philharmonia Orchestra conducted by Sir Adrian Boult with Hugh Bean, solo violin. E.M.I. H.M.V. TD-ASD 2329, 3 $\frac{3}{4}$ ips, $\frac{1}{4}$ -track Stereo. 47s. 4d. including purchase tax.

This album could be taken as a brilliant demonstration of the quality that E.M.I. can now achieve in their $\frac{1}{4}$ -track 3 $\frac{3}{4}$ ips records. With a minimum of background noise the orchestral sounds have an individual clarity that one normally associates only with the faster speed. It really is a joy to sit back and listen to this tape as an example of the recordist's art, quite apart from musical content.

And what of the music itself? In his sixth symphony Vaughan Williams paints a rather mystical picture in which are combined elements of rural England together with themes heavily portentous of approaching doom. It is not difficult to understand the composer's mood when one realises that the material originated from the years 1944 to 1947, an era when thinking people began to realise that the Second World War was bound to generate more and deeper problems than ever it solved.

The final movement of the symphony is most unusual. Never rising above a pianissimo whisper—thank goodness for the quality of the recording!—it progresses in unearthly fashion to its ethereal finale leaving one looking inwards and upwards rather than outwards. So the choice of The Lark Ascending was a most happy coupling.

Here Hugh Bean gives a refined performance to carry us back into the countryside leaving far behind the sombre implications of the symphony. Now all is light and simple pleasure and the album concludes on an optimistic note. Perhaps the ultimate victory of Nature is the one and only hope for us all. Personally I like to think so.

This Vaughan Williams recording is strongly recommended for its technical quality and also for its programme which will be appreciated by the quietly thoughtful introvert rather than the more superficial extrovert, although it should make more impact on the latter!

SCHUBERT. The "Trout" Quintet. Quintet in A Major, D667 ("Trout") and Adagio and Rondo Concertante in F Major D 487. Members of the Melos Ensemble: Emanuel Hurwitz, violin, Cecil Aronowitz, viola, Terence Weil, cello, Adrian Beers, double bass and Lamar Crowson, piano. EMI HMV TD-ASD 2328 3 $\frac{3}{4}$ ips four-track stereo. 47s. 4d. including purchase tax.

Dignity and grace are the words one has uppermost in one's mind when thinking of the famous Schubert *Trout Quintet*. Dignity and grace are most certainly two of the outstanding qualities of this album. With as near to absolute silence in the background as is possible the delicate string tones are faithfully rendered. The piano is not quite so happy. One effect of the very quiet background is to reveal transparently any minor shortcomings, and there is a trace—only a trace—of distortion on the piano notes. What

a pity, because it does mar what would otherwise be a real gem.

The fact that this distortion is present must be noted, but frankly it was by no means so obtrusive as to spoil my enjoyment—in fact many would probably not notice it at all. After listening carefully to the tape as reproduced on two quite separate and different reproducing systems I confirmed my opinion that it is the tape that is at fault, but I also noted that the subjective effect varies with different speaker/amplifier/recorder combinations.

Performance is exemplary, and in all other respects this record is first-class. My recommendation must, therefore, be qualified, but it does seem to be a pity to ignore this version of a famous work because of its one small blemish.

THE GEORGE MITCHELL MINSTRELS SING THE IRVING BERLIN SONG BOOK. From the Black and White Minstrel Show. Orchestral Accompaniment Directed by George Mitchell. EMI Columbia TD-SCX 6267. 3 $\frac{3}{4}$ ips four-track stereo. 41s. including purchase tax.

If the Black and White Minstrel Show is for you, then so is this tape. The numbers come tumbling out, one after the other, bubbling away with all the joys of life and living to make a succession of the prettiest audio pictures one could wish to hear. There's too many of them to list—must be fifty or more together. Like the U.S. Army which keeps cropping up, they go marching relentlessly on—and on—and on.

Recording is excitingly good, with excellent definition to endow these shadow figures of the TV screen with more substantial flesh and blood. Makes one realise just how much audio quality is missing from television.

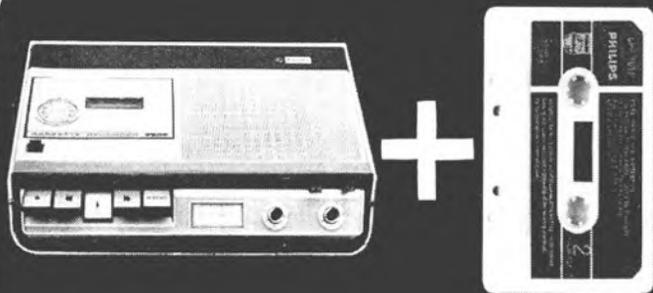
This is not a tape that I personally would buy, but thousands will and they will get excellent value for their money. Listening once again I really do marvel at what the engineers have been able to do at 3 $\frac{3}{4}$ ips. This is really fine, so if it's your cup of tea don't hesitate.

MAGIC FOUNTAINS. Manuel and the Music of the Mountains. EMI Columbia TD-TWO 219. 3 $\frac{3}{4}$ ips, 4-track stereo including purchase tax.

Personally I find that too much of Manuel and his Music of the Mountains tends to be boring. There is a certain sameness about his rhythms and blends of tonal colour that tire the listener with too much repetition.

However, with that single reservation one can make no other criticism of this collection. It comprises: *Stardust, Tangerine, Corcovado, Lonely Cloud, The Story of a Starry Night, You and the Night and the Music, Symphony, A Man and a Woman, Estrellita, Magic Fountains, By the Fountains of Rome and Stella by Starlight.*

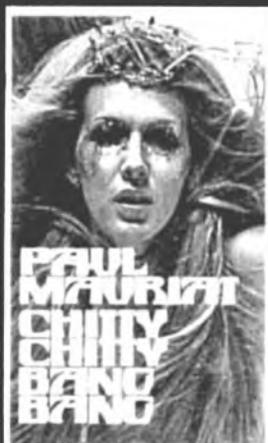
I can only say that if Manuel is what you want then you can hardly ask for his music to be better presented than in this Columbia tape. It is most encouraging to find that quality standards are rigorously maintained even though the albums chosen for review this month have been genuinely selected at random. The stereo spread and low background noise on which I have previously commented are again the outstanding qualities of this album and they provide a new quality level for home-produced tape records.



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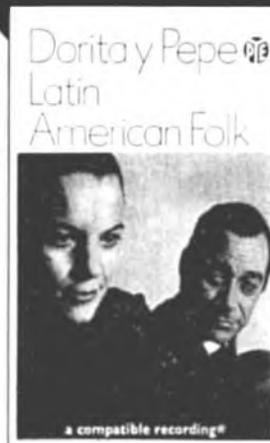
Pick of this month's releases



CCP 1078



CMP 7030



CYP 190

Richard II
FULL CAST
CCS 0806 (2)

Comedy of Errors
FULL CAST
CCS 0807 (2)

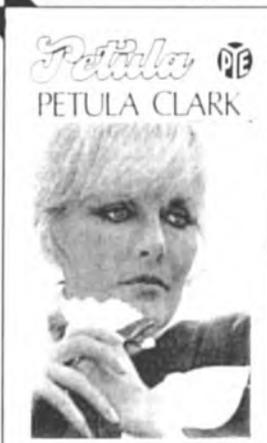
Bernard Shaw—St. Joan
FULL CAST
CCS 0808 (2)

The Shadow of Your Smile
THE BILL MCGUFFIE
QUARTET
CPP 1069

**Ivor Emmanuel
sings Ivor Novello**
IVOR EMMANUEL
CYP 195



CYP 198



CYP 199



40 63411



Illustrated above is the Philips 2205 cassette recorder. At home it plugs into the mains. On outings or in the car it runs on batteries.

MUSICASSETTE

REVIEWS

ROSSINI. Overtures. Orchestre des Concerts Lamoureux conducted by Roberto Benzi. Philips CPC 0059. 55s. 11d. including purchase tax.

The lyrical melodies of Rossini have a timeless indestructibility; it is difficult to imagine a world without them. Essentially a man of the theatre, Rossini was never happier than when writing descriptive music for the stage, and this art reached its peak in the overtures to his operas. With these overtures he sets the scene, both geographically and emotionally, for the action that is to follow. With consummate skill the overtures condense and summarise, whilst at the same time arousing in the audience precisely those feelings that will open their minds to the drama that is to follow.

It is hardly surprising that these musical gems have been divorced from their accompanying operas and appropriated for performance on the concert platform. There they have become firm favourites, appreciated by all who have the very least musical sympathy as much as by the dedicated musicologist. The melodic lines must be amongst the most well-known and well-loved in the entire musical repertoire—an achievement that should make some of our contemporary "music makers" turn green with envy.

In this album we have five overtures: *Il barbiere di Siviglia* (The Barber of Seville), *La scala di seta* (The Silken Ladder), *Guillaume Tell* (William Tell), *La gazza ladra* (The Thieving Magpie), and *Semiramide*. A truly popular and representative selection which has obviously been limited solely by the programme time available.

Recording is excellent with a delightfully low level of background noise. One can really sit back and enjoy this music, allowing the melodies to flow in easy succession one after the other. Here no demands are made on the listener; there is no intellectual struggle required to interpret hidden meanings; facile cleverness gives way to masterful expression.

There are really no complaints or criticisms to be made. I can think of no one who would not enjoy this collection equally for the pleasure to be derived from its music and the quality of performance and reproduction. Perhaps the occasional voice might be raised to lament that here we have yet more Rossini, offered to a public that should be well satisfied with existing editions of the same works. Sorry, but I don't agree. With the new Compact Cassette medium there is a crying need to establish a comprehensive classical catalogue in this form. In spite of noble efforts already made the list of such Musicassettes is pitifully small. It will take not years but decades to produce a classical list worthy of the name, so Rossini is more than welcome.

This album of Rossini overtures offers great listening pleasure to the widest possible audience; with its high technical standard it can be strongly recommended as a worthwhile investment.

MERCI MAURIAT. Paul Mauriat and his Orchestra. Philips CPP 1073. 55s. 11d. including purchase tax.

"Thanks Mauriat," says the title of this cassette, and for once the title-makers have

come up with just the right choice. A charming compliment to a great musician and arranger, "Thanks Mauriat" is just what we feel like saying for the pleasures to be found in these delightful numbers.

With a cosmopolitan repertoire the items include: *Delilah, La source* (The Spring), *Des que je me reveille, L'amour te ressemble, L'opera des jours heureux, Pata pata, Comme un garçon, I'm coming home, Ne sois pas triste, Comme d'habitude, Bonnie and Clyde and Mirabelle.*

The whole is presented with polished professionalism as one might expect from an ex-classical musician. Somehow Mauriat seems to enter into the very essence of a number, endow it with his own inimitable personality and then re-create it with sparkling freshness. The changes he makes are very subtle, consisting mainly of alterations in instrumentation and rhythmic backing with the finely graduated addition of choral voices used to give an extra harmonic dimension. The remarkable thing is the way in which he is able to preserve—or even enhance—the mood of the original.

Production is very good indeed. The graceful musical effects would have been hopelessly spoiled by heavy-handed recording techniques or poor quality reproduction. Happily these pitfalls have been avoided to give us a wholly successful and entertaining collection of hits and near-misses in new guises. As such a cassette that can be confidently recommended without reservation.

OUR WINTER LOVE. Felix Slatkin. Liberty C 0603. 55s. 11d. including purchase tax.

The sleeve notes make the point that we are now experiencing a return towards "good music." I would dispute that because in my opinion the amateurish ravings of certain self-styled "musicians" are not music at all. In fact a love of music is a natural trait found throughout the entire human race, irrespective of nationality or culture. We cannot leave it because it is a part of us—the only argument lies in deciding what is good and what is bad, what is music and what is "non-music." For most it is sufficient to invoke that well-worn cliché: "I don't know anything about music—but I know what I like!"

Good or bad there will be no difficulty in liking the contents of this album, a collection of arrangements by our old friend, Felix Slatkin. He gives us: *Our winter love, I left my heart in San Francisco, Love letters, Lollipops and roses, Fly me to the moon, Days of wine and roses, Meditation, What kind of fool am I, Theme from "Lawrence of Arabia," Gina, Stranger on the shore and The twelfth of never.*

With silky precision number follows number. Nothing grates, nothing irritates. All is a gentle progression of sweeping sound. And here, perhaps, lies the weakness. Stiff with sticky sentiment one could argue that such unrelieved sweetness is a far cry from "good music." There comes a point where artistry is lost to commercial superficiality, and this is undoubtedly a border-line case. As I said earlier, there is no difficulty in liking this cassette, but its memory will not endure because the whole is so insubstantial. The verdict is that it will be scorned by the sophisticated but quite shamelessly enjoyed by everyone else.

Overall sound quality is, like the programme itself, unremarkable and unobtrusive—which could be regarded as high praise! It all reminds me of the modern packaging industry which dresses up an insignificant product in sleek containers which, when discarded, reveals a disappointing lack of con-

tents. It is impossible to have any very strong feelings about such a pleasantly colourless and innocuous collection.

MY LAND OF SONG. Ivor Emmanuel with the Rhos Male Voice Choir. Pye CYP 197. 55s. 11d. including purchase tax.

We are told in the sleeve notes that this record was made "without a hitch" in only six hours. I am glad the publishers have been honest enough to confirm my first impressions, because it has all the hallmarks of a rush job. I know only too well from practical personal experience it is quite impossible to record the two sides of an LP at two three-hour sessions on a single day. Correction—it cannot be done if ultimate performance and quality standards are required.

The traditional Welsh tunes are very dear to my heart; for some two years I had my own "little Welsh home" amongst the mountains of Snowdonia—a traumatic experience that still affects my life today. So I would fall over backwards to say something kind about this album if only I could. Alas, its technical failings are much too obtrusive to be overlooked.

One hundred strong, and genuine Welsh miners to a man, the Rhos Male Voice Choir are said to have sung in their coach all the way to the old Music Hall, Shrewsbury, where the recording was taken, and then to have sung all the way back home again. Not for one moment do I doubt it, but their living voices would not have sounded like much of what has been sadly perpetrated here. With a lack of clarity and occasionally painful distortion the effect is really disappointing. Add to that a lack of presence in the solo voice, some bad errors in timing and a thoroughly artificial overall acoustic (a you-are-listening-to-a-record feeling) and you have just about all the faults that could be made. What a pity!

Men of Harlech opens well, and here quality is not too bad. *My little Welsh home* is ruined by trite English words and *Sospen fach* follows with a swing. Here the lack of richness in the solo voice really makes itself felt and one begins to lose interest in the rest of Side One: *Forth to the battle, The dove and Sweet Gwen of Aberdovey*. Distortion becomes an increasing problem on Side Two with: *The bells of Aberdovey, All through the night, David of the white rock, Idle days in summertime, Ash grove and Land of my fathers.*

It is difficult to judge how much of the audio troubles are due to high-speed copying into cassette format and how much can be blamed on the original recording session. Certainly the balance and lack of presence (and I suspect most of the lack of clarity too) could only be attributed to rushing the thing through. So the miners had to get back to work. But they would have earned far more if the engineers had persuaded them to take more time off to make a really good job of their record.

Philips, Liberty and Pye are distributed by Philips Records Ltd., of Stanhope House, Stanhope Place, London, W.2. C.B.S. and Capitol are distributed by E.M.I. Records Ltd., Imported Division, of Blythe Road, Hayes, Middlesex, and are only obtainable from E.M.I. Specialist Dealers and C.B.S. also by Transatlantic Music Tapes, Ltd., of 36, High Street, Salisbury, Wiltshire.

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Higher powered models are available to give 50 watts and 100 watts output and recommended retail prices are: TPA25 £42, TPA50 £65, and the TPA1000 £99. Trade prices and details of the range of accessories are available on request from:

H. H. Electronic, 147, High Street, Harston, Cambridge.

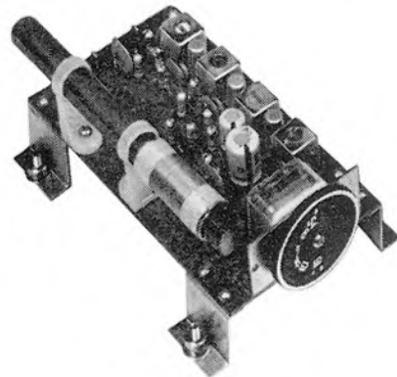
THREE NEW EAGLE MODELS

RENOWNED for the diversity of their practical audio accessories Eagle announce the introduction of three new items to their already comprehensive lists.

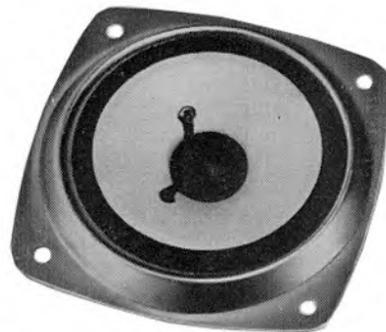
Model HA 10 is a transistor stereo headphone amplifier which it is said can be used with any record deck and cartridge to give



high fidelity listening at headphone level. Twin stereo output sockets are provided giving a stated 50 mW of power per channel and the three inputs are for magnetic cartridge (5 mV equalised) ceramic cartridge (100 mV flat) and tuner (100 mV flat). Recommended list price of this useful accessory is £11 0s. 6d.



The new sub-miniature AM tuner chassis AMT 35 is said to be an ideal addition to those installations which are FM only where the rest of the family might want to listen to AM stations. Operating from a single 9 volt battery it has a stated frequency coverage of 600-15,000 kHz together with a built-in ferrite rod aerial. Recommended list price is £4 18s. 10d.



Last of the three new products is the CT 5 low cost high efficiency 3 in. tweeter unit using a special foam mounted cone. The overall frequency response is said to be 3,000-15,000 Hz and the recommended cross-over is at the lower figure. Impedance is 8 ohms and the required mounting hole is 3 3/8 in. Recommended price is £1 0s. 6d.

Full details of these and other Eagle products apply to the distributors:

B. Adler & Sons (Radio) Limited, 32A Coptic Street, London, W.C.1.

MILLBANK AUDIO MODULES

FIVE additions to the range of Millbank silicon transistor audio modules have recently been released, two of which incorporate integrated circuits. Of particular interest is the module 062 which provides a maximum output of plus 5 dB at 600 ohm balanced line impedance. The output is by transformer and this affords full isolation of the line. Module 063 provides an output power of 2 watts for less than 1 per cent distortion into a load of 15 ohms. Both the

above modules utilise integrated circuits for their active components.

The existing range of standard audio modules includes 050 RIAA equalised for magnetic pick-up, 051 CCIR equalised tape head pre-amplifier and 064, a simple power supply, low current.

Prices for the individual modules vary, but as examples 050 and 051 both cost 74s. 1d. and 064 costs 84s.

Full details of these and other useful audio devices and accessories from:

Millbank Electronics, Hartfield, East Sussex.

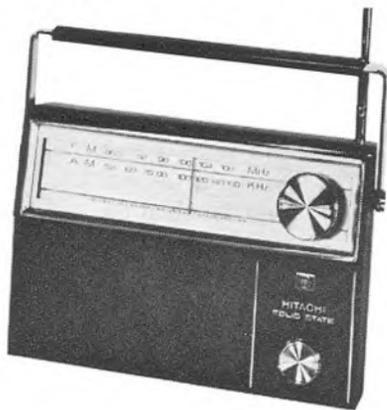
HITACHI CASSETTE RADIO

THE increasing popularity of the Compact Cassette system is underlined by the announcement of a new FM/AM portable radio cassette tape recorder from Hitachi to be distributed by Lee Products (Great Britain) Limited.



Powered by either four dry cells or AC mains the equipment offers full monophonic record and playback facilities with a push-key operated tape transport system and level indication by meter. Jack sockets are provided for microphone, remote control, line-in and line-out and the general specification of the cassette side of the equipment follows the usual lines.

Combined with the cassette unit is an AM/FM radio tuner complete with ferrite core and antenna aerial for AM use and a telescopic rod for FM. The radio is provided with an AFC switch, tone control, monitor switch, radio/tape select switch, etc., etc. The complete equipment measures 11¼" x 3¾" x 7¾" and costs, complete with



accessories including microphone and tape cartridge, £57.

Another release from Hitachi is the KH-930 FM/AM two-band portable radio.

Offered at the very reasonable recommended retail price of £13 10s. the radio is powered by four six volt cells and is complete with ferrite core antenna for AM reception and telescopic rod for FM.

Lee Products (Great Britain) Limited, 10/18, Clifton Street, London, E.C.2.

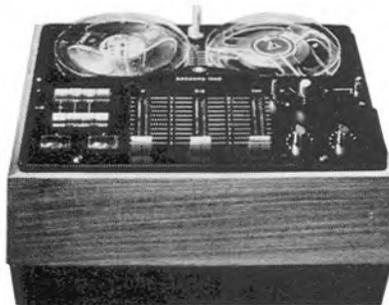
BEOCORD 1800

BANG & OLUFSEN UK Limited announce the release of a new high quality tape unit, the Beocord 1800. Designed for use in conjunction with external high quality amplifiers and speakers the machine does not include its own audio output stage.

Available with either four-track record and playback facilities or alternatively as a half-track machine with an additional four-track replay head for pre-recorded tapes, the familiar B. & O. mixing panel as incorporated in earlier models is also featured. The mixer section has six individual controls for three dual channel inputs or microphones radio/gram and line signals.

Additional facilities include multi-track recording and echo effect on all inputs and synchro playback for the control of a slide projector.

Frequency response is given as 20-20,000 Hz at 7½ ips, plus or minus 2 dB over the range 13 to 18,000 Hz. Signal-to-noise ratio figures are said to have been achieved without the use of special low noise tapes and are quoted as 60 dB for the half-track version and 57 dB four-track. Wow and flutter at 7½ ips is given as 0.07 per cent RMS, 0.11 per cent RMS at 3¾ ips and 0.18 per cent at 1½ ips.



The Beocord 1800 is equipped with hyperbolically ground heads which are said to present a smaller contact area to the tape thus producing less friction and wear. The low noise drive mechanism is mounted on a rugged diecast aluminium chassis and the Papst synchronous motor is said to ensure accurate and stable tape speed. In addition to the normal conducting foil automatic stop there is a switchable photo-electric stop which operates during programme scanning and in the event of tape breakage. Available in either teak or rosewood finish the recommended retail price is, half-track Teak £184 15s., Rosewood £185 10s., four-track Teak £179 15s. and Rosewood £180 10s., all inclusive of purchase tax.

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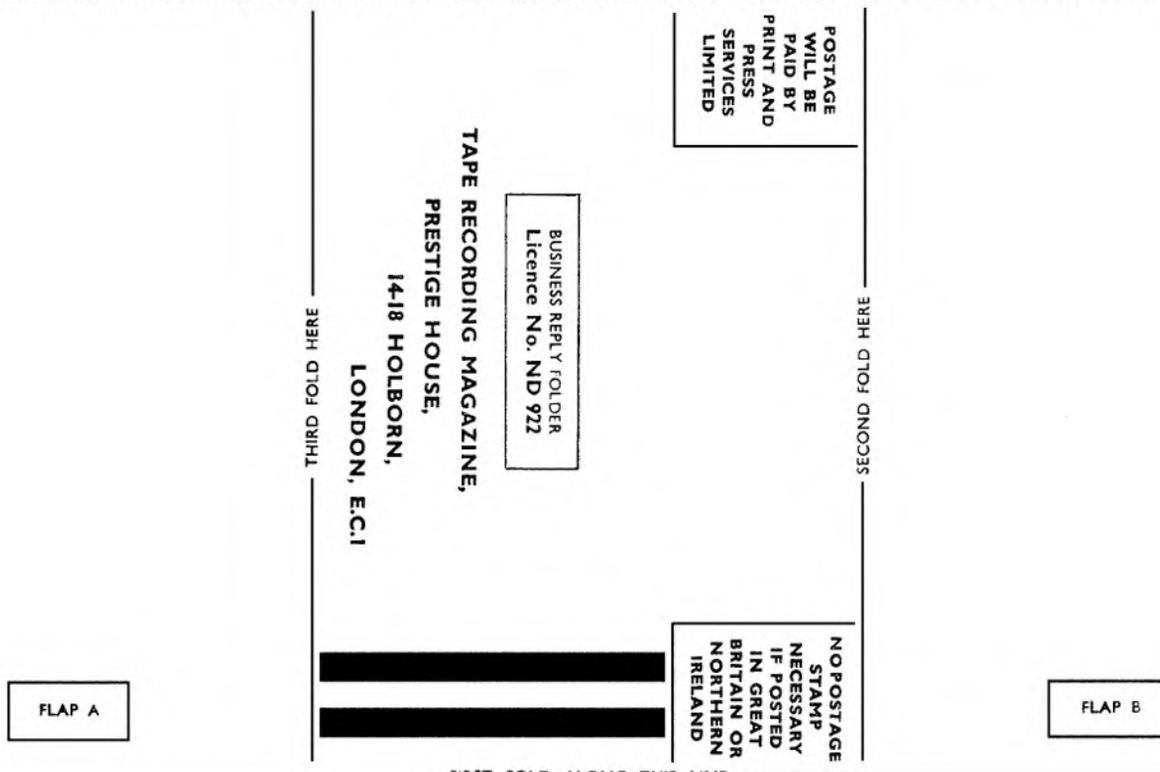
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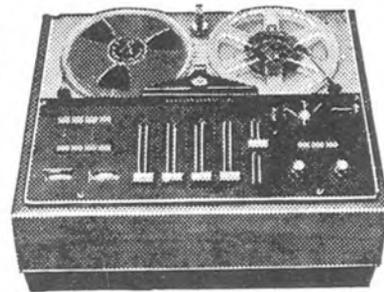
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