Acoustics Bulletin

July 1979 Volume 4 Number 3

INSTITUTE OF ACOUSTICS

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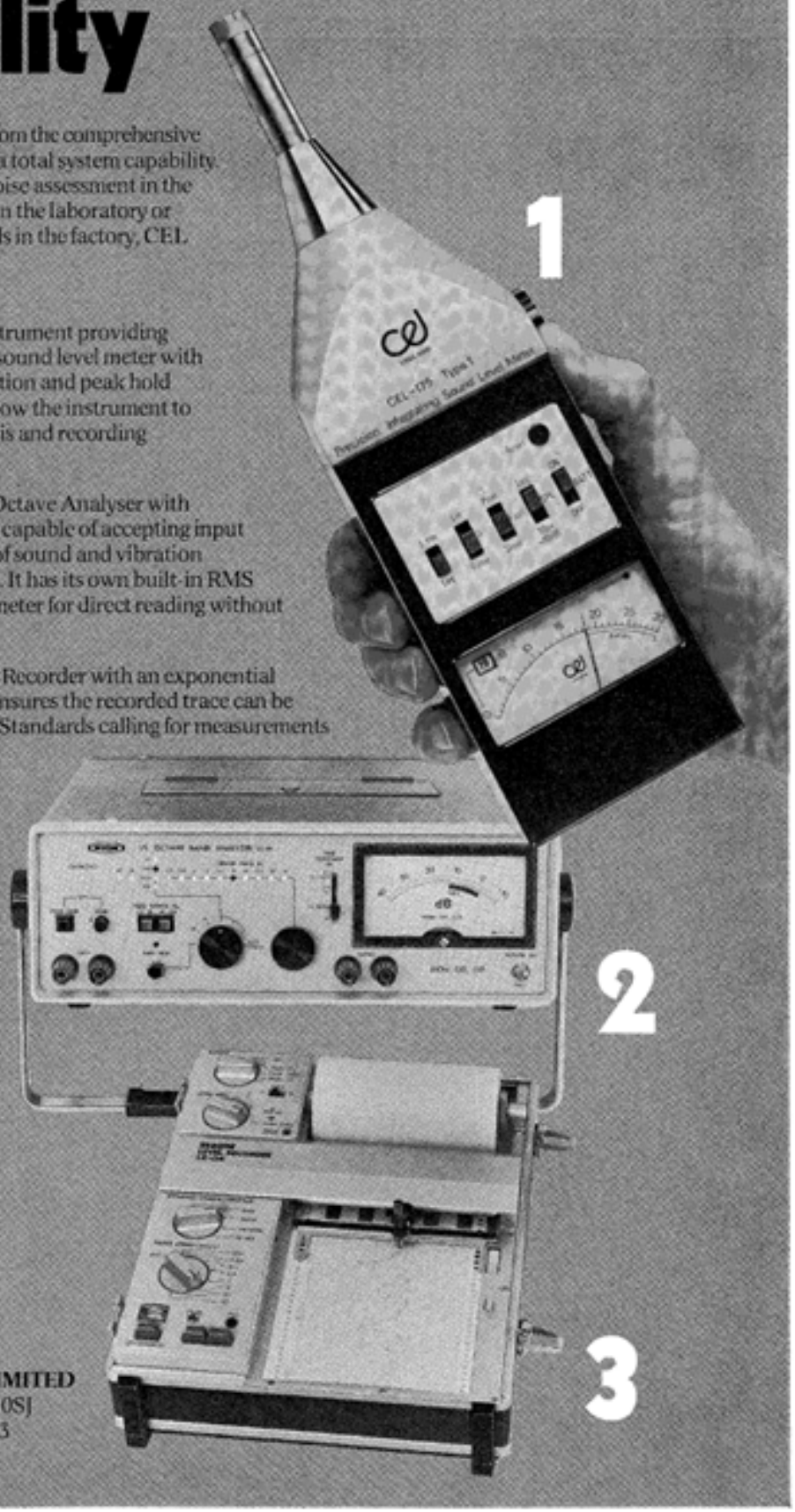

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The Institute of Acoustics was formed in 1974 by the amalgamation of the Acoustics Group of the Institute of Physics and the British Acoustical Society and is now the largest organisation in the United Kingdom concerned with acoustics. The present membership is in excess of one thousand and since the beginning of 1977 it is a fully professional Institute.

The Institute has representation in practically all the major research, educational, planning and industrial establishments covering all aspects of acoustics including aerodynamic noise, environmental acoustics, architectural acoustics, audiology, building acoustics, hearing, electroacoustics, infrasonics, ultrasonics, noise, physical acoustics, speech, transportation noise, underwater acoustics and vibration.

Membership of The Institute of Acoustics

Membership of the Institute is generally open to all individuals concerned with the study or application of acoustics. There are two main categories of membership, Corporate and Non-corporate. Corporate Membership (Honorary Fellow, Fellow, Member) confers the right to attend and vote at all Institute General Meetings and to stand for election to Council; it also confers recognition of high professional standing. A brief outline of the various membership grades is given below.

Honorary Fellow (HonFIOA)
Honorary Fellowship of the Institute is conferred by Council on distinguished persons intimately connected with acoustics whom it specially desires to honour.

Fellow (FIOA)
Candidates for election to Fellow shall normally have attained the age of 35 years, have had at least seven years of responsible work in acoustics or its application, and have made a significant contribution to the science or profession of acoustics.

Member (MIOA)
Candidates for election to Member shall normally have attained the age of 25 years, must either (a) have obtained a degree or diploma acceptable to Council and have had experience of at least three years of responsible work in acoustics, or (b) possess an equivalent knowledge of acoustics and cognate subjects, have had experience for not less than seven years of responsible work in acoustics or its application, and must have been a Non-corporate member of the Institute in the class of Associate for not less than three years.

Associate
Candidates for election to the class of Associate shall have attained the age of 18 years and (a) be a graduate in acoustics or a discipline approved by Council, or (b) be a technician in a branch of acoustics approved by Council, or (c) be engaged or interested in acoustics or a related discipline.

Student
Candidates for election to the class of Student shall have attained the age of 16 years and at the time of application be a bona-fide student in acoustics or in a related subject to which acoustics forms an integral part. Normally a student shall cease to be a Student at the end of the year in which he attains the age of 25 years or after five years in the class of Student, whichever is the earlier.

Full details and membership application form are available from: The Secretary,
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47 Belgrave Square,
London SW1X 8QX.

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President's Letter

Dear Member,

In April I had the pleasure of attending the Spring Conference at the University of Southampton. I, along with many of the participants, felt that it was a tremendous success. It was one of those rare conferences where there was something to interest everybody; it was well organised and there appeared to be little deserving of criticism. There was a noticeable increase in the number of ladies attending, probably due to the fact that considerable attention had been given to providing an extensive social programme.

The Annual General Meeting was held during the conference. One point which was raised and is worthy of mention is that, in the opinion of some, the Institute's Proceedings leave much to be desired in terms of academic quality. Although some academics may feel that some of the papers published in the proceedings can hardly be classed as worthy of a learned society, it should be understood that the Institute does not purport to be that sort of society. It is quite clear in its terms of reference that it is an Institution which is there to serve as a forum for all those involved in the profession of acoustics and that publications are intended to be informative in some instances and learned in others; there is clearly a place for both. If the two categories sometimes overlap, all well and good, but it is not an occasion for mourning when they do not.

On a more serious note, I have to inform you that after 1 July 1979, through economic necessity, we shall no longer be making use of the secretarial services provided by the Institute of Physics. Mrs Catherine Mackenzie has been appointed as our new Secretary; she will have an office in the Heriot-Watt University, in Edinburgh, and so this will become our future headquarters. Further details explaining the reasons for the move and describing the new secretariat will be found elsewhere in this issue of the Acoustics Bulletin.

NEW ELECTIONS

At its meeting on 26 April 1979, Council approved the following elections.

Fellow

M D G Randall

Member

H S Al-Samarrai
C Chinoy
J Christophorou
G J Cooper
P J Corbishley
C P Daubney
B T Dorgan
C E English
D B Evans
J W Hill
P N Hodgson
E J Margetts
N W Millard
J R Oswin
S de Pulford
D R Romaine
V Schroter
R Shack
R A Smith
R I Wickison
J C Young

Associate

B J Blain
F J Brooks
B Elieli
D J Geary
J R Jackson
D Jarema
L M Mackenzie
A P Mayne
R F Phin
D E Poley
D R Poole
R J Rendell
A W Rossall
A Sestieri
M J Squires
D J Toop
C Waites

Student

P Berriman
M E Collins
D J Mackenzie
T J Murphy

New Headquarters for IOA

From 1 July 1979 the Institute of Acoustics will cease to avail itself of the administrative services provided by the Institute of Physics, so ably undertaken over the last two and a half years by John Byrne and his assistant, Sandra. The decision is a strictly financial one. Were the Institute of Acoustics to continue with the present arrangements, it would be in considerable financial difficulties before the end of 1979. In fact the balance sheet circulated with the Annual Report should convince the membership that stringent economic measures are necessary if the IOA is to survive and provide the sort of service which has become accepted as the norm.

The Institute of Physics has until now asked for a management fee which was only a portion of the real cost, the idea being that the IOA would eventually be expected to pay the full economic rate for the services it received. This year the fee was increased to £12,000 and it is easy to appreciate that this amount would be difficult for us to raise. So after much debate Council decided, on the advice of a sub-committee set up to assess the financial situation and chaired by the President, to take the Secretariat right away from London so as to benefit from lower overheads in the provinces.

Alternative schemes were invited and out of several submissions received it was decided to appoint Mrs Catherine Mackenzie as full-time Secretary. She will be based in office accommodation at the Heriot-Watt University, Edinburgh, so this becomes the new headquarters of the Institute. It will have its own telephone line and will be additionally staffed by two part-time secretaries so that contact with the Secretariat should be possible at all times. Mrs Mackenzie is the wife of Dr Robin Mackenzie who is at present serving on Council; she is a graduate in Business Organisation and has recently submitted a research thesis in acoustics for the degree of MSc. Her past experience has included work for the Co-operative Insurance Society and as Treasurer for the Union of Insurance Officials (Edinburgh Branch).

P Lord

TRANSDUCER ARRAYS AND ARRAY PROCESSING

The fifth specialist meeting of the Underwater Acoustics Group of the Institute of Acoustics was held in December 1978 at the University of Birmingham. The meeting took the form of two half-day sessions and was attended by nearly 100 scientists and engineers, most of whom came from the United Kingdom although roughly 10 per cent were from other countries.

The twelve papers presented were very varied. The meeting began with two interesting papers by Dr Riches and Dr Buckingham of the Royal Aircraft Establishment on the design of vertical line arrays to be used on sonobuoys. The work at Loughborough University of Technology on the design and construction of arrays for within-pulse sector scanning sonars was described by Dr Stevens. This presentation included a video-tape demonstration of an optical technique for observing the moving face of an acoustic transducer. Mr Weighton of Wolverhampton Polytechnic and Dr Denbigh of the University of Birmingham described some novel methods of removing unwanted vertical sidelobes for a particular side-scan sonar application. In an entertaining but highly mathematical address Dr Glazier-Smith of the Plessey Company described a computational technique for modelling the modal behaviour of partial-spherical transducer elements. The final paper of the first day was presented by Dr Heier of Simrad (Norway) in which he showed the effects of air-bubbles on transducer performance.

The second session opened with a paper by Messrs Madden and Wright of the Admiralty Underwater Weapons Establishment (AUWE) in which they investigated the limitations caused by flow-noise on a sonar system mounted on a homing torpedo. The next paper by Mr Dunn of the University of Birmingham dealt with the design of wide-band receiving arrays with constant beamwidths. The use of such arrays is proposed as part of a programme concerned with fish-stock assessment. Continuing the fisheries theme, Mr Hood of the Ministry of Agriculture, Fisheries and Food, Lowestoft, described the development of a within-pulse sector-scanning sonar array in which the elements are bonded to a polycarbonate plate. A new technique for within-pulse sector scanning was then described by Mr Ong of the University of Birmingham who showed how charge-coupled devices can be used to produce a time-delay beamformer incorporating only two chips, with their associated circuits.

Dr Butler and Mr Talbot of the Plessey Company then showed how correlated noise sources can give rise to bearing errors and the meeting was concluded by a paper by Dr Earwicker of AUWE, concerned with the way the performance of a passive sonar can be degraded by the fact that the signal source has finite dimensions and is not merely an ideal 'point' source. □

V G Welsby and D J Creasey

INSTITUTE OF HEARING RESEARCH PROGRESS BULLETIN

M P HAGGARD

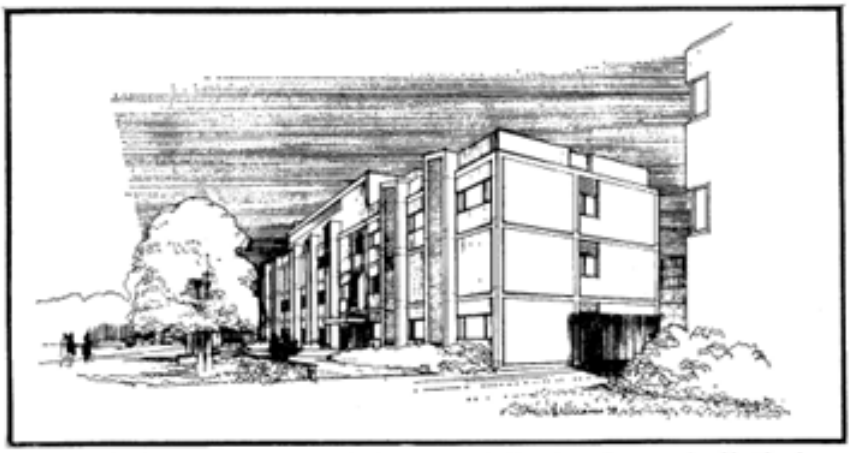
In the early 1970's the Medical Research Council appointed a sub-committee on deafness to determine the principal areas of research that were needed. The report of that sub-committee, which included reports from its two working parties, on clinical and epidemiological aspects and on social and rehabilitative aspects, underlined the multi-disciplinary nature of problems of deafness. It was clear that only a research programme which brought together several fields such as clinical otology, audiology, physiology, psychology and biomedical engineering had any chance of success in the type of research needed. The Council therefore agreed that an Institute should be set up comprising a headquarters building, which would house the Director and his immediate research team, and a number of out-stations, where service-dependent and service-orientated research would also fall within the overall responsibility of the Director. These would be situated at suitable centres throughout the country in order to undertake multi-centre clinical trials, epidemiological surveys and rehabilitation studies. The MRC allocated the funding and advertised the Director's post in these terms in the summer of 1975.

THE INSTITUTE was formally founded with my commencement as Director in January 1977, but planning had to begin as soon as my appointment was known in the summer of 1976. The immediate task was to define and plan the research objectives, negotiate the site for the headquarters building, and discuss with interested parties the possible locations, nature and structure of the out-stations. A wide range of factors was taken into account in determining the site for headquarters of the Institute but the final choice was constrained by the need for both temporary accommodation and a permanent site. In the event the permanent site selected was on the main campus of the University of Nottingham. The University and Medical School here encompass a wide range of scientific expertise relevant to the interests of the Institute — in particular the Departments of Medicine, Community Health, Psychology, Physiology, Zoology, Biochemistry, Child Health, Human Morphology, Medical Physics and Electrical Engineering. The short-term accommodation made available by the exercise of considerable flexibility and goodwill by the Medical School is of high standard and, for the long term, an excellent site was available in the Applied Sciences area of the University with easy access to the Medical School and University Hospital complex. Much of the first year was spent in determining the design and details of the headquarters building, of which an artist's impression is shown in the Figure. We expect to move in in January 1980.

Clearly, with only temporary accommodation in the short term and delays in locating specialist trained staff, we have had to be content with a rather modest start to the Institute's programme. A staff list is appended, of which the majority joined us in the summer and autumn of 1978. There are still several out-station posts to be filled in 1978 - 79. Nevertheless it has been possible to set in hand projects on the perceptual bases of lip-reading, schemes for possible new types of hearing aid, speech audiometry and audiometric standardisation. However, as our main concerns have been to acquire equipment and define procedures for future large scale projects, there is still at this stage little scientific progress to report. Eventually we plan to circulate annual reports which will comprise abstracts from which reprints and preprints can be ordered.

In running such a research enterprise it was particularly important that we should have an otologist or medical audiologist with extensive research experience to coordinate the clinical studies, and Dr R R A Coles of the Institute of Sound and Vibration Research (ISVR), University of Southampton, was appointed from 1 January 1978 as Coordinator of Clinical Studies and Deputy Director. He has kept his office at ISVR where he continues his clinical work as the audiological physician in the Wessex Region Audiology Centre and with his own MRC-supported research team. He still makes a substantial, though reduced, contribution to the teaching of the audiology MSc course and other short courses, and has recently been appointed Visiting Professor by the University of Southampton.

Other appointments have included an epidemiologist who will aim to establish more precise figures on the incidence of hearing impairment than are at present available, within a more satisfactory classification system. To avoid the wastefulness sometimes experienced in large population studies, the epidemiological project is being built up slowly and being planned on a moderate scale centred on the out-stations and closely integrated with other types of project. This will have the benefit that groups of patients investigated in detail to obtain more insight into the nature and causes of the auditory symptoms can be characterised as sub-populations and the



The Medical Research Council, Institute of Hearing Research, Nottingham.

percentage of the population they constitute established. The research to be conducted through the out-stations falls into three main categories: the first comprises the multi-centre epidemiological study already mentioned; secondly, the out-stations will provide the basis for field trials of new psychoacoustic methods of assessment, and of rehabilitation techniques including hearing-aid designs that will arise from research at IHR headquarters; thirdly, the out-stations will provide the basis for multi-centre trials of medical treatments for some deafness causing conditions.

Progress with the establishment of out-stations has been steady since the middle of 1977. Appointments of NHS staff are now complete for the first two out-stations — at the Royal South Hants Hospital in Southampton and at the Southern General Hospital in Glasgow. The MRC scientist in charge at Southampton, Dr Roger Thornton, has already taken up his appointment and Dr Mark Lutman moves to Glasgow in the early summer of 1979. The Cardiff out-station opens in early 1980.

In each out-station the MRC scientist in charge will be locally responsible for the scientific integrity of multi-centre projects and for the general allocation of out-station resources, including the time of the non-clinical staff. Working in parallel with him, or her, will be a consultant or senior lecturer in otology or audiological medicine, either full-time or part-time with a mixture of clinical and research responsibilities. The other NHS support posts generally comprise an audiological scientist, two technicians, a clerical officer and a part-time secretary. The activities of the new 'hearing therapists' may be integrated into the rehabilitation research work in some of the out-stations, but at present we are more concerned to provide the scientific basis of what they may do in the future than to intervene directly in the development of their role.

The fourth and largest out-station is to be in Nottingham itself, opening in January 1980. The justification for this may not be evident until one reflects that the out-stations are mainly clinical units *in support of* research. Having an out-station in Nottingham provides a clinical unit as a constant stimulus to the headquarters scientific staff, providing new problems plus an inducement to get the balance between so called 'pure' and 'applied' work right. (Actually we do not use this distinction in the Institute.) The South Nottingham Health District has made available a building on a private site in the centre of town to accommodate the clinical out-station and the AHA's upgraded hearing-aid centre. There will be some emphasis on trials of new hearing-aid designs in the local part of the Nottingham clinical out-station programme.

Many of our projects are long term ones and involve the juxtaposition of advanced techniques of more than one discipline. These are the most difficult projects which have not been done precisely because they are both complex and time consuming. As a result of the inevitable delays in recruiting and training staff, it may take us until about 1982 to grow to full strength, and the financial stringency imposed in 1976 could mean that the Institute will not grow to the scale orginally envisaged in 1975. However, there is no lack of challenging work to be done which can be accomplished with the resources allocated. □

(Dr M P Haggard is Director, Institute of Hearing Research, Medical School, Nottingham.)

Research Staff of the Institute are as follows:

Headquarters

Dr Gregory Bock (Auditory Neurophysiology)
Prof Ross Coles (Deputy-Director and Coordinator of Clinical Studies)
Dr Adrian Davis (Statistics and Epidemiology)
Mariano Fernandes (Clinical Audiology)
John Foster (Research Assistant)
Dr M P Haggard (Director)
Norman Hoare (Electronic Instrumentation)
Dr Quentin Summerfield (Speech science)
Dr Karen Steel (Genetics and Anatomy)
Julian Trinder (Communications Engineering and Signal Processing)
Dr Richard Tyler (Psychoacoustics and Audiology)
Elizabeth Wood (Part-time Research Assistant)
Dr Graeme Yates (Biophysics)

Deputy Director's Team (ISVR, Southampton)

Elaine Saunders (Electrophysiology)
Dr D J Parker (Electrophysiology)

Southampton Out-Station (Royal South Hants Hospital)

Ian Bell (NHS Audiological Scientist)
Mr A Seymour-Jones (NHS part-time Consultant in Otology)
Dr Roger Thornton (MRC Scientist in Charge: Electrophysiology)

Glasgow Out-Station (Southern General Hospital)

Mr George Browning (NHS Consultant in Otolaryngology)
Dr Stuart Gatehouse (NHS Clinical Physicist: Audiology)
Dr Mark Lutman (MRC Scientist in Charge: Middle ear mechanics)

Cardiff Out-Station (University Hospital of Wales)

Mr Alun Thomas (NHS part-time Consultant in Otology)

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Dr R K Mackenzie
Dr T J B Smith
Mr T Smith
Mr R M Taylor
Dr D E Weston

To attend by Open Invitation
Dr B J Smith
Dr R W B Stephens

SPRING CONFERENCE & EXHIBITION
ACOUSTICS 79

Held at University of Southampton 8-11 April

Acoustics 79 was held at the University of Southampton during the period 8 to 11 April. Southampton had the unenviable task of following the 1978 Conference at Cambridge, which was rated as the most successful endeavour ever organised on behalf of the Institute. Whilst Southampton was not able to offer the architectural delights of Cambridge, it was felt by the Meetings Committee of the IOA that the acoustical background at ISVR would ensure the technical success of the meeting.

THE ORGANISATION for the conference was begun in May 1978 and the general format was that, in addition to several specialist sessions arranged by groups within the Institute, there would be sessions comprising contributed papers of a general acoustical nature. In fact, the programme contained 71 papers in 14 sessions, including three invited lectures and the Rayleigh Medal Lecture. Emphasis was placed on obtaining the written contributions in sufficient time to allow them to be printed, so that delegates received copies of every paper at registration. In retrospect, it is felt that this was an important factor in ensuring the technical success of the meeting.

Some 200 delegates attended the conference, and registration took place during the evening of 8 April at Glen Eyre Hall, one of the University's student halls of residence, pleasantly situated within walking distance of the main campus, where most of the participants were staying. Prof Lord, President of IOA, opened the conference with a brief welcome on Monday morning, 9 April. The proceedings then continued with three parallel sessions of specialist papers. The format of these sessions was a review paper preceding four invited papers and each session was organised, either by a Group within the Institute or by ISVR. On the afternoon of the first day there were three parallel sessions of contributed papers which were arranged in sessions covering a particular topic.

On the Tuesday morning three parallel sessions of specialist papers were again held. These were followed by the Rayleigh Medal Presentation and Lecture by Dr E A G Shaw of the National Research Council of Canada. A programme of technical visits was arranged to ISVR Laboratories and to local industrial research organisations. The Institute's AGM, during which an honorary Fellowship was graciously received by Dr William Allen, was followed by the Presidential Address. After this the delegates attended a Reception given by the Mayor and City of Southampton in the Art Gallery at the Civic Centre. The pleasant surroundings were appreciated by 200 people attending, when they were able to view the many works of art on display in the Gallery. The conference dinner took place immediately afterwards and some 160 persons enjoyed the pleasant meal and several amusing after-dinner speeches.

The proceedings on the Wednesday followed the pattern of the previous days with specialist and contributed papers being presented in parallel sessions during the morning and afternoon. The conference was brought to a close by Dr Roy Lawrence, Chairman of the Meetings Committee, when he congratulated the organising Committee of the conference on the highly successful and enjoyable 1979 Spring Meeting.

An important contribution to the success of the conference was the Technical Exhibition at which major manufacturers and suppliers of measurement and analysis equipment were present. The Exhibition was located in the foyer of the Physics Building, immediately outside the conference rooms and was well supported by the delegates. The exhibitors included: B & K Laboratories, Computer Engineering Ltd, Dawe Instruments Ltd, Gracey & Associates, Hayden Laboratories Ltd, Hewlett Packard Ltd, Spectral Dynamics (UK) Ltd and Nicolet Instruments Ltd.

TECHNICAL SUMMARY

The Rayleigh Medal Lecture, presented by Dr E A G Shaw of the National Research Council of Canada, was related to the NRC investigations into the acoustics of the external ear. The lecture was most interesting and the subject matter formed a distinguished contribution to the study of hearing.

The three invited lectures were presented by Prof J H Collins and Dr P M Grant of Edinburgh University, Dr W Kentner of the University of Cologne, and Prof I C Whitfield of the University of Birmingham. Prof Collins discussed the principles and applications of surface acoustic wave (SAW) Fourier transform processors. These offer sophisticated wideband (10's of MHz) signal processing for radar, sonar and communication systems. The applications of individual SAW based processors to spectrum analysis, network or communication link analysis, and frequency hopped waveform generation were reviewed, prior to investigating the use of two or more processors for cepstrum analysis and programmable correlation.

Dr Kentner described the economic problems that resulted from the introduction of the Bill for protection against traffic noise produced along streets and railways by the Government of the Federal Republic of Germany. The implications of this subject are not always fully appreciated by acousticians, particularly those working in the research or academic spheres. His paper was a valuable contribution to the conference.

The third invited paper entitled *Auditory coding and perception of stimuli* was, to some extent, divorced from the majority of the papers presented at the conference.

However, this did not detract from the interest it generated and the paper was certainly enjoyed by a large number of delegates. Prof Whitfield described the study of neurocommunications and said that the ultimate object of this study was to establish a relationship between the way information is coded in neural pathways and the way stimuli are perceived. He said that perhaps more progress had been made in the solution of this problem in the auditory system than in other sensory pathways and, although a complete solution is still a long way off, at least some pointers are apparent.

BUILDING ACOUSTICS I

The first session of specialist papers on Building Acoustics, chaired by Dr C L S Gilford, was made up of prac-

tically oriented and well presented papers on services noise control and scale modelling.

It was opened by T J B Smith with a fascinating review of current developments in the control of mechanical services noise. The trend is away from large equipment sited well away from all noise sensitive areas, connected by large ducts, and towards small 'air-handling units' of unitary construction containing fans, thermal units, filters and attenuators, conveniently located near to the areas served to which they are connected by small-section tubes carrying air at high velocities. The development of highly effective anti-vibration mountings and floating floors giving up to 80 dB attenuation further increases the flexibility of siting. The other paper on noise control was by A Cummings of the Polytechnic of the South Bank, who showed that unsuitably designed lagging of rectangular ducts could increase noise 'breakout' in certain frequency bands, compared with the unlagged duct.

Two papers from Cambridge University Department of Architecture described work by the modelling unit. M Barron showed how a one-eighth scale model of the Barbican Theatre is being used to guide design with respect to such properties as diffusion and spatial effect. R J Orlowski's paper was a study of mathematical modelling, applied to an actual factory, of the possibilities of scale modelling of noise propagation in large factory buildings. One felt that with two good papers from the same small unit, the opportunity could have been taken to avoid some of the overlapping which occurred.

The last paper on modelling was from S E Lee of the Department of Building, Herriot-Watt University. By the use of one-fifth scale models and statistical energy analysis an explanation was provided of the fact that walls with windows give better transmission loss than expected from existing theory. The difference is greatest for small thick windows where transmission is mainly by resonant vibration.

STRUCTURAL DYNAMICS

On the recommendation of Council it was decided to explore the possibility of forming a Structural Dynamics Group within the Institute of Acoustics. As a first step, those known to be working in this field were invited to attend a special session during the Conference and to contribute papers if they had suitable material available. About forty people attended the two sessions and eight papers were presented. Professors Johns and Clarkson acted as chairmen.

The first paper, presented by R E D Bishop, outlined the development of the theory for the motion of a ship in the sea. Illustrations were given of the solution of the coupled hydro-elastic equations of motion of the structural fluid. D J Ewins then described his recent work on the identification of vibration systems from measured response data. O A Olatunbosun showed the results of measurements of the acoustic field inside car body structures and its coupling with the wall vibration. There then followed two papers on damping. In the the first one, P Grootenhuis reviewed the recent work on constrained layer damping applications. This was followed by a specific investigation by M B Milsted of the damping of chimneys. This study included the effect of the foundation damping.

The second group of papers began with a description by A J Pretlove of the design, construction and testing of a tuned vibration absorber for a welded steel footbridge. A short film showed very vividly the effect of the absorber. The second paper, by B R Mace, presented an analytical method for the study of sound radiation from 'periodic' structures. The final paper, by D J Saunders, described the effect of blast waves on building structures.

This range of contributions provided a very good basis for active discussion amongst members. Finally it was decided not to set up a formal organisation such as a Structural Dynamics Group but to meet again at the next conference. It is hoped that the focus for the meeting can be a range of contributions covering the broad field of structural dynamics.

PSYCHO-ACOUSTICS

Speakers in this session discussed factors relevant to the formulation of noise annoyance criteria. The approaches taken were quite different and gave both national and international flavours to both laboratory and field researches. The overall conclusion seemed to be that it was premature to be thinking that a unique dose-response relationship could be applied to all community noise problems.

J B Large (ISVR) gave an excellent overview of the problems currently facing administrators and researchers alike, and succinctly delineated between the acceptance of a universal dose-response relationship for large scale strategy planning, and the need to recognise that local conditions could move this response by $\pm$ 10 dB. C A Powell (NASA Langley Research Center) gave a lucid account of his classical laboratory study leading to an interactive-model for the prediction of annoyance due to multiple noise sources. This illustrated the possibility for large differences in percentage highly annoyed between communities of equal noise exposure in terms of L_{10}. M Vallet (IRT France) outlined the implications for regulatory purposes of the effects of noise upon sleep patterns. A most important finding was that noise exposure can reduce the 'deep sleep stage' time, which could have eventual long term effects on health. E J Rathe (Swiss Federal Institute of Technology) developed a very convincing argument on the limitations of L_{eq} to account for annoyance due to short term variations in noise level. The legal implications with respect to environmental protection were also outlined. In reviewing recent work carried out in the Netherlands, Ing Kleinhooutje von Os (TND-TH) provided salutory references to previous work of the last two decades, and to the continuing battles between the scientist and the legislator. His paper clearly reminded us that people are not meters, and moreover the longer one works in this field and accumulates experience, one's role changes from that of expert to intermediary.

ENVIRONMENTAL NOISE

The session of contributed papers on Environmental Noise was chaired by Dr J G Walker of ISVR. K Attenborough (Open University) presented a paper on the influence of ground effects on surface transportation levels. He suggested, therefore, that the accuracy of predictions should be carefully considered when prediction methods were being used.

J Kastka (University of Dusseldorf) reported on work aimed at quantifying annoyance reactions of residents to highway noise. An important finding was that, at low noise levels, motorway noise had an annoying effect equivalent to an urban street noise level 15 dB higher than motorway noise; at higher levels the difference was 5 dB. R R K Jones and D C Hothersall (University of Bradford) investigated the relationship between noise level and speed and acceleration for individual vehicles. E G Terry

(ISVR) described a noise survey carried out in rural areas and pointed out that at low noise levels natural sounds are increasingly significant contributors to the noise environment. The philosophy of study was to investigate the positive reactions to sounds, not merely disatisfaction as is normal in social surveys. This was expanded upon by M M Hawkins (ISVR) who described the methods being used to evaluate the subjective effects of these noise environments. Results to date suggest that if the L_{10} is less than 55 dB(A) there is a tendency to rate the general acoustic environment as more satisfactory than was the case in the National Survey recently completed.

D C Hothersall and S Simpson (University of Bradford) outlined a method of examining the effect of complex building arrangements on noise propagation. The importance of diffraction effects and secondary reflections was pointed out.

MUSICAL AND AUDITORIUM ACOUSTICS

Unfortunately, only three of the four scheduled papers in the Musical and Auditorium Acoustics session, chaired by Prof P E Doak (ISVR), were presented. Last-minute travel difficulties prevented the presence of the fourth contributor, from overseas. Nevertheless, there was a good attendance and lively discussion. The subject matter of the first paper on air coupling between front and back plates of a violin, by E Johnson of the University of Salford, proved to be a controversial one, as did that of the last, reverberation reinforcement by means of electro-acoustic coupling, by D J Oldham of the University of Sheffield. The critics appeared to agree no better among themselves than they did with the authors, and so honours were even all round at the end. The second paper, on the tuning of keyboard instruments, by K A Macfadyen of the University of Birmingham, was very enjoyable and directly informative as it included tape recorded audible demonstrations of the effects of the celebrated 'Pythagorean comma' and other such intricacies of the musical temperaments.

NOISE SOURCES

Dr M J Fisher (ISVR) chaired a session on noise sources. This session included contributed papers by M S Howe (BBN) on the theory of plane wave propagation in low Mach number turbulent pipe flow; by D Butler and D Hodgson (Plessey Marine Research Unit) on the behaviour of a thin plate immersed in a fluid with regard to the transmission of arbitrary wave number and frequency components of both normal and tangential forces applied to one face; by S Glegg and C R Wills (Westland Helicopters Ltd) on the importance of blade thickness noise on high speed rotors; by P O A L Davies and R F Halliday (ISVR) who reviewed progress in the application of linear acoustic models to the design of exhaust systems for internal combustion engines.

BUILDING ACOUSTICS II

The second session on Building Acoustics was chaired by Dr R K Mackenzie. The presence of two sessions on the subject in the programme reflects the interest in the subject by IOA and the enthusiasm of the Building Acoustics Group. W E Scholes presented the review paper in which he outlined current UK sound insulation control procedures, updated information presented at the 1976 IOA Spring Conference, compared UK experience with other countries and discussed the possibility for better control of sound insulation performance.

M Ohlrich (The Technical University, Lyngby, Denmark) reported on a theoretical study of harmonic vibration of a column structure with transverse beams. W A Utley and A C Salvidge (Building Research Establishment) described the background to recent UK legislation, including work undertaken by BRE, concerning Noise Abatement Zones. P T Lewis (UWIST, Cardiff) examined how changes in ambient noise level and a number of other physical parameters, affect the values of different types of traffic noise measure. The final paper in the session by J W Sargent and W A Utley (BRE) reported an investigation of the disturbance caused to secondary school teachers by noise, so that design of new schools could be optimised and remedial work could be applied to existing schools where necessary.

SOUND GENERATED BY IMPACTS

The session on Sound Generated by Impacts was chaired by A H Middleton. S Vajpayee, deputising for M M Sadek, gave a review of the work done by Birmingham University on noise generated by impact forging machines, with particular reference to the Petro-forge type of machine. He outlined the types of noise generation phenomena involved in such machines, air ejection noise, deceleration noise and ringing noise, and described the fundamental investigations into these phenomena. He also briefly discussed computer modelling of impact machine sound radiation and showed a few sample results. He emphasised that their interest was more in investigating the reasons for the noise from these machines rather than just producing an aid for designing quieter machines. In the course of questions it was revealed that a new version of the forging machine had been produced, making use of the results of the investigations carried out previously, which was 15 dB(A) quieter.

H A Evenson presented the results of investigations into drop forge machine noise carried out in USA as a joint effort between forging hammer manufacturers and the Michigan Technological University. He described the techniques used to distinguish the contributions to the total noise of air ejection noise, deceleration noise and structuring ringing. These investigations showed that it is possible to reduce drop forge noise by enclosure of the impact process, but this was deemed unacceptable for productivity reasons, and presented durability problems arising from the high acceleration levels encountered.

M D Croker explored the auxiliary noises involved in forging and other impulsive metal forming processes. These included ringing of flywheels, effect of bearing clearances, gear backlash and press tool design. He also discussed impact noise due to metal handling and demonstrated the noise reduction which can be obtained with damped pallets.

M E Westcott gave a two part paper on the production of impact noise, concentrating particularly on acceleration noise and ringing noise of structures. He concluded that acceleration noise can be predicted with reasonable accuracy, which would allow prediction of the minimum noise which a given process would produce, if all other noise radiation were eliminated. In connection with ringing noise Mr Westcott described the work done at ISVR on the radiation efficiency of structural elements typical of those found in machines.

BUILDING VIBRATION

The session on Building Vibrations, chaired by K Ratcliffe (ISVR Wolfson

Unit), was devoted largely to the standards for assessing human response and to the effects on people of vibration in dwellings due to traffic noise. Other papers were devoted to case studies and to an international study by the International Council of Building (CIB) of vibrations in buildings being carried out in nineteen laboratories throughout the world.

Attendance at this session varied from 25 to 45 and the question periods were very active. After the review paper on Standards, the speaker was asked to comment on the relative merits of RMS and peak measurements. The two complementary papers on traffic-induced vibrations prompted questions on the limited frequency range covered in the investigation; it was explained that data were being analysed for frequencies down to 3 Hz, but that these were not available at the time of the lecture.

Questions after the final paper describing the Edinburgh results of the CIB Survey included comments on the use of statistical energy analysis method. It was stated that not all the laboratories involved in the survey were unanimous in the use of this method of analysis.

SOUND POWER DETERMINATION

Dr F J Fahy (ISVR) chaired the session on Sound Power Determination. The first paper was by G Hübner (Siemens GmbH) who reviewed practical problems in the determination of sound power. F J Fahy and V Schroter (ISVR) described some results and problems of sound power based on a practical technique described at the 1978 Spring Conference. A paper presented on behalf of E J Richards (ISVR) identified sources of noise output from industrial machines and techniques to control the noise levels. A H Middleton (ISVR) outlined the difficulties in measuring sound power levels of furnaces, and in the final paper of the session D Anderton (ISVR) described the calculation of noise levels produced by surface vibration of machine components in which continuous cyclic excitation occurs.

SUBJECTIVE ACOUSTICS

There were four papers in the session on Subjective Acoustics, chaired by J B Large. The first *The Influence of repetition rate on the subjective impression of blade slap* (R J Stent and B J Southwood) concluded that the subjective penalty decreases with increasing repetition rate up to a frequency of 25 Hz, and thereafter the trend is reversed. An analysis in terms of dB(A) and PNL showed significant differences. For helicopter repetition rates between 10 - 20 Hz, impulse corrections of 4 - 9 dB(A) and 3 - 6 PNL were observed.

The second paper *Subjective response to the noise inside cars* (G D Callow) illustrated a simple objective measurement method, the Composite Rating of Preference, which gave the highest correlation with subjective preference averaged over four experiments. Three criteria were identified as significant in the subjective judgements of preference. The three factors are used in the formula for CRP and are relatively simple to measure. Also, they are broadly influenced by separate noise sources and therefore are amenable to independent control.

The third paper *A combined laboratory and field study of traffic noise* (I H Flindell) showed that by using a carefully designed laboratory and field environment that close correspondence between the laboratory and the social survey responses to traffic noise could be achieved. The appropriate indoor/outdoor characteristic is an attenuation of 18 dB, and corresponds to a typical open window attenuation when using 24 hour L_{eq} measurements at facades in the field, and 10 minute evening L_{eq} measurements in the laboratory.

The final paper in this session *The determination of human stress due to noise* (G J McNulty and J Stacey). Results of this experiment show that in the case of certain rapid reverberant impacts the EEG and GSR showed a low stress level. The main reason being that these impacts came at the end of the sequence thus underlying the habituation effect which predominated the results. The survey showed that human stress caused by a wide variety of reverberant noises is soon reduced once the subjects become used to the stimulus.

PSYCHOACOUSTICS

The session of contributed papers on Psychoacoustics chaired by A M Martin (ISVR) covered topics ranging from a discussion of a computer model of auditory neural firings to a description of a computer-controlled audiometer.

A J Watkins (University of Reading) described experiments on monaural localisation which showed that changes in perceived azimuths may be generated monaurally by varying the temporal characteristics of the signal and that the results support Blauert's directional band theory. The acoustic performance of hearing aids measured objectively on real ears, the 2 cc coupler and the Zwislocki artificial ear, was investigated by B L Lawton (ISVR) in terms of transmission gain. He concluded that the 2 cc coupler significantly under-estimated the hearing aid performance compared to that in real ears and the Zwislocki device, the latter two giving similar results, and suggested that the insertion gain measured in real ears would be the most realistic and useful measure of performance. The details of a computer-controlled self-recording audiometry system were described by B F Berry, A J John and M S Shipton; this is designed to give audiometric results in real time and will be used initially to study the 'air/bone gap' in normals.

A J Brookes and R P Williams then described a computer model of auditory neural firings exhibiting the second effect of shift pitch and concluded that the model predictions closely matched psychoacoustical and neurological findings. The final paper of the session presented by J Stacey and G J McNulty (Sheffield) summarised current knowledge on noise-induced tinnitus, both from the point of view of industrial deafness and the unfortunate lack of knowledge of the causes of this widely occurring and sometimes distressing disorder.

NOISE CONTROL AND BUILDING ACOUSTICS

This was an essentially practical noise control session. In addition to the three listed papers in the programme, F J Fahy of ISVR presented a late paper on coupling between Helmholtz resonators and sound fields in enclosures.

D J Snow, of the CEGB, described an ejector silencer for steam vent silencing, giving attenuation data for various operational conditions. G Kerry, of University of Salford, then gave a paper on the use of lead clad steel in noise control, describing its use in sheet form as enclosure panels, and for formed components such as tappet covers.

The third paper, given by R D Ford, of University of Salford, dealt with a comprehensive measurement programme of the sound absorption and

impact insulation of a range of carpets and underlays. The author related the data to the physical and mechanical properties of the carpets, such as pile height and density.

Dr Fahy's paper described an investigation of the performance of a Helmholtz resonator as a function of the modal structure of the sound field within an enclosure. He showed how the tuning of the resonator could be adjusted to optimise attenuation over a range of frequencies within its working range, illustrated by experimental data.

J G Walker and Session Chairmen

The ladies have the last word . . .

What a pity more wives were unable to join in the fun of the ladies programme. It was such a refreshing change to enjoy new sights and new company.

While the men were busy entertaining each other in the Lecture Halls, or queuing in the refectory, there were we, having a gourmet lunch at Mrs Large's delightful home, being treated to fascinating tours of Winchester Cathedral and College. The next day, it was wandering among the amazingly preserved mosaics of Fishbourne Roman Palace, and sampling the country fare at the Old Granary restaurant in Bishops Waltham. These were just a few of the pleasures organised for us, and they were made the more enjoyable by the spirit of friendliness and companionship we all felt. Even the weather did not attempt to spoil our activities; it was fine and even sunny for most of the time. We were very grateful for the services of our constant and long-suffering friend who had the dubious pleasure of driving a bunch of chattering females about in a minibus.

I personally found the conference a very relaxing and educational break, and I am sure all those who joined in the ladies programme would wish to thank those concerned, for making our trip to Southampton such a memorable one. Future organisers of the Spring Conference will find it hard to match such an interesting programme of activities for their ladies. □

Penelope Berry

Pioneers of British Acoustics

'A Doubles Partnership' W A Allen, A T Pickles

At a time when we are congratulating the mother of acoustical societies — the Acoustical Society of America — on the occasion of its 50th anniversary, our thoughts turn to the beginnings of such an institution in Britain. It resulted from the growing need which had been felt following the end of the Second World War for a focus for acoustical studies and investigations. The existence of subject groups within the Physical Society led to the suggestion of forming a Physical Society Acoustics Group.

THE PRIME movers behind the idea were Messrs W A Allen, B Arch, RIBA, and A T Pickles, OBE, MA, and they called an inaugural general meeting which was held in the Jarvis Hall of the Royal Institute of British Architects on 19 February 1947. Under the chairmanship of H L Kirke, Head of the BBC Research Department, an address was given by Dr Alex Wood (Cambridge University) on *The Contribution of Acoustical Science to Allied Studies*, and about 170 persons were present. At this meeting the Acoustics Group of the Physical Society was officially launched, with H L Kirke as Chairman, Alex Wood as Vice-Chairman, and W A Allen and A T Pickles as Joint Honorary Secretaries.

The Group was fortunate in this choice of secretaries, for each brought a valuable background of experience to guide its destiny. Allen's father, who occupied the Chair of Physics at Manitoba, knew W C Sabine quite well so that Bill had an early contact with acoustics and, in fact, wrote his final thesis on the design of theatres. He came to the UK in 1936, being attracted by the work of Hope Bagenal (whose passing in May of this year sadly severs yet another link with the past), and while the Philharmonic Hall in Liverpool was still under construction. Although denied the opportunity at that time to carry out post-graduate work in architectural acoustics, Allen was fortunate in obtaining a post at the Building Research Station. He worked under Robert Fitzmaurice, an engineer with whom in 1940 he published a book entitled *Sound Transmission in Buildings*, but unfortunately most of the edition was destroyed in the blitz. At the end of the war Pickles joined the BRS as head of the Physics Division after an illustrious wartime career as the leader of the Admiralty group in Edinburgh, working on underwater acoustics devices. Allen was appointed deputy head to Pickles who brought Parkin along with him from the Admiralty to take change of experimental acoustics.

During the 'doubles partnership' of nearly four years as honorary secretaries, Allen and Pickles gave an invaluable service to British acoustics by bringing together for the first time in Britain, physicists, electrical and mechanical engineers, musicians, psychologists, architects, industrialists, research workers in universities and government laboratories, and even music critics to learn about and to discuss each other's acoustical problems. They also brought British acoustics into the international arena by the inauguration of an international symposium on a *Comprehensive Review of Noise and Sound Transmission*. Furthermore, the multi-disciplinary nature of acoustics was emphasised by the arrangement of a joint meeting with the IEE, *Toward the Specification of Speech*, the lecturers being the President of the Acoustical Society of America and the Director of Research of the Bell Telephone Laboratories. The educational side was not neglected and Prof Bolt (MIT) gave a well-attended course of lectures on *Modern Principles of Room Acoustics*.

The Acoustics Group moved with the Physical Society when it merged with the Institute of Physics, and continued as a Group organisation until 1974 when it amalgamated with the British Acoustical Society to form the Institute of Acoustics. Bill Allen has remained a central figure throughout these developments but at the same time has achieved an international reputation as a consultant in the field of architectural acoustics. □

R W B Stephens

Scottish Notes

Ultrasonics in the Department of Bio-Medical Physics and Bio-Engineering, University of Aberdeen

Ultrasound is increasingly used and relied upon for different aspects of medical diagnosis and for therapy. The range and number of recent developments in both applications and instruments are growing at such a pace that a small specialist group such as ours (usually four staff and two PhD students) must be careful to restrict its direct interests.

THE MOST important area of investigation is the nature of the sound-tissue interaction since on it depends both the actual imaging process and also the safety of the technique when applied to patients. In order to make meaningful measurements of the bio-effects of ultrasound the field parameters must be determined. For these reasons we have selected four main areas of investigation:

(i) to investigate the 'signature' of tissues on pulses reflected back to a transducer by normal and pathological tissues. This is tissue characterisation by ultrasound spectroscopy. Similar principles are applicable to flaw detection.

(ii) to study the mechanisms of damage of moderately intense megahertz ultrasound on plant material, Hela cells and animal tissues. This has implications relating to the controlled destruction of (unwanted) tissues and, moreover, should also help in defining safety thresholds.

(iii) to develop a calorimetric technique of power measurement and to compare it with radiation force measurements.

(iv) to develop a multi-element phased array for cardiac imaging in real-time.

Areas we have so far neglected include acoustic microscopy, holography, Doppler imaging and measurement of blood flow, impediography and time of flight imaging.

The attraction of ultrasound in diagnosis lies in the fact that it is both non-invasive and is believed to be non-toxic at intensity levels currently employed. Reflected pulses of ultrasound are used to build up a picture of tissues and various internal features can be identified mainly from anatomical outlines. Current techniques do not utilise all the information carried by these reflected pulses and the possibility of obtaining more information on tissue pathology is an interesting one. With this end in view, we have set up a facility for computer recording and storage of signals from scattered ultrasound. Our main emphasis is on frequency-domain studies for which we use particularly broad band pulses of ultrasound. We have begun collecting data from *in-vitro* tissue samples and will now be seeking to isolate tissue characteristic features of the scattered sound. The application of this technique to patients is called Telehistology and, if successful, it might well obviate the need to biopsy.

As well as its widespread use in diagnosis, ultrasound is also employed at much higher intensities in physiotherapy to treat a variety of conditions. The nature of the interaction of ultrasound with tissue is not well understood and much work in recent years has concentrated on investigating both the mechanism of this interaction and, from a safety point of view, the thresholds for intensity, frequency, exposure-time, etc, for this mechanism to occur. Although all the evidence to date indicates that ultrasound under the conditions used diagnostically is completely safe, it would obviously be much more satisfactory if the effect of ultrasound on tissue was completely understood.

In this department, we have investigated the effect of ultrasound on both plant cells and mammalian cells although, if extrapolations to the human situation are intended, mammalian cells are obviously more suitable for investigation. However, the interaction of ultrasound with tissue is so complex that there is still a place for work on simple multi-cellular systems such as in plants. A number of experiments have therefore been carried out using the root tip of Vicia faba, the broad bean, and leaves of Elodea, a type of pond weed. The effect of ultrasound on both types of plant tissue has been observed directly, 'in vivo' as it were, using an inverting microscope. In the case of Vicia faba a number of indirect methods have also been used including the measurement of the effect of different exposures to ultrasound on the growth rate of the primary root and the use of light microscopy and electron microscopy to examine the damage at the cellular level.

A collaborative project between members of the departments of Bio-Medical Physics and Bio-Engineering, Bacteriology and Pathology has investigated the bio-physical effects of ultrasound at theapeutic intensity levels on Hela cells. Suspensions of cells were irradiated by high frequency sound (750 kHz) for various times. A counting technique showed a reduction in the number of cells. The magnitude of the reduction increased with increasing exposure time and increasing intensity. Several different sites of damage to the cells were found by electron microscopy of sonicated cells. Effects of this nature may occur when vessels containing blood are irradiated by high power ultrasound.

The suspension of cells in a liquid is rather different from the normal arrangement of cells in a tissue. To gain more insight into the effect of ultrasound on tissue itself, experiments have been carried out in which the livers of mice have been subjected to known doses of ultrasound. The experiments are still at an early stage.

Although the work on plant cells indicates that ultrasonic effects are possible at quite low powers, these effects are associated with gas channels which are unlikely to be present in mammalian tissue. Similar mechanisms to those operating in plant tissue may occur in liquids where oscillating bubbles may concentrate the ultrasonic stress. Thus far, the nature of the interaction of ultrasound with mammalian tissue is only partially understood.

In the field of ultrasound dosimetry, a constant-flow calorimeter is being developed to measure accurately the acoustic power output of medical ultrasonic transducers operating in the frequency range 1-6 MHz at power levels from a few milliwatts up to several watts. Comparisons are being made with radiation force measurements of acoustic power, for both continuous and pulsed transducer outputs. An important aim of the work is to test the theory upon which the more commonly-used radiation force method is based.

The motion of the heart makes imaging by conventional B-scanning impossible. To overcome the problem we have used an array of 36 adjacent piezoelectric elements fired in such a way as

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CITATION

RAYLEIGH MEDAL FOR 1979

E A G Shaw, National Research Council, Ottawa

Edgar Albert George Shaw was born at Teddington in July 1921 and received his secondary education at Harrow County School. On obtaining his Intermediate Science Certificate he joined the Ministry of Aircraft Production (London) as a Technical Officer and later proceeded to Washington as a member of the British Air Commission. In 1946, following his return to Britain, Shaw entered Imperial College as a physics undergraduate and graduated with honours in 1948. For his post-graduate work it was natural that Edgar should join the newly-formed acoustics research group in the Physics Department as he had already become 'wedded' to acoustics during his stay in America, his charming wife Millicent being a violinist of distinction. Early in his research it was evident he had the ability to rapidly assess the salient features of a problem and his incisive analysis took him quickly towards a 'Shaw' solution. It is a notable fact that he gained his PhD in the minimum time of two years, a feat very rarely equalled by a physics post-graduate at Imperial College. Moreover, during this period he was the author of two published technical notes and of a short communication to JASA and he also gave a lecture to the Acoustics Group of the Physical Society entitled *On the Measurement of Specific Impedance of Absorbing Materials.*

On leaving Imperial College Dr Shaw joined the Physics Department of the National Research Council of Canada at Ottawa where he has remained to date, becoming Head of the Acoustics Section in 1975. His research investigations at Ottawa are revealed in nearly 40 papers and cover a range of topics of which about one-third are concerned with the ear in both its physical and instrumental aspects. In this connection he holds (jointly with G J Thiessen) patents on an ear-defender and on an improved ear-phone. His papers on the vibration of ceramic discs also form a notable contribution to acoustics.

E A G Shaw

The high esteem in which Edgar Shaw is held internationally by the scientific world is evident in the various assignments he has undertaken in recent years. He has served as President of the Acoustical Society of America, Chairman of the International Commission on Acoustics, Member of the Executive Council of the US Commission on Hearing, Bioacoustics and Biomechanics (National Science Foundation). He is also a member of the Governing Body of the American Institute of Physics and Secretary for the Canadian National Committee for IUPAP.

This record of achievement however would be incomplete without reference to Shaw's election as a Fellow of the Royal Society of Canada. He thus joins a very small band of acousticians who have received distinction from an institution or society concerned with the whole body of science.

The Institute of Acoustics is privileged to honour an Englishman who received his academic training in England, followed his research career in Canada, and is now acclaimed as one of the leading international figures in acoustics.

By the degree of excellence he has achieved in many aspects of acoustics, as an experimenter, as an organiser, as a lecturer of outstanding clarity and as a research leader, the Institute of Acoustics is proud to bestow upon Edgar Albert George Shaw its Rayleigh Gold Medal. □

RWBS

(Presented to Edgar Shaw at the Spring Conference, held at ISVR Southampton 8 - 11 April 1979.)

ELASTIC WAVE PROPAGATION AND SCATTERING IN SEISMOLOGY AND MATERIALS TESTING

A one or two day meeting is to be held on 27/28 February 1980 at the Geological Society of London, Burlington House, Piccadilly, London W1V 0JU. Sponsored by the Joint Association of Geophysics, the Institute of Acoustics, and the Institute of Physics: Materials and Testing Group.

Elastic wave propagation and scattering is of interest to workers in fields as diverse as seismology and geophysics, civil and mechanical engineering, materials testing and electronics. The aim of this meeting is to bring together workers from these various fields of study so that discussion and an interchange of ideas can occur.

The meeting will be concerned with all aspects of and types of systems involving the generation, propagation and scattering of elastic waves, especially those topics which are of interest in more than one field of study.

In addition to visual material used to illustrate papers it is proposed, if there is sufficient interest, to include a session to show short films and/or slide sequences.

Offers of papers (title and brief abstract typed on one side of an A4 sheet) and/or offers of films should be sent by 1 OCTOBER 1979; an early notification of intention to submit a paper (with the paper title), and/or interest in a film/slide session would assist in planning a balanced programme.

Joint Conference Secretaries:—

Dr J A Hudson (for JAG), Department of Applied Mathematics and Theoretical Physics, University of Cambridge, Silver Street, Cambridge.

Dr L J Bond (for IOP and IOA), Department of Physics, The City University, Northampton Square, London EC1V 0HB.

Appreciations

Philip Hope Bagenal

Philip Hope Bagenal, OBE, DCM, RIBA, Hon FIOA, died on 20 May 1979 at the age of 91. He was a widely loved and respected member of the architectural profession, a writer of quality, a personality of quiet strength and in his time the leading architectural acoustics consultant. He advised upon numerous important building including before 1939 Sir Herbert Baker's Legislative Chambers at Delhi, the Shakespeare Memorial Theatre at Stratford-upon-Avon, and Liverpool Philharmonic Hall, and after the war the Royal Festival Hall (with the Building Research Station), the Fairfield Halls at Croydon and the Free Trade Hall at Manchester. The number of smaller works which he touched with his wise judgement are very numerous.

He was born in Dublin into a family which had been settled for four centuries near Muine Bheag, formerly Bagenals Town, in County Carlo. His education began at St Peter's, York, and later he moved to Cuthbert Creighton's House at Uppingham. He made a start on engineering studies at Leeds but abandoned this for architecture, which he entered through articled pupillage, still then a common practice.

He was early influenced by the Society of Friends and when the war broke out in 1914 he became a stretcher-bearer. He was severely wounded at the Somme and was awarded the Distinguished Conduct Medal. The wound left him with a limp and a stoop which added memorably to his spare figure and unforgettable face. In 1919 he published a moving and beautiful account of life behind the lines. It revealed for the first time the high quality of writing of which he was capable and which is evident in everything he wrote, about acoustics, about architecture, about the technology of building materials, and including some very attractive published poetry. This was to be reflected also in his purity of diction and in his contemplation of the acoustical problems of beauty in speech and music.

Underlying it all was a strong sense of Irish fun and humour which I first encountered when I heard him deliver a lecture at the Architectural Association in 1937 titled *Modernism; a Criticism*. The evening lectures at that time took place after a formal dinner, and as he stepped to the lectern he reached beneath it and to everyone's immense please drew out a bottle of stout and a glass which he proceeded to fill, holding then up to the light as he said 'I always drink stout, for acoustic purposes', he downed and finished the bottle as he lectured.

He practiced very little as a designer; he was essentially a scholar and in this role he served as Librarian/Editor of the Architectural Association, in which position he was influential upon an entire generation of students between the wars. With Robert Atkinson he wrote a most distinguished book *The Theory and Elements of Architecture,* Atkinson being at that time a leading architectural historian. It appeared in 1926 and was an immediate success.

While hospitalised in Cambridge in 1919 he had met the physicist Alex Wood, later a distinguished Fellow and Tutor of Emmanuel College. It was their friendship and Wood's interest in acoustics which generated what subsequently became the focus of Bagenal's principal endeavours. Together they embarked upon a book titled *Planning for Good Acoustics* which was published in 1931. It was by far the best book on the subject published between the wars, and largely because Bagenal's sense of beauty of sounds pervaded the book, and his acoustical perceptions led him to opinions and advice which was much in advance of the research base of the subject at that time. It was a totally civilised piece of writing and it gave to those interested in architectural acoustics throughout the world at that time a feeling of being involved in a subject of great importance to the cultural life of societies.

As a small example of his acoustical insights, the book lays quite a lot of evidence upon the value of panelling for sound absorption. This was six or eight years before Lauffer, working with Meyer in Germany, published a prediction basis for their use, and as late as 1945 or 46 an American critic of one of Bagenal's writings was still scoffing at their value.

Bagenal had a constant interest in the building sciences and maintained close contact with the Building Research Station from its inception in 1920. He was welcomed onto its staff in 1940 and the files of those days became illumined by witty and perceptive memoranda. He did not enjoy the cinema, and I remember receiving a memorandum from him on the acoustics of a kiss about 8 feet wide and 12 seconds long which he had encountered at a local cinema the night before.

His OBE was awarded late in life, and in 1975 he was made an Honorary Fellow of our Institute.

He married in 1914 Alison, daughter of Stuart Hogg, who with two of their children happily survives him. She made their home by the river Lee a constant pleasure for the many visitors it attracted over more than half a century. □

W Allen

Gilbert Faraday Dutton

Dr G F Dutton passed away in March of this year at the age of 76. He was educated at Exeter Grammar School and Imperial College, and after graduation joined Siemens Bros, Woolwich. In 1929 he transferred to the Gramophone Company to work on talking-picture research and in particular on microphone technology with particular relevance to the pioneer research of Alan Blumlein on stereo-recording. The research team of Dutton, Blumlein and Schonberg was responsible for many developments in sound recording and reproduction. Dutton was himself responsible for the first professional tape-recorder to be designed in Britain. He was head of the recording research section at EMI when he retired in 1968.

Dutton's achievements were recognised by his appointment as the Faraday Lecturer of the IEE in 1951, and in 1964 he became the first Englishman to receive the Emile Berliner award. Dutton also served on the Committee of the Acoustics Group of the Physical Society.

R W B Stephens

DESIGNATORY LETTERS

Council has approved the following recommendation from the Membership Committee. In future all IOA publications such as Proceedings will, where appropriate, carry the designatory letters for its corporate grades (FIOA or MIOA) after the author's name. This will help publicise one of the benefits of corporate membership. All corporate members are asked to assist in a similar way in respect of letter-headings and papers submitted elsewhere.

D J Johns

ACUSTICA BRASILIERA

F J FAHY

Brazil, the fifth largest country in the world, having an area 36 times that of the British Isles, possesses enormous mineral resources, vast tracts of uncultivated land, and a climate which varies from tropical Northern Amazonia, where the nuts come from, to Mediterranean in southern Rio Grande do Sul, where the gaúchos live. The population of the country is around 115 million persons, of whom the majority live in the East of the country, close to the Atlantic coast. Industrialisation has been in progress in the large cities such as São Paulo, Rio de Janeiro, and Porto Allegre for many decades and has, of course, been the main cause of the rapid growth in their populations. 'Progress' has promoted the usual crop of modern diseases; pollution, dense traffic, overcrowding and shortage of accommodation.

WHILE studying for his PhD at the Institute of Sound and Vibration Research, Southampton University, Prof José João de Espíndola, of the Federal University of Santa Catarina at Florianópolis, became aware of the strenuous efforts of the Europeans to combat industrial pollution, especially that of noise in the community and in workplaces. Consequently, when he returned to Brazil and became responsible for the postgraduate programme of the Department of Mechanical Engineering at the 5000 student strong UFSC, he saw the need for postgraduate instruction in all aspects of noise and vibration prediction, assessment and control. Having assembled the basic components of an acoustic laboratory, and obtained a government grant to build an anechoic chamber and vibration test facilities and to equip these with a comprehensive range of instrumentation, he turned to the ISVR for help with getting the course off the ground.

The Royal Society was approached and agreed to sponsor a brief visit by Brian Clarkson to assess the need for, and practicability of, setting up an instructional MSc course and industrially sponsored research at UFSC, to be organised initially with the help of the Institute. His report was favourable to the enterprise and June 1978 found my colleague, electronics and instrumentation lecturer Peter Tanner, transported from an English summer into a Brazilian winter (which apparently seemed little different) and teaching sound measurement and instrumentation techniques to a small group of students as part of their postgraduate studies. Two of the students were seconded from the Metrology Laboratory in Rio which was planning to start an acoustics section. Portuguese not being one of the strong points of Peter or myself, it was fortunate that English was taught as the second language: however, some were more fluent in German, because the state of Santa Caterina was extensively settled by German immigrants.

My own journey, which was financed by the Royal Society out of the Unilever Brazil Programme Funds, took place in mid-September. I was very fortunate to be able to take advantage of the pioneering efforts of Peter Tanner who had to overcome many of the types of administrative, academic and technical problems which are always likely to be encountered at the start of any such enterprise, even to the extent of having to repair the damage which occurred when the local water course attempted to take a short cut through the acoustics laboratory. Due mainly to his efforts, and those of the departmental carpenter, I was able to organise a fairly comprehensive programme of laboratory work in the field of basic experimental techniques used to measure the properties and performance of acoustical systems, in association with which I taught a 40-hour course on Basic Acoustics. Among the experiments were impedance tube and reactive filter measurements, made with the aid of locally produced plastic pipes, measurement of transmission loss of plates, estimates of sound power radiated by sources from reverberant and direct field SPL surveys, studies of SPL distribution in an enclosure, and measurements of radiation efficiency damping and point input impedance of metal plates. The students greatly appreciated the chance to do practical work because of the strong theoretical bias of most of their courses.

During my 14-week stay in Brazil, for which a subsistence grant was made to me by the National Research Council of Brazil (CNPq), in addition to my teaching commitments I was expected to offer advice on the design and equipment provision for the new laboratories, especially the anechoic chamber, and to visit local industrial firms in an attempt to suggest and initiate joint research and MSc projects. I visited a number of local companies at Jaraguá, Blumenau and Joinville in the company of José de Espíndola and José Carlos Banini, another member of staff of the Mechanical Engineering Department, who once a month visited those of the Department's students who were currently being trained in industry. I was impressed by the great trouble taken by the department to maintain close contact with those students and their industrial tutors.

Among companies which I visited together with my hosts were manufacturers of air compressors, air conditioning equipment, textiles, screws, steel castings, and electric motors. The latter company has a thriving export market in a wide range of motors to both the USA and Europe, with a large output in the marine field. I was fascinated to see the entire process, including the conversion of copper ore from Chile into miles of thin wire coated with up to 16 layers of insulation coatings, and also some very interesting novel techniques in aluminium casting developed within the firm.

Noise problems in manufacture included those associated with steel laminate stamping, casting finishing, steel bar cropping, textile spinning and draw twisting processes. Operational noise problems included those created by air conditioner compressors, Rootes blowers and electric motor cooling fans. I had the unusual experience of being allowed to suggest, and to observe the results of, some ad hoc modifications to motor cooling air intake geometry, actually carried out on the spot in the motor test facility. The noise was reduced, but the motor overheated! Perhaps this illustrated the dangers of proposing solutions to noise problems without fully understanding the constraints imposed by other operational requirements; a good object lesson in engineering noise control. As a result of this and earlier visits by the staff of UFSC, several joint research and MSc projects have been proposed.

In the light of my experience in Florianópolis I can thoroughly recommend a project on the design of an anechoic chamber as an excellent exercise for engineering students. Problems of choosing wedge materials, shapes and mounting pale into insignificance beside those of devising

acoustically transparent floors to support heavy items of plant, retractable or removable lifting gear, fire protection and safety systems, cable runs, remotely controlled microphone traversing gear, air conditioning and waterproof, resilient, chamber mounting systems.

Brazil has relatively few acousticians at present although there are a few excellent audio companies and a very good dynamic test laboratory at IPT, the large research laboratories on the campus of the University of São Paulo, which provide a service to industry in a wide range of technologies. This laboratory carries out vibration tests mainly for the hydroelectric power industry, but is now developing facilities in the fields of machinery health monitoring, resilient material testing and cavitation detection. It also manufactures its own accelerometers for underwater measurements. At São Paulo University the Department of Civil Engineering carries out acoustic measurements and has produced educational films on noise effects and control for the local city authorities. There are also audiological departments at Rio and São Paulo. The Brazilian Acoustics Journal carries a mixture of technical articles and advertisements.

Acoustics is growing fast in Brazil and we hope that our efforts in Florianópolis may have made a significant contribution to this development. If you like sun, and girls, and food, I recommend a trip. □

BRANCH AND GROUP NEWS

Underwater Acoustics Group

At the recently held Group Annual General Meeting Mr C Richardson (AUWE, Portland) and Mr N W Millard (IOS, Wormley) were elected to the Group Committee; Dr N G Pace (Bath University) becomes Secretary whilst Mr R Mitson (Fisheries Lab, Lowestoft) and Dr A R Pratt (University of Loughborough) continue respectively as Chairman and Treasurer.

A technical visit to AUWE Portland, and Plessey Marine, Templecombe has been arranged for 12/13 June 1979.

The provisional programme for the meeting *Underwater Applications of Non-Linear Acoustics* which is to be held at Bath University on 10 and 11 September 1979, includes three invited papers from leading authorities in the United States together with twelve contributed papers. The conference organiser is Dr N G Pace, School of Physics, University of Bath.

Copies of most of the Proceedings of Conferences held by the Group are still available from the Underwater Acoustics Group Publications Secretary: Mr J Mills, Bell Electronics, John Scott House, Market Street, Bracknell, Berks; Telephone: 0344-27530.

N G Pace

Building Acoustics Group

The Group was very well represented at the Spring Conference at ISVR with a total of 15 papers presented under three sessions covering topics such as Building Vibrations, Sound Insulation, Scale Modelling Techniques and Traffic Noise.

The open meeting of the Group was also held during the conference and this was attended by 17 members including the President, Prof Lord. The meeting was informed of the progress in arranging future Technical Meetings which included the two-day meeting on *Room Acoustics* to be held in Edinburgh during the latter part of August; the half-day visit/meeting to be held at the National Theatre during October, and the *Buildings, Noise and People* meeting to be held at the Building Research Establishment, Garston, during February 1980.

The subject of workshops was also discussed at length and two buildings were identified in this connection, viz the Hexagon, Reading, and Westlake/Eastlake. In addition it is hoped to arrange visits, where appropriate, to local BBC/ITA studios during future conferences.

Notice was given of an approach made by the Chartered Institute of Building Services with a view to holding jointly sponsored meetings in the near future. This met with general approval and the Committee were asked to discuss the matter further with representatives from the CIBS.

The question of the group becoming more active in the setting and reviewing of building acoustic standards was raised. Following a discussion it was felt that the most that we could achieve at present was to ensure that we were represented on all standards committees.

The subject of giving advice to architects and manufacturers with regard to setting down and interpreting acoustic specifications for building materials was discussed at length. Those members present were split as to whether positive action should be taken and after taking a vote it was decided to recommend that the committee be asked to pursue this matter further.

Finally, the subject of carrying out an acoustic survey of auditoria in the United Kingdom was raised and generally welcomed although it was felt that the matter should be left for further discussion by those members directly involved in auditorium research. □

Robin Mackenzie

ACOUSTIC EMISSION

The third meeting on Acoustic Emission organised cooperatively by the Institute of Acoustics and the British Acoustic Emission Working Group was held at Chelsea College 3-5 April 1979. The main theme of the meeting was the use of Acoustic Emission (AE) for Material Evaluation and it attracted a large percentage of speakers from abroad. The general standard of papers was high and, although the poster sessions received little support from the audience, they were most usefully used by the exhibitors to describe the general and particular features of the AE systems.

The five sessions dealt with the topics of source identification, AE and metals, AE and composite materials, and phase changes and AE, with a final session devoted to AE and geology. The trend towards greater quantification in ultrasonics was evident in a number of contributions such as that of S P Ying who proposed a model for AE from steel under stress which was based on quantum dislocation theory and was found to be successful in accounting for temperature dependence and the effect of crack size on the emission. The use of AE for the detection of phase changes in a material is an area of much interest for physicists and metallurgists and the opening paper of the meeting was concerned with the motion of domain walls of ferroelectric and ferroelastic crystals. The phase changes in these materials is analogous to the martensitic transformations in metals. □

R W B Stephens

THE INSTITUTE OF ACOUSTICS FIFTH ANNUAL REPORT OF THE COUNCIL 1978

THIS YEAR saw the installation of Prof Peter Lord as President and the retirement from this post of Prof E R Dobbs. Members of Council wish to place on record their appreciation of the very substantial contribution made by Prof Dobbs during his period of office, which was marked by two major developments in the forms of the introduction of professional membership structure and the initiation of the Diploma in Acoustics and Noise Control. Council also wishes to note, with pleasure, the acceptance of an Honorary Fellowship by a Past President, Dr W Allen, who has worked tirelessly over a period of many years to promote the cause of education in acoustics, and to secure recognition of the profession of acoustics, in this country. The past services to Council of Mr A Burd and Mr M C Martin who retired in 1978 are gratefully acknowledged. Alex Burd's skilful guidance of the process of establishing the general aims and administrative structure of the Diploma Course has been of inestimable value to the Institute.

The examination for the first year of operation of the Diploma in Acoustics and Noise Control took place in June. There were 56 candidates distributed between four schools of instruction. Ninety-three per cent of these candidates sitting the General Module paper were successful and seventy-one per cent passed the full examination. Four additional colleges have since been approved to take part in the scheme. Diploma Registered students will be granted free Associate membership for a year.

The total numbers of corporate and non-corporate members stand at 582 and 424 respectively. Since the introduction of the new structure, including the two professional (Corporate) grades in January 1977, there has been an increase of about fifteen per cent and applications for membership continue at a healthy and encouraging rate.

STANDING COMMITTEES

The operation of the Institute is carried out by Council through the following Standing Committees: Meetings, Membership, Publications, Diploma Advisory and Examination Boards, and Medals and Awards. Terms of reference have been clarified and expanded. The Education Committee has been wound up and its various responsibilities assumed by Publications Committee and the Diploma Boards.

Meetings

Seventeen formal meetings were held during the year, of which the Spring Conference and Exhibition at Cambridge was the largest, with an attendance of over 250 persons. This event was undoubtedly a great success, from both the technical and social points of view, on which the organisers are to be congratulated. In March a joint meeting with the Institute of Physics Education Group on the teaching of Acoustics aroused considerable interest. Other joint meetings of note were those on *Planning noise and the environment, Acoustics of pumps, Instrumental techniques in the speech sciences,* and *Noise in our society*. These meetings are of great importance in advertising the existence and activities of the Institute to a wider audience.

The Policy of devolving the responsibility for initiating and planning meetings to the Groups and Branches of the Institute, reported last year, has now been fully implemented and has received enthusiastic support from the respective committees, with the Building Acoustics and Underwater Acoustics Groups leading the field. The London Evening Meeting organisers have been extremely active in arranging a programme of informal meetings which has covered a wide range of topics. The enterprise has met with signal success and the organisers are to be congratulated.

The Committee has introduced a scheme to improve awareness of forthcoming meetings among members, and to stimulate response to calls for papers, by means of monthly digests containing reply slips.

Membership

Under the guidance of its new chairman, Prof D Johns, the Committee has given considerable thought to means of increasing the membership of the Institute. Groups and Branches are urged to take a more positive attitude to recruitment. As noted above, co-operation with other Institutes and Societies is recommended. Measures to facilitate application for membership have also been introduced.

Publications

The Committee has responsibility for the following publications: Acoustics Bulletin, Proceedings, Special Volumes of Proceedings, Medals Lectures Volumes, Diploma material, Annual Report, Education and Careers Information and Meeting Notices.

Four issues of the Bulletin have been issued during 1978. Council wishes to note the vital role of this publication, and to acknowledge with gratitude the skilful and sustained efforts made by the editor, Dr M E Delany. A leaflet entitled *Education in Acoustics* containing information and details of courses available in Universities, Polytechnics and other establishments of Higher Education has been published and copies are available from the Secretary.

The first volume of Medals Lectures 1974-1977 has been published and distributed to members. Revised arrangements for the publication of the Proceedings have been introduced this year. Instead of distributing the 'four-page' sets of papers to each member, the papers are accumulated during the year and bound into a single volume for circulation to members in the Spring. It is hoped by this method to form a more acceptable permanent record.

Diploma

As noted above, the first examinations have taken place. Reports from students indicated that they had appreciated the standard and scope of the course. Council is indebted to those concerned with the teaching, administration and examination of the course and in particular to the Chief Examiner, Dr R W B Stephens, who has borne a large part of the burden virtually single handed. Eighty-eight students have been registered for the current academic year.

Medals and Awards

The 1977 Rayleigh Medal was presented to Academician L Brekhovskikh of the USSR on the occasion of his lecture to the Spring Conference. The A B Wood Medal and Prize was presented to Dr A D Hawkins of the Marine Laboratory, Aberdeen, at the meeting on *Acoustics in Fisheries* held in September. Prof E G S Paige of the Department of Electrical Engineering, University of Oxford, received the 1978 Rayleigh Medal for his outstanding work on Surface Acoustic Wave Devices on the occasion of his address to the Autumn Meeting. At the same meeting the 1978 Tyndall Medal for achievement and services in acoustic education was presented to Dr H G Leventhall of Chelsea College, London University. During the year Prof Sir James Lighthill, FRS, Dr W A Allen and Prof E J Richards have been elected to Honorary Fellowship of the Institute.

BRANCHES

North Eastern Branch

The year commenced with a joint meeting with the IOP and IEE in January on *The Dolby Noise Reduction System*, which attracted a large audience but added no new weapon to the armoury of certain Branch Members interested in real noise reduction. The AGM and an enjoyable snooker evening took place in February.

The next meeting took the form of a half-day meeting on the subject of Traffic Noise. Three papers were presented and each was well received by the good sized audience. The following meeting took the form of an evening visit to a University Phonetics Laboratory, including a talk on the work on Speech Analysis. In October a visit was made to Harrison and Harrison Limited, Organ Builders, of Durham and this was followed by a meal. This meeting was well supported and thoroughly enjoyed by all.

The Autumn Meeting on the subject of Combustion Noise extended over two days. It was successful in spite of only moderate attendance. The final meeting of the year was held jointly with the IOP and the subject was *Ultrasonic Medical Diagnosis*. The attendance was satisfactory bearing in mind the highly specialist nature of the topic.

Southern Branch

The main event of the programme was the meeting on *Statistical aspects of outdoor sound propagation*, organised as an Institute main meeting in June, which was attended by 61 people. The year's programme included lectures on loudspeaker response and jet noise, visits to British Hovercraft Corporation and Structural Dynamics, and a film evening. From a Group Membership of 65, Dr J Powell, of Portsmouth Polytechnic, was elected Chairman at the AGM, in place of Dr F J Fahy, who has served as Chairman for five years.

Musical Acoustics Group

By far the major event of 1978 for the Musical Acoustics Group was the Autumn Meeting of the Institute at Aston University where, in collaboration with the Building Acoustics Group, a major, and most successful, session on *Halls for music from the performers' point of view* was arranged. A few papers on musical instrument acoustics were also given at the Autumn Meeting.

An enjoyable visit to the Dolmetsch factory took place in July but the Autumn programme of the group was completely disrupted by a serious accident which befell the group Secretary; both committee meetings and scientific meetings had to be abandoned.

Physical Acoustics Group

The Group held two meetings during the calendar year of 1978. These were *Acoustic visualisation* in February and *The transmission and scattering of ultra-sound in human tissue* in May. They were attended by 38 and 75 registered participants, respectively, and were both financially successful.

The Group Committee was unable to attract sufficient participants to merit a Physical Acoustics session at the Autumn Conference. Following this, and what seemed to be a general lack of interest in Group activities by Group members, the Committee concluded that it had failed to find the support of the Physical Acoustics community. The Chairman, Honorary Secretary and two ordinary committee members gave notice to the membership of their resignations and an Emergency General Meeting of all members of the Group was called. None of the membership apart from Group Committee members, attended this meeting. The Group is now without a Chairman or Honorary Secretary.

Building Acoustics Group

The Group started the year with a very successful meeting in Cambridge on Theatre Acoustics. Over 200 participated. This was followed in May with a meeting on Noise, held in association with the Royal Edinburgh Society. The papers covered neighbourhood, environmental and industrial noise, and there were, in addition, two contributions on the transmission of noise in buildings.

It has been decided to hold the Group's main symposia within the Spring and Autumn meetings, thus reducing the necessity for certain members to make long journeys for short-term events. A further advantage is that it becomes financially possible to invite distinguished overseas speakers. Thus it was possible to include Prof Cremer among the speakers at the meeting on *Halls for music from the point of view of the performer* organised jointly with the Musical Acoustics Group. This symposium included papers from conductors and solo artistes as well as architects and acousticians, and was supplemented by others on more general aspects of musical acoustics.

As a result of informal discussions arranged for the group members present at the Spring meeting, the Building Acoustics Group now has representation on one of the main BSI committees dealing with Building Acoustics and has circulated suitable draft standards to interested members during the comment stage.

Speech Group

During 1978 a total of three group meetings has been held, and the Speech Group was also active in its association with the Spring Conference of the Institute. The programme of that Conference contained three half-days of speech papers, including important overseas contributions.

The first of the Group's own informal meetings was held at University College London, in June on the subject of production and perception of speech by children. In October seven papers on various aspects of speech synthesis were presented at the University of Keele. Important features highlighted by this meeting were the growing importance of synthetic speech for practical applications of machine-man communication, and the rapidly increasing use of digital electronics for implementing synthesisers. The year's programme concluded with a meeting at Shrivenham in December on the subject of digital coding for speech transmission.

It can be seen from the above meetings programme that the Group has continued its policy of covering a very wide range of different types of speech research activity and also, as far as practicable, of spreading the meetings over most of the UK to spread the travelling load equitably between members from different districts. We hope in this way to encourage more inter-disciplinary contacts, which are such an essential part of progress in the science of speech communication.

Industrial Noise Group

Twelve members of the Group enjoyed the hospitality of the National Coal Board during their trip to Gedling Colliery near Nottingham in September.

At the invitation of the Aerodynamic Noise Group and North East Branch, the Industrial Noise Group assisted in the organisation of the two-day conference on *Combustion Noise* held at the British Gas Corporation Engineering Research Station, Killingworth, in November.

Underwater Acoustics Group

There were three meetingns of the Group during the year. The highlight was the two-day Conference on *Sound Propagation and Underwater Systems* held at Imperial College, London, in April. Over 100 delegates attended to hear papers on system design, the latest developments in the theory and measurement of underwater sound propagation, studies on environmental noise and methods of detection and estimation. The *Acoustics in Fisheries Meeting* at Hull in September proved very popular with 58 attendees. During this meeting the A B Wood Medal and Prize was awarded to Dr A D Hawkins of the Ministry of Agriculture and Fisheries, Aberdeen, for his work on the hearing of fish. The final meeting of the year, at Birmingham University, on *Transducer Arrays and Array Processing* was attended by 88 delegates. This was a follow-up to the meeting held two years previously.

Administration

Council wishes to acknowledge the services of the Secretary, Mr John Byrne, and his assistants in handling the day-to-day running of the Institute. The Institute is also indebted to the Institute of Physics for the provision of headquarters and for the help in various aspects of the work of the Secretariat.

The Year Ahead

Last year members were exhorted to contribute actively to the life of the Institute by helping to initiate, organise and contribute to Group and Branch functions, and to improve the quality and quantity of information exchange between different specialist groups. This year has brought substantial progress in these directions, particularly through the more consistent coverage and reporting of group meetings in Acoustics Bulletin. It is to be hoped that this improvement will be continued and consolidated during 1979. □

All material for the October issue of Acoustics Bulletin should be sent to Mrs F A Hill, 158 Kingsmead Road, High Wycombe, Bucks HP11 1JB no later than 25 August.

ISVR SHORT COURSES AND CONFERENCES

ANNUAL COURSES

1979	3 - 7 September	Industrial Audiology and Hearing Conservation Course
	10 - 14 September	8th Advanced Noise and Vibration Course
	17 - 21 September	Technical Audiology Course B for physiological measurement technicians
	23 - 27 September	Industrial and Machinery Noise Control Practice Course
	8 - 12 October	ISVR/CONCAWE Noise Course for Engineers in Process Industries at the Polygon Hotel, Southampton. (Wolfson Unit)
	22 - 26 October	Course on Environmental Noise — its assessment, control and economic impact; sponsored by the Environmental and Consumer Protection Service, in Brussels
1980	14 - 18 April	Clinical Audiology Course for specialists and trainees in otolaryngology
	14 - 18 April	Noise and Vibration Control Course for Environmental Health Officers (Wolfson Unit)

MODULAR COURSES

1979	21 - 25 May	Industrial Noise and Vibration Control	G2 Module
	25 - 28 June	Transportation Noise and Vibration Control	T1 Module
	11 - 13 July	Instrument and Measurement Techniques for Noise Control	D1 Module

CONFERENCES

1979	17 - 20 July	Symposium on Internal Noise in Helicopters, in collaboration with The Royal Aircraft Establishment, Farnborough (by invitation)
1980	7 - 11 July	Recent Advances in Structural Dynamics Symposium

Further details may be obtained from Mrs O G Hyde, ISVR Conference Secretary, The University, Southampton, SO9 5NH. Telephone: (0703) 559122 Ext 2310. Telex 47661.

Acoustics in Parliament

24 OCTOBER

Soundproofing (Grants)

Mr Cledwyn Hughes asked the Secretary of State for Defence if he will take steps to amend the terms of the White Paper 'Development and Compensation' Command Paper No 5124, so as to enable grants to be paid towards the installation of soundproofing of properties subjected to high noise levels from neighbouring RAF stations as a result of the introduction to those installations of new and more powerful aircraft producing a much louder noise.

Mr Wellbeloved: The Noise Advisory Council is currently examining the question of grants for noise insulation and the conditions under which they may be paid. The Government are currently awaiting the results of these investigations which are expected next year.

21 NOVEMBER

Experimental Establishments (Noise Abatement)

Mrs Bain asked the Secretary of State for Defence what recommendations he is in a position to make in relation to Property Services Agency reports on noise abatement at source level of proof and experimental establishments such as Inchterf, Kilsyth.

Dr Gilbert: Inchterf is the only proof and experimental establishment for which the Property Services Agency is conducting a study of the possibilities of noise reduction. As I informed the Hon Member last week, I hope that the technical report will be available within a matter of weeks. When it is, I will send her either a copy of it or a summary of its main findings and conclusions.

Before any recommendations can be made on the basis of the technical study, it will be necessary to consider the practicability of its findings in relation to the operational functioning of the establishment and how worthwhile the measures would be in relation to their likely cost.

15 DECEMBER

Hearing Aids

Mr Ashley asked the Secretary of State for Social Services (1) if he will estimate the number of children who were issued with commercial aids, and who then, when they had become too old to qualify for such an issue, had either to buy their own or use a National Health Service one;

(2) what representations he has received urging him to allow the National Health Service to provide commercial aids for young adults when such aids were provided for them when they were children;

(3) what representations he has had following the report of the National Deaf Children's Society on 'Deaf Children and their Hearing Aids'; and if he will make a statement;

(4) when he plans to introduce National Health Service body-worn and ear-level aids comparable with the most powerful ones in the commercial sector.

Mr Alfred Morris: I regret that information is not available on which to base a reliable estimate. A small number of representations about the provision of commercial hearing aids have been received. The number increased slightly following publication of the report. The Government are committeed to extending and improving hearing aid provision as soon as resources permit.

Mr Ashley asked the Secretary of State for Social Services (1) if he will take steps to ascertain the number of children who are on waiting lists for commercial aids which have been prescribed by consultants but which the hospitals cannot supply immediately because of cost restrictions; and if he will publish the figures on an area basis;

(2) how many hospitals where consultants prescribe hearing aids have requested an increased allocation of funds for the provision of commercial hearing aids.

Mr Alfred Morris: I am not aware of any general delay in the provision of commercial hearing aids to children through the National Health Service. I understand that one hospital in London is seeking an increase in its financial allocation for hearing aids in 1979 - 80 and has also issued a few hearing aids from the standard range, as a temporary measure, because the commercial aids that have been prescribed cannot be supplied immediately due to difficulties over funding.

Mr Ashley asked the Secretary of State for Social Services (1) if he will issue a circular recommending that consultants should prescribe commercial hearing aids paid for by the National Health Service, in all cases where they are of greater benefit to profoundly deaf children than the National Health Service aids even if the child has to go on a waiting list;

(2) whether his Department has issued advice on consultants on the circumstances under which they should prescribe commercial aids.

Mr Alfred Morris: Commercial hearing aids may be issued to children when, in the opinion of the consultant, their clinical needs cannot be met from the standard range of NHS aids. Guidance to that effect was first issued in March 1974, and is updated as necessary.

Mr Ashley asked the Secretary of State for Social Services (1) if he will estimate the number of deaf adults who are not helped by the current National Health Service aids but would be helped by the commercial aids; and if he will express this number as a proportion of the number of adults who use a National Health Service aid;

(2) if he will estimate the cost of the National Health Service paying for commercial aids for all adults who would benefit from them and cannot benefit from the current National Health Service aids.

Mr Alfred Morris: I regret that information on which to base reliable estimates is not available, but the number is believed to be very small.

Mr Ashley asked the Secretary of State for Social Services (1) how many children have been issued with hearing aids by the National Health Service for each year since 1974; and what proportion of them have been issued with commercial aids;

(2) if he will give the ratio of commercial to National Health Service aids prescribed for children in each National Health Service region;

(3) if he will estimate the number of deaf children whose deafness is such that they get more benefit from commercial aids than from the National Health Service ones; and what proportion these are of all deaf children.

Mr Alfred Morris: No reliable estimate can be made of the number of children who receive more benefit from a commercial hearing aid than from an aid in the standard NHS range. Information about issues of hearing aids is not available in the form requested, but it is estimated that, in 1977, one-quarter of all hearing aids issued to children were commercial models.

Mr Ashley asked the Secretary of State for Social Services if he will give the cost of the National Health Service aids and of the commercial aids provided through the National Health Service for each year since 1974; and if he will express the cost in money and real terms.

Mr Alfred Morris: It is not the practice to disclose unit prices for individual articles purchased under Government contracts. However, the total central expenditure for England, which includes purchase of aids and accessories together with batteries, earmoulds, repairs of aids and stock provisioning, was as follows:

	£
1974 - 75	2,174,816
1975 - 76	4,576,201
1976 - 77	5,294,090
1977 - 78	5,863,869

Excluding fitting and diagnostic costs, the average cost of National Health Service hearing aids issued to patients including repaired and re-issued aids was:

	£
1974 - 75	7·14
1975 - 76	13·05
1976 - 77	14·13
1977 - 78	15·48

The bulk of the increase between 1974 - 75 and 1975 - 76 was due to the introduction into general supply of behind the ear hearing aids. I regret that changes in the range of models supplied over the period would make it impossible to construct an accurate overall price index for hearing aids purchased centrally for the National Health Service.

Information is not available centrally of the costs of commercial hearing aids provided by National Health Service authorities.

Audiology Technicians

Mr Ashley asked the Secretary of State for Social Services (1) if he will publish the number of audiology technicians working in the National Health Service for each of the past five years:

(2) what evidence there is of a shortage of audiology technicians; and what representations he has received concerning a shortage.

Mr Deakins: The number of qualified physiological measurement technicians — audiology — employed in the National Health Service in England has been as follows:

1973	391
1974	433
1975	399
1976	411
1977	451

Notes

(i) Due to problems associated with reorganisation, the accuracy of the 1974 manpower figures is open to question.

(ii) All figures are expressed as whole time equivalents.

I have received no representations concerning a shortage of audiology technicians, but I understand that some health authorities experience difficulty from time to time in recruiting trained staff.

Mr Ashley asked the Secretary of State for Social Services if he will list the centres which train audiology technicians; if he will give details of the type of course provided; and if he will state how many technicians who took part in pilot training schemes in physiological measurement later became audiology technicians.

Mr Deakins: Regional health authorities are responsible for co-ordinating the action taken to organise courses of training solely for physiological measurement technicians — audiology. These courses are in addition to ordinary and higher national certificate courses which train physiological measurement technicians generally. A comprehensive list of centres which train physiological measurement technicians — audiology — separately is not held centrally, but the following centres in England are known to take students from other regions: Matthew Boulton Technical College, Birmingham; North Riding infirmary, Middlesborough; St Mary Abbot's Hospital, London; The Institute of Laryngology and Otology, London.
My Department has recommended an outline training course which centres are expected to follow. Part A consists of theoretical and practical instruction in the following: theory of hearing and speech; medical aspects of hearing loss; principles involved in hearing aids; taking of aural impressions and the fitting and checking of aids. Part B consists of further theoretical and advanced practical instruction to those who will undertake higher grade duties as follows:

(i) Theoretical studies: Anatomy and physiology; electricity; acoustics; rehabilitation methods.

(ii) Advanced practical training: Speech audiometry; loudness balance test; masking; application of audiometry to children; auditory techniques; special techniques.

I regret that the answer to the third part of the question is not readily available.

Mr Ashley asked the Secretary of State for Social Services if he will give the number of technical colleges now offering Ordinary or Higher National Certificate courses in physiological measurement; and how many audiology technicians have emerged from such courses.

Mr Deakins: In England there are 12 further education establishments offering Ordinary National Certificate courses in medical physics and physiological measurement and four offering the Higher National Certificate. It is not known how many physiological measurement technicians—audiology—have emerged from such courses. The courses are broadbased and those who obtain an ONC, for example, are qualified to work in any physiological measurement specialty.

Mr Ashley asked the Secretary of State for Social Services what representations he has received concerning the proposed scheme for training audiology technicians under the aegis of the Technician Education Council; and whether his Department's advisory committee on services to hearing for impaired persons has reported its views on the proposed Technician Education Council scheme for training audiology technicians.

Mr Deakins: None. A sub-committee of the Advisory Committee on Services for Hearing Impaired People is at present considering the training and qualifications of physiological measurement technicians — audiology — and I expect to receive its report next year.

23 FEBRUARY

Hearing Impairment

Mr Pavitt asked the Secretary of State for Social Services when last he issued a departmental circular to general practitioners informing them of the latest developments for the amelioration of hearing impairment.

Mr Alfred Morris: In October 1977, the Chief Medical Officer of my Department wrote to general practitioners informing them of the final extension of the programme for the exchange of body-worn hearing aids for a behind-the-ear model. With his letter was enclosed a copy of the Department's booklet 'General Guidance for Hearing Aid Users'. My Hon Friend can be assured that general practitioners will be kept fully informed of any significant further extensions of service provision.

7 MARCH

Unidentified Noise

Mr Palmer asked the Secretary of State for the Environment if he will make a statement about an unidentified continuous noise recorded in several parts of the country, including Bristol, having a frequency of 40 Hz.

Mr Denis Howell: There is no evidence of a particular low frequency noise which is present throughout the country. There is evidence that in some cases where complaints about noise have been made, a low frequency tone is present. I am awaiting with interest the results of the research at Chelsea College, London, into case histories of complaints about low frequency noise. □

(In addition, members may like to consult Hansard for 23 February 1979 for details of the debate on the Hearing Aid Council Act 1968 (Amendment) Bill.)

Non-Institute Meetings

1979		
28-31 August	International Tyre Conference	Stockholm
11-14 September	Internoise 79	Warsaw, Poland
17-18 September	Non-linear and Active Mechanical Processes in the Cochlea (Institute of Laryngology and Otology)	London
9-11 November	1st Week-end Conference of the British Association of Teachers of the Deaf	Brighton, UK
27-30 November	On the Protection of Workers against Noise	Dresden, GDR
1980		
21-25 April	3rd Seminar on Noise Control (Hungarian Optical, Acoustical and Film Technology Society)	Székesfehérvár, Hungary
9-16 July	10th ICA	Sydney, Australia

Book Reviews

Acousto-Optics

J Sapriel

English translation by S Francis and B Kelly

John Wiley and Sons 1979
126 pp £8.00

The development of the laser has been an important factor in the increased activity in acousto-optics during the last decade, although the interaction was discovered by Leon Brillouin some sixty years ago. The book under review was first published in 1976, in French under the title *L'acousto-optique*, the author being J Sapriel, of the Centre National d'Etudes des Télécommunications.

The initial chapters are respectively devoted to an introduction to the use of tensors to represent the physical properties of solids and elasticity theory, followed by chapters on basic acoustical propagation theory firstly in non-piezoelectric and secondly in piezoelectric media, particular reference being made to surface waves. In chapter V the author discusses relevant crystalline optical properties and quotes the work of Nelson and Lax who pointed out the inadequacy of Pockels' phenomenological description and the need to introduce a term due to the indirect photoelastic effect. The three remaining chapters are concerned with light diffraction by an acoustic wave, acousto-optic deflectors and modulators, and experimental determination of acoustic and acousto-optic characteristics of materials. The latter chapter contains useful data on various materials and there are two useful appendices, one dealing with the matrix presentation of physical properties of crystals and the other with circuit equivalents to an acoustic delay line.

The author set out to condense into a minimum number of pages the basic theory and practical applications of acousto-optics and despite this compression he has achieved a readable and clear text, which is moreover implemented by suitable exercises with solutions at the end of the book. This monograph is deserving of a place on the bookshelf of those interested or working in the field of acousto-optics.

R W B Stephens

Reference Data for Acoustic Noise Control

W L Ghering

John Wiley and Sons 1978
150 pp £9.45

In this 150 page book, the author, who is a research scientist with Babcock and Wilcox, Alliance, Ohio, has brought together many of the facts and figures regularly used by practising noise control engineers. Eleven chapters are devoted to definitions and material constants, noise level estimation, transmission loss calculations, enclosure and barrier performance, standards, noise control techniques, annoyance and hearing damage risk criteria, characteristics of noise sources, structural radiation and response to sound, and statistical energy analysis. Fifty-nine figures, and thirty-six tables, many of which are drawn from Beranek's *Noise and Vibration Control* and other similar texts, are included in the book.

The usual subjects such as level difference between two rooms, and insertion loss of a full enclosure are covered, as also is double wall transmission loss (briefly), but information on, for example, excess attenuation in the atmosphere, due to wind and temperature gradients, is omitted.

The section on Standards is restricted to those of American origin, with no mention of the existence of ISO, and is therefore of limited use to UK readers. A further problem for UK readers is that, being American in origin, the author persists in using Imperial units, which are referred to in the text as 'engineering units', for much of the numerical work.

The section on noise sources includes data for fans (Graham method only), pumps, gears, compressors, control valves, and industrial air vents (after Burgess), although much of this information will already be known to the practising engineer. The ten pages devoted to structural radiation and response, and the four pages allocated to statistical energy analysis, seem a little out of context from the rest of the book.

Typographically, the book is of a good standard, with only a few errors such as transposed axes for at least one graph, and a reference to a 'plain wave', which perhaps is related to the 'great American plain' wave, bearing in mind the origin of the book.

Since the majority of the equations and graphical relationships found in the book are given without explanation, and often without guidance as to their limits of applicability, I would hesitate to recommend the book to anyone starting to work in noise control engineering. It is more suited to the practising engineer, who may well have copies of the various source books anyway. In this case, is the book of any value? First impressions were negative, but after having the book on my desk for a few days I found myself referring to it for frequently used data, rather than to the source material in Beranek, for instance; as such, I found it useful. I doubt, however, whether I would actually consider purchasing it at its price of £9.45. □

P D Wheeler

Scottish Notes

continued from page 12

to give a real-time, 93 line, image on a television monitor. By introducing swept phase delays on the received pulses we have also obtained dynamically-focussed images. The images produced by our prototype are nevertheless less satisfactory than we would like because the choice of frequency (2 MHz) not only limits axial resolution but also permits multiple-reflection artefacts. We feel that the need to avoid invasive investigations such as cardiac catheterisation is a spur for us to achieve diagnostically acceptable real-time scans of the heart.

Dr James M S Hutchison and Mr Robert B Selbie are responsible for the design and construction of the phased array, Graham Torr for ultrasound dosimetry, Dr Colin Martin and Dr Howard Gemmell for studies of the interaction of ultrasound with biological materials and Miss Linda Eastwood for the ultrasound spectroscopy. The group will be interested in collaboration with commercial companies for exploitation of both devices and ideas. □

D Watmough

(Copy for Scottish Notes to Dr R Hill, School of Physics, RGIT, Aberdeen.)

London Evening Meetings

The Effects of Vibration on People

The current series of London Evening Meetings continued with the talk given on 1 March 1979 by Dr Mike Griffin, entitled *The Effects of Vibration on People*. The speaker introduced the whole topic with a picture of Gladstone's journey on early underground trains. An excellent review was given of the various stages between vibration measurement, transmissibility studies and finally the subjective and objective responses of differing groups of the population standing, sitting and even lying down. The secret was revealed that the best position for travel in certain railway coaches is sitting on the floor rather than on the seats! Also mention was made of the amplifying effect of devices previously presumed to reduce vibration, in relation to anti-vibration boots, gloves, car seats and beds.

The speaker critically discussed the ISO 2361 standard and gave some early thoughts on standards in general for protecting the population at work and at home against discomfort or damage due to vibration. He finished with an outline of the major study in progress at ISVR on building vibration, and smaller studies on specialist areas.

A useful discussion on topics ranging from operating theatre criteria to the differing sensitivity to vibration experienced by assorted persons of assorted ages, including the vibration isolation of beds, concluded this interesting and entertaining meeting.

The ISVR Work on Noise Pollution

On 29 March Prof J B Large, Director of the Institute of Sound and Vibration Research at Southampton, in a talk entitled *The ISVR Work on Noise Pollution*, gave a detailed description of the ISVR and its development from its very small research beginning in 1963 to its present role as an international Institute with an annual budget approaching £1.3 million, and carrying out not only research but teaching and consultancy services. These include clinical audiology work on over 3,000 patients a year, a very sophisticated data analysis centre, and the automotive and Wolfson consulting units.

Prof Large reviewed the work in the operational acoustics and audiology group on the response of human beings to noise. He went on to resist strongly the American and European simplified approach as expressed in Schultz's work, where he coalesces many social surveys to produce an apparently simple relationship between noise and a percentage of people highly annoyed. Findings by Rice had re-analysed Schultz's data and, for instance, had shown that the rating of aircraft noise varied for equal noise exposure on the actual annual throughput through the facility. He referred to Dr Walker's railway work, showing that where locomotive units were concerned, people apparently found that a diesel was just as undesirable, although it contributed 10 less on an L_{eq} scale than an electric drive unit.

In summary, his view was that there needed to be two levels of approach to the effects of noise: that for strategic planning, with the use of the universal units, and then a local evaluation such as indicated in BS 4142 and taking into account local factors. One of the most important topics discussed was the validity of not revising ISO 1996 at this stage. The general feeling seemed to be by all means revise it, but there's no real data to revise it on — preferably, however, don't use it anyhow!

Planning and Noise Control for Industrial Developments

At the start of his talk on 26 April Ken Ratcliffe identified one of the few hazards of being a regular attender at these meetings. He had been spotted and asked to give one of the talks! Under the title *Planning and Noise Control for Industrial Development* he described as a case history the preparation of evidence for a Public Inquiry. The application related to a proposed extraction of Fuller's Earth from an attractive part of rural Bedfordshire. The extraction process used could best be described as open-cast mining. About 45-60 m of sandy soil needed to be removed to reveal the 2.5 m deep seam of the mineral deposit. The plant used for this operation consisted of items like scrapers, dump-trucks and bulldozers.

LONDON EVENING MEETINGS — SEPTEMBER 1979/MAY 1980

27 September 1979 by G Vulkan, GLC	AIRPORT NOISE — A NECESSARY EVIL?
18 October 1979 by H Davies, Crane Ltd	NOISE IN FOUNDRIES
29 November 1979 by David Martin, TRRL	CONTROLLING ROAD CONSTRUCTION NOISE
EVENT: December 1979 Joint organisers: Alan Cummings Alan Saunders	An outing is being arranged which hopefully will embrace both acoustic interest and Christmas good cheer. Details in the October edition
17 January 1980 by Terry Wagstaff, DHSS	NOISE IN HEALTH CARE BUILDINGS
14 February 1980 by a speaker from BRE	SOUND INSULATION BETWEEN DWELLINGS
20 March 1980 by M S Ankers, EHO Manchester	NOISE NUISANCE NORTH OF WATFORD
17 April 1980 by Alan Gibson, B & K Labs	INSTRUMENTATION FOR NOISE AND VIBRATION . . . (title to be confirmed)
15 May 1980 by Alan Martin, ISVR	NOISE AND DEAFNESS

Enquiries to: Robert Hill
GLC Scientific Branch
County Hall
LONDON SE1 Tel 01-633-7709

This Inquiry was held in 1976 and at that time no prediction techniques were available to enable the resulting noise levels to be calculated. The speaker described the measurements that were taken to determine the noise emission from the plant, the problems involved in combining these levels to express the time-level history and the methods used to establish the attenuation of this noise across hilly, wooded terrain. As usual with work of this nature, much heart-searching was needed in deciding on suitable noise units and criteria for evaluating the likely nuisance to the affected residential property. As a matter of policy the information presented to the Inspector was based on calculations of the 'worst case'.

A lively discussion followed the presentation but regrettably this had to be cut short as Ken had to return to the site of the traffic noise survey that he was engaged on. The hard life of a Consultant !

J G Charles
R C Hill

Details of the forthcoming fourth session of London Evening Meetings, running from September 1979 to May 1980, are being finalised at present, and an outline of the programme follows. More information about the Christmas 'event' will be given in the October edition of Acoustics Bulletin, and a Meeting Notice will shortly be circulated to IOA members which will include synopses of the subjects to be discussed in the pre-Christmas meetings.

Association of Noise Consultants

The 6th AGM of the Association was held at the Royal Society on 1 May 1979. In accordance with the Constitution, all officers of the Association resigned. Peter Allaway (Grootenhuis Allaway Associates) was re-elected as Chairman for a second term; Francis Oakes (Cremer and Warner) was re-elected as Vice-Chairman for a second term, but passed the post of Honorary Treasurer to Bob Hood (RTM Partnership). Geoffrey Leventhall (Jessop Leventhall and Associates) did not stand for re-election as Honorary Secretary, but was warmly thanked for his services to the Association over the past three years. Richard Galbraith (Sandy Brown Associates) was elected as Honorary Secretary. □

INSTITUTE MEDALS

Rayleigh Medal

The medal is awarded, without regard to age, to persons of undoubted acoustic renown for outstanding contributions to acoustics. The medal is normally awarded to a United Kingdom and to a foreign acoustician alternately. A suitable citation accompanies the presentation of the medal to the recipient. As a condition of the award, each recipient is required to give a presentation in a suitable form, to the Institute, of an acoustical topic of his interest.

(*The* 1980 *Medal is expected to be awarded to a UK worker.*)

Tyndall Medal

This medal is awarded biennially to a citizen of the United Kingdom, preferably under the age of 40, for achievement and services in the field of acoustics. A suitable citation accompanies the presentation of the medal to the recipient. As a condition of the award, each recipient is required to give a talk on an acoustical subject of his choice. The award is made in even-numbered years, normally at the Autumn Meeting.

A B Wood Medal and Prize

This is an annual award made for distinguished contributions in the application of acoustics, preference being given to candidates whose work is associated with the sea. The award consists of a silver-gilt medal, a parchment scroll, and a cash prize. It is made alternately to a person domiciled in (i) the United Kingdom and (ii) in the USA or Canada. The recipient is preferably under 35 years of age in the year of award, which is normally made on a suitable occasion in the United Kingdom. Opportunity is given for the recipient to deliver a lecture at the time of the presentation.

(*The* 1980 *Medal is expected to be made to a UK worker.*)

(*Anyone wishing to put forward a name for consideration by the Medals and Awards Committee should write in strict confidence to the President, enclosing a brief outline of achievement etc before* 15 *September.*) □

RECENT PUBLICATIONS

The sound insulation of wood joist floors in timber frame.

W A Utley and P Cappelen.

BRS Current Paper 46/78.

Full-scale and model-scale studies of the dynamic behaviour of an off-shore structure.

B R Ellis, A P Jeary and P R Sparks.

BRS Current Paper 39/78.

The dynamic behaviour of the Arts Tower, University of Sheffield, and its implications to wind loading and occupant reaction.

A P Jeary (Editor).

BRS Current Paper 48/78.

Manual audiometry: a comparison of two methods.

M S Shipton.

National Physical Laboratory Acoustics Report Ac 88, November 1978.

Normal hearing threshold and its dependence on clinical rejection criteria.

D W Robinson, M S Shipton and R Hinchcliffe.

National Physical Laboratory Acoustics Report Ac 89, February 1979.

A damped flat-plate coupler for use in calibrating circumaural earphones.

M E Delany and E N Bazley.

National Physical Laboratory Acoustics Report Ac 90, March 1979.

Catalogue of Acoustical Standards (USA).

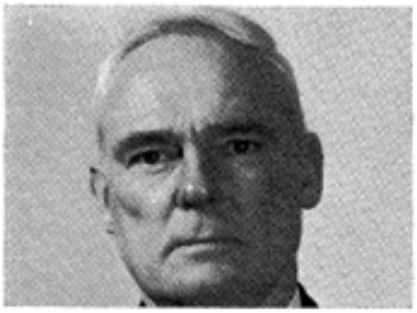
Catalogue No 1-1979, available from the Acoustical Society of America.

Occupational hearing loss: conservation and compensation.

R L Waugh and J H Macrae (Editors).

Proceedings of 1978 Annual Conference of the Australian Acoustical Society, December 1978.

BIRTHDAY HONOURS



Congratulations to Prof R E D Bishop, Kennedy Professor in Mechanical Engineering at University College, London, who was awarded a CBE in the Queen's Birthday Honours.

Congratulations to Raymond E Cooke, Managing Director of KEF Electronics Ltd, who was awarded an OBE in the Queen's Birthday Honours.

Calls for Papers

The Meetings Committee of the Institute of Acoustics are always pleased to receive offers of contributions to any of its Meetings. Contributions are particularly sought for the following:

Underwater Applications of Non-Linear Acoustics
(ranging from the theory relevant to parametric arrays to their routine use as tools in underwater applications)
University of Bath, 10-11 September 1979
Meeting Organiser: Dr N G Pace, School of Physics, University of Bath, Claverton Down, Bath, Avon
(200/300 word abstracts as soon as possible)

Non-Physical Aspects of Noise and Noise Criteria
Portsmouth Polytechnic, 5 October 1979
Meeting Organiser: Dr J Powell, School of Architecture, Portsmouth Polytechnic, Portsmouth
(200 word abstracts as soon as possible)

Autumn Conference
(joint with British Society for Audiology)
Hydro Hotel, Windermere, 4-6 November 1979
Contributions are invited for consideration on any aspect of acoustics including Speech Research, Audiometry and Noise in Industry
Conference Organiser: Dr R Lawrence, Acoustics Group, Liverpool Polytechnic, Byrom Street, Liverpool 3
(200 word abstracts as soon as possible)

Noise in Large Cities
Institution of Civil Engineers, London, 6 December 1979
Meeting Organiser: Mr R Hill, Scientific Branch, Room 758, Greater London Council, County Hall, London
(200 word abstracts by 15 September)

Progress in Sector Scanning Sonar
Fisheries Laboratory, Lowestoft, 18/19 December 1979
Meeting Organiser: Mr R B Mitson, Ministry of Agiculture and Fisheries, Fisheries Laboratory, Lowestoft, Suffolk NR32 5DA
(200 word abstracts by 15 September)

Elastic Wave Propagation and Scattering in Seismology and Materials Testing
(joint with Joint Association of Geophysics and Institute of Physics Materials and Testing Group)
Geological Society, London, 27/28 February 1980
Conference Secretary (IOA): Dr L J Bond, Department of Physics, The City University, Northampton Square, London EC1V 0HB
(200 word abstracts by 1 October)

Spring Conference 1980
Bedford College, London, 8/11 April 1980
Conference Organiser: Dr H G Leventhall, Chelsea College, Pulton Place, London SW6 5PR
Contributions are invited on any aspect of acoustics particularly Noise in Building Services, Design for Good Sound in Buildings, Acoustics in Condition Diagnosis (Machines and Man), Physical Acoustics and Ultrasound
(200 word abstracts by November 30)

New Products

Submissions for inclusion in this section should be sent direct to J W Sargent, Building Research Establishment, Garston, Watford WD2 7JR.

Kemo catalogue

Kemo Ltd has just produced a new 36-page catalogue giving full details of the company's range of low frequency signal processing systems and electronic filters. Products covered in the catalogue include variable filters, custom-designed OEM filters, spectrum shapers, analogue memories and phasemeters. In addition, a section is included dealing with Kemo's consultancy, design and manufacturing service for instruments used in the processing of electronic signals in the frequency range 0.001 Hz to 100 kHz.

Catalogue from: Kemo Ltd, 9-12 Goodwood Parade, Elmers End, Beckenham, Kent BR3 3QZ.

Kaye Visipitch

The Kay Model 6087 'VISIPITCH' is a split-screen storage scope display system intended to assist those teaching students with serious speech difficulties due to impaired hearing. The instructor stores on the upper half of the split screen a sentence with proper intonation and then the student attempts to create a similar pattern.

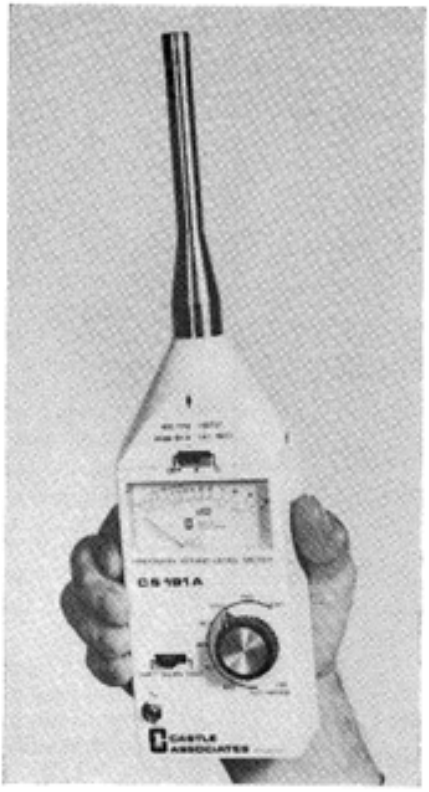
The Display Time can be 1, 2, 4 or 8 seconds in duration and the frequency range can be adjusted to be a function of the voice quality and range of speech sounds being recorded.

Full details may be obtained from Wessex Electronics Ltd, 114-116 North Street, Downend, Bristol BS16 5SE. Telephone 0272 571404.

Castle CS 191A

Castle Associates CS 191A provides a basic hand-held precision sound level meter. This is fitted with the new Castle half-inch microphone MK 201B, a high polarisation voltage condenser microphone. The CS 191A has a conventional logarithmic meter scale and, in addition to A-weighting, provides either C-weighting or a linear response (customer-specified option). The alternative weighting will typically be used for vibration measurements which can be achieved by means of a Vibration Adapter ZE 322B and Accelerometer Set KD 36A. Both fast and slow meter responses are provided.

Application of the CS 191A will be found in industries where accurate measurement of the sound levels to which employed persons are subject is available. Full support for the CS191A is provided by its companion measurement kit K6. Recently revised to keep the range fully up to date, the kit provides in a slim, lightweight attache case the accessories normally required for general-purpose sound measurements — tripod, windshield and wrist-strap. A calibrator CA16 is provided in the kit, as are a spare set of batteries and a screwdriver for calibration adjustment. List price £399. For further details contact David Marsh on 0723 66347. □



Castle CS 191A Level meter

Dr W A Allen has accepted Honorary Fellowship of the Institute of Acoustics. The presentation was made at the IOA Spring Conference held at Southampton.

British Association of Teachers of The Deaf

The first week-end course/conference of the British Association of Teachers of the Deaf will be held at the Metropole Hotel, Brighton, from 9-11 November 1979. The general title is *Comprehensive Counselling* and covers counselling and guidance available to the hearing-impaired child, to his family, and to those concerned with his education and welfare. Four schools for the deaf in the Brighton area may be visited on Friday 9 November. On Saturday 10 November three separate sessions will cover the pre-school, the primary-school and the secondary-school age, followed on Sunday morning by a session called 'The Recipients'. The Annual General Meeting of the BATOD will also take place on Sunday 11 November.

For further information contact Mrs S E Knowles, Audiology Unit, Hollyeld School, Surbiton Hill Road, Surbiton, Surrey KT6 4TU. □

Standards

Recent British Standards

BS 5428 : Part 8 : 1979 Methods for specifying and measuring the characteristics of sound system equipment.

Part 8 Artificial reverberation, time delay and frequency shift equipment.

BS 5721 : 1979 Frequency weighting for the measurement of aircraft noise (D-weighting).

BS 5428 : — Methods for specifying and measuring the characteristics of sound system equipment.

BS 5428 : Part 7 : 1979 Automatic gain control devices. (IEC 268-8).

BS Drafts for Comment

78/31443 DC Basic environmental testing procedures.
Part 2.1 Tests Fc : Vibration (sinusoidal).

78/80831 DC Ultrasonic testing of steel plates (BS 4336).

79/22306 DC Audio-visual, video and television equipment and systems.
Part 1 : General (IEC 574-1).

79/22463 DC Audio-visual, video and television equipment and systems.
Part 10 : Audio cassettee systems (IEC 574-10).

79/22464 DC Audio-visual, video and television equipment and systems.
Part 2 : Explanation of general terms (IEC 574-2).

79/71253 DC Vibration and shock — Mechanical driving impedance of the human body (ISO/DIS 5982).

Recent International Standards

IEC 268 : — Sound system equipment.

IEC 268-10A : 1978 First supplement to IEC 268-10 : 1976 (will be implemented with IEC 268-10 in BS 5428 : Part 9).

IEC 268 : — Sound system equipment.

IEC 268-15 : 1978 Preferred matching values for the interconnection of sound system components (will be dual-numbered with BS 5428 : Part 10).

IEC 581 : — High-fidelity audio equipment and systems. Minimum performance requirements.

IEC 581-3 : 1978 Record playing equipment and cartridges (will be implemented as a dual-numbered BS).

ISO 3741-1975 Acoustics — Determination of sound power levels of noise sources — Precision methods for broad-band sources in reverberant rooms. AMENDMENT. □

Institute of Acoustics Meetings

1979			
2 August	SG	Speech Production Modelling	University of Leeds
23/24 August	BA	Room Acoustics with Emphasis on Electro-acoustics	Heriot-Watt University, Edinburgh
10-11 September	UA	Non-Linear Acoustics	University of Bath
27 September	LEM	Airport Noise — A Necessary Evil	County Hall, London
5 October	M	Non-Physical Aspects of Noise and Noise Criteria	Portsmouth Polytechnic
18 October	LEM	Noise in Foundries	County Hall, London
24 October	BA	Visit to National Theatre and Meeting on Design of Olivier and Littleton Theatres	National Theatre, London
4-6 November	M	**AUTUMN CONFERENCE** (Sessions on Speech Communication, Audiometry and Noise in Industry)	Hydro Hotel, Windermere
29 November	LEM	Controlling Road Construction Noise	County Hall, London
6 December	M	Noise in Large Cities	Institution of Civil Engineers, London
18/19 December	UA	Progress in Sector Scanning Sonar	Fisheries Laboratory, Lowestoft
December	SG	Speech Production and Perception in the Disabled (Joint with British Society for Audiology)	University College, London
1980			
27/28 February	M	Elastic Wave Propagation and Scattering in Seismology and Non-Destructive Testing (Joint with Joint Association of Geophysics and Institute of Physics Materials and Testing Group)	Geological Society, Burlington House, London
March	BA	Buildings, Noise and Man	Building Research Station, Garston
8/11 April	M	**SPRING CONFERENCE** (Sessions on Noise in Building Services, Design for Good Sound in Buildings, Acoustics in Condition Diagnosis (Machines and Man), Physical Acoustics and Ultrasound)	Bedford College, London
7/9 May	M	Low Frequency Noise and Hearing (Joint with the Danish Acoustical Society and Aalborg University)	Aalborg University Centre, Denmark

Key

LEM = London Evening Meeting
BA = Building Acoustics Group
UA = Underwater Acoustics Group
SG = Speech Group
M = Meetings Committee Programme

Further details from:
Institute of Acoustics
25 Chambers Street,
Edinburgh, EH1 1HU