



Noise Control and Acoustics Division Newsletter

Gary H. Koopmann, Editor

March 1990

Sir James Lighthill gives 1989 Rayleigh Lecture

Over three hundred persons attended the Rayleigh Lecture given by Sir James Lighthill at the 1989 American Society of Mechanical Engineers Winter Annual Meeting in San Francisco this past December. Jointly sponsored by the Noise Control and Acoustics Division and the Bioengineering Division, the lecture was entitled, "The Biomechanics of Hearing Sensitivity". The inner workings of the human cochlea and the related place principle were discussed. The place principle suggests how the basilar membrane of the inner ear vibrates in locations unique to the frequencies of vibration of the imposed external air-borne sound field. The lecture centered around the use of group velocity concepts in order to prove that basilar membrane oscillation, once begun through adjacent middle ear vibration, steepens in magnitude and eventually peaks at a location coinciding with wave energy termination due to local dissipation through the mechanism of critical layer absorption at a particular spatial point that is associated with a particular frequency. The key feature of this most recent contribution is the formation of conclusions based only on the experimental data of researcher, University of Wisconsin neurophysiologist, Dr. Rhode. Sir James deduced phase information from Rhodes' data and showed how basilar member wavelengths, which are initially long in comparison to typical cochlear dimensions, begin with increasing distance to steepen in amplitude and shorten in wavelength. His results indicate that in a brief transition region near the point of maximum excitation, the phenomena is entirely of a short wavelength nature. A master in the use of energy flow concepts and group velocity in particular, Sir James has used this expertise to independently confirm and provide new insights into this well-known physiological phenomena.

Most recently retiring from his position

as Provost of University College, London, a position that he held between 1979 and 1989, Sir James has served in numerous honored positions over his long and distinguished career. These include being the Lucasian Professor of Mathematics at Cambridge University (1969-1979). This same chair was once held by Sir Isaac Newton. Prior to being at Cambridge, he was Royal Society Research Professor at Imperial College, 1964-1969; Director RAE Farnborough, 1959-1964; Beyer Professor Applied Mathematics, University of Manchester, 1950-1959; Senior Lecturer in Maths, University of Manchester (1946-1950). Sir James has served as Secretary and Vice-President of the Royal Society (1965-1969) and has held many, many other honors and positions and possesses a mammoth publications record.

His contributions to the field of applied mathematics and fluid mechanics include pioneering work on dynamic turbulence and studies on the motion of fish in

water and flying birds.

In the field of acoustics and noise control, perhaps his most important contribution is his oft quoted paper, "On Sound General Aerodynamically. I. General Theory". *Proc. Roy. Soc.*, 24, 1952, and its companion, "On Sound Generated Aerodynamically: II. Turbulence as a Source of Sound", *Proc. Roy. Soc.*, 222, 1954. These papers helped to set the stage for much of modern noise analysis and control.

The Noise Control and Acoustics Division is fortunate to have Sir Michael James Lighthill give the Rayleigh Lecture on the important topic of hearing sensitivity.

Ingard Received First Per Bruel Gold Medal

At the Honors Assembly of the 110th ASME Winter Annual Meeting, December 13, 1989, Dr. K. Uno Ingard, Professor at Massachusetts Institute of Technology

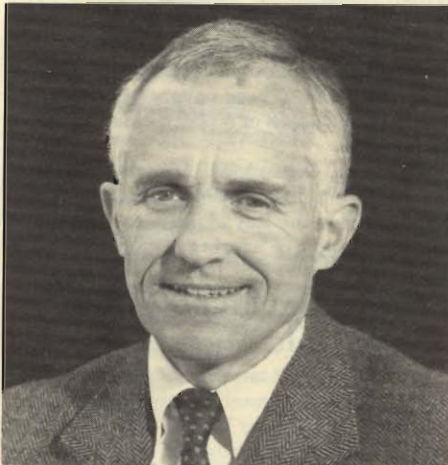


l to r: David Belden, Chuck Velsey, Uno Ingard and Phil Engelrood

received the Society's first Per Bruel Gold Medal. The medal recognizes eminent achievement and extraordinary merit in the field of noise control and acoustics, including useful applications, while honoring a pioneer in acoustics and vibration measurements. A dynamic audio-visual presentation of highlights from Professor Ingard's life and career, complete with "goose-bumps", preceded the conferral by President Chuck Velzy. Dr. Per Bruel was there and duly recognized to make it a truly memorable occasion. Professor Ingard was honored for his renowned scholarship, seminal contributions to the literature, deep physical insight in the physics of acoustics and inspiration to generations of students and colleagues. His inspiration will become, if it has not already, the Ingard legacy; and who can imagine its actual impact worldwide?

An interesting historical note is that Professor Ingard wrote his first paper with Dr. Bruel in the 1940s concerning a device that became known as the level recorder. This technology was an important part of the foundation for Dr. Bruel's company, sophisticated noise and vibration instrumentation and equipment.

Thank you Per Bruel and "bravo" Uno!
Terrence A. Dear



Eversman is NCAD Chairman for 1990-91

In the best of worlds the succession to the chairmanship of NCAD runs a five year cycle, beginning with election to the executive committee and then progressing through the positions of secretary/treasurer and vice-chairman, with other responsibilities not described by job titles occupying two other years. Because this is not a perfect world, and due to opportunities presented to other executive committee members both inside and outside of NCAD, here I am assuming the chairmanship in my third year. I am obviously not a seasoned veteran, but I hope to learn fast.

I take on the leadership role at a time when we are having great success in projecting our image outside the division and outside the society. At WAM '89 we presented the first Per Bruel Medal to Dr. K.U. Ingard. The award is endowed by an interest bearing fund which will allow us to honor on a regular basis those individu-

als who have distinguished themselves in the field of acoustics. The award is recognized as among the most prestigious in the society and will be part of the annual ASME award ceremony at WAM.

We have succeeded in promoting the establishment of the Journal of Vibrations and Acoustics which focuses its We were for many years just part of the crowd in the Journal of Vibration, Acoustics, Stress, and Reliability in Design. We can now much more effectively showcase our technical excellence before the world, and this should greatly enhance our image.

We have established a pattern of presenting to the society an outstanding Rayleigh Lecture each year. These have traditionally drawn a large audience from all segments of ASME. 1989 certainly ranks as a banner year with the presence of Sir James Lighthill, whose genius is not restricted to our field. His lecture on the mechanics of hearing appealed to a wide range of interests and fit in perfectly with the bioengineering theme of WAM '89. Both Alan Powell, who gave the Rayleigh Lecture in 1988, and Sir James Lighthill will publish the written versions of their presentations in the new journal.

We have also established a reputation for fellowship with the Wine and Cheese Social Event which now traditionally follows the Rayleigh Lecture. The 1989 get together was particularly successful and drew a large crowd.

Our technical offerings continue to be of world class in quality, and there is a slow but steady growth in quantity. Bob Bernhard did an excellent job in organizing the "International Symposium on Numerical Methods in Acoustic Radiation" at WAM '89. This followed an equally successful Symposium on Statistical Energy Analysis in 1987 organized by K. Hsu and Don Netske. We also achieve a lot of success with our continuing participation as a co-sponsor of the Symposium on Flow Induced Vibrations.

Yes, we are riding high on success, but there are many things to be done. We have made significant gains, but there is some consolidation to be carried out. NCAD has many members who have made significant technical contributions and have also served the society well. Yet we have relatively few members who are ASME Fellows. It is time for us to toot our own horn and establish a systematic procedure for identifying and nominating our qualified members.

We need to learn more about our membership and our potential membership. The success of our technical activities depends on participation. This includes participating from contributors of papers and participation from those who listen and discuss. In order to draw participants we need to know who we serve and how to reach them. A goal of the coming year will be to learn more about who is out there and the most effective way to reach them.

We have reached our present level of success largely because of the vision and dedication of the founders and those who have followed. To sustain this success and grow we need to strengthen our technical

activities. The key to this is in the hands of the technical committees. We hope to continue to strengthen the TC's, consolidate where advisable, and encourage long range planning of significant activities such as Symposia and bound volumes. We also look to the TC's for our future executive committee leadership. The TC's are where the action is and we hope you will take up the challenge.

I am looking forward to the coming year. I hope you are too.

Walt Eversman

Outgoing Chairman's Remarks

In reflecting back on my five years on the executive committee, it is evident that one great challenge facing volunteer organizations such as NCAD is the conservation of momentum. We need to constantly bring new and energetic people to our organization with new ideas to keep NCAD "on the roll" - a condition that is highly dependent on the level of dedication of our volunteers and the support that they get from their management. Meeting this second requirement is most critical and it is this one that seems to be losing ground, especially during the last few years when so many companies and funding agencies were trimming their budgets.

In searching for new people to assume leadership roles in NCAD, it is evident to me that the leadership pool is diminishing, particularly in the area of industry and government. The reasons given are that it is too costly for management to send their engineers and scientists to several meetings a year (usually a 3-4 day affair) which incur fairly high travel and lodging expenses. Many managers feel that their people can "catch up" on the latest technological developments simply by subscribing to the technical journals. This may be possible up to a point, but it is certainly short-sighted and overlooks the one thing that organizations like NCAD provide - the opportunity to interact with a wide range of people who have similar technical problems and who are solving them with a wide variety of approaches. Interaction is the key word. Our technical meetings are more than the presenting of papers to each other. That is just the starting point. What usually follows are intense discussions (usually one-on-one) and an exchange of information on an informal basis. This is what a technical meeting is all about and I think NCAD is doing an excellent job towards providing this kind of encounter.

So I extend a plea to our colleagues in industry, the university, and government. If you are a manager, please encourage your engineers and scientists to provide leadership roles in NCAD by supporting their volunteer activity. It is a critical ingredient for their professional growth, even more so for young people at the outset of their careers.

Personally, I have found my five-year membership on the NCAD executive to be

an extremely rewarding experience. As fellow volunteers, my colleagues shared the same challenges and frustrations cheerfully with a great deal of comradery. Their actions have certainly contributed to the momentum of NCAD. For their contributions during the two years that I chaired the division's activities, I extend my sincere thanks. NCAD is now in the very capable hands of our new chairman, Walt Eversman. Good luck to him and to all the new members on all of the committees. NCAD is still a young organization that needs nurturing and energy, and I think that we have an excellent team in place for the 1990's to carry the division forward.

Gary H. Koopmann

Outstanding Paper Recognized at WAM 89

An award for outstanding paper was made at the 1989 WAM to Professor Allan D. Pierce of the Pennsylvania State University and Hyun-Gwon Kil of the Georgia Institute of Technology for their paper "Elastic Wave Propagation from Point Excitations on Thin-Walled Cylindrical Shells". This paper was recognized by the reviewers as a major contribution to the field of structural acoustics and to the understanding of wave propagation in complex structures. Presentation of the citations to the authors was made at the wine and cheese social during the meeting in San Francisco.

R.F. Keltie

Membership Profile

To gain a better understanding of our Division member's interests, we obtained the membership database from ASME and analyzed the demographics and other dimensions which could assist us in our operations and service. The following charts reveal some interesting statistics and trends which may prove useful in establishing future goals and policy decisions.

We analyzed data for 465 individuals with the Noise Control and Acoustics Division selected as their primary area of interest. Additionally, 1,172 members chose NCAD as a secondary technical division of interest. The following data represents results obtained from the primary member data base, with the exception of "technical division interests" which include the secondary members as well.

Approximately half of our members are concentrated in 3 regions (3, 1, 5). Region 1 is the New England states with about 15%, Region 3 is New York, Eastern Pennsylvania, Delaware, and Maryland with 22%; and Region 5 is Ohio, Western Pennsylvania, West Virginia, Ontario, and part of Michigan at 11%. The other regions (2, 7, 8, 9, 12) each had less than 5% of the membership, representing about 18% of the total. Foreign members make up about 5% of our membership.

The median age of division members is 35, and the largest group (28-32) accounts for 23%. Recent college graduates would fall in the category of ages 23-27, representing 19%. Of our members, 72% are not

registered, although approximately 30% have passed the Fundamentals of Engineering exam, 44% have obtained Bachelor of Science Degrees, and another 31% have completed Masters Degree programs.

Our members work in many industries and the largest single employer is the Federal Government with 19%. Most of the employer categories (38%) have less than 4% of our membership individually. Miscellaneous services, transportation equipment, and educational services are the largest fields with 8, 7, and 5% membership, respectively. Although no single manufacturing or service industry employs a large percent of our members, 40% work in product or system design and applied research, 12% are managers 9% educators, and less than 2% students.

NCAD members reflected their interest in other technical divisions in the following way: applied mechanics 12%, design engineering 11%, dynamic systems and controls 10%, fluids engineering 7%, computer engineering 6%, and ocean engineering 6%, representing more than 50% of the secondary technical division interests. All other divisions had less than 3%. This information may be helpful in guiding us in future joint division activities.

William J. Hanson

New Journal Title Effective January 1990

Beginning with the January 1990 issue, the name of the journal serving the Noise Control and Acoustics Division has been changed to the *Journal of Vibration and Acoustics*. This change was made to reflect the focus and emphasis of the majority of the papers appearing in the Journal. It will also serve to strengthen the technical identity of the division and its activities. Many thanks go to the previous Technical Editor, Professor Tom Conry of the University of Illinois, who was instrumental in changing the title of the Journal.

R.F. Keltie

Technical Committee Information

Flow Induced Noise and Vibration

The Flow Induced Noise and Vibration Technical Committee sponsored two symposia at the 1989 Winter Annual Meeting in San Francisco, CA. Dr. W. Blake and Professor R. Arndt organized a multidivisional symposium on Cavitation Noise that consisted of five technical sessions containing a total of twenty papers. Drs. T. Farabee and J. Hansen organized a symposium on Flow-Induced Noise Due to Laminar-Turbulence Transition Process that

consisted of two technical sessions containing a total of six papers. Both of these symposia provided excellent technical exchanges as indicated by the quality of the papers presented and the level of attendance. The Committee's praise goes to both the organizers and authors of these symposia.

The Committee's plans for the 1990 Winter Annual Meeting were to sponsor technical sessions on Interactive Aspects of Flow-Induced Noise and Vibrations as well as on Flow-Induced Noise and Vibration in Multiphase Flows. The call for papers did not generate sufficient interest and it has been necessary to cancel these symposia from the plans for the 1990 WAM. It is planned that the latter symposium will be re-scheduled for the 1992 WAM and be part of the International Symposium on Flow Induced Vibration and Noise that is scheduled.

Plans for the 1991 Winter Annual Meeting are that the Committee will sponsor technical sessions in two areas: (1) Hydroacoustic Facilities and Instrumentation Techniques, and (2) Flow Noise Modeling, Measurement and Control. Two technical sessions are planned for each symposium. Both symposia will be jointly sponsored with the Fluids Engineering Division and the former is to be jointly sponsored with the NCAD Instrumentation Committee. Additional information on these symposia is contained in the call for papers included elsewhere in this newsletter.

As is true of all professional societies the health of the society is measured by the level of participation in society activities by those that the society serves. In pursuit of a healthy and active Noise Control and Acoustics community you are encouraged to share your thoughts and ideas by participation in the activities of the Technical Committees. The Technical Committees meet during the Winter Annual Meetings and are open to anyone who wishes to attend. Further information about activities of the Flow Induced Noise and Vibration Committee can be obtained by contacting the Committee Chairman, Dr. T. Farabee, David Taylor Research Center, Code 1942, Bethesda, MD, 20084-500 at (301) 227-1731.

T.M. Farabee

Experimental Acoustics and Instrumentation

The Technical Committee on Experimental Acoustics and Instrumentation organized a session for the Winter Annual Meeting in San Francisco on December 15, 1989. In this session several experimental techniques based on acoustic field imaging were discussed. The session was very well attended and it stimulated interesting discussions. The committee is actively seeking new members. Specifically, the committee is seeking industrial members because the majority of current members represent academic or research institutions.

The committee is also planning to organize a session during the WAM 1990. Computer-

ized experimental methods will be the focus of this session.

Anna Pate

Analysis Techniques in Acoustics

The main thrusts of the committee during 1989 was an International Symposium on Numerical Techniques in Acoustic Radiation organized by Professor Robert Bernhard of Purdue University for the WAM '89 in San Francisco. Six technical sessions with topics ranging from Boundary Element, Finite Element, Double Asymptotic Approximation, Probabilistic to Variational Methods were presented. All contributed papers at the Symposium were published in an ASME bound volume, NCA-Vol. 6. The Symposium and volume should serve for many years as a reference to numerical methods in acoustics radiation.

In a parallel effort, the committee also organized two technical sessions on general topics on Analysis Techniques in Acoustics at WAM '89. These papers can also be found in an ASME bound volume NCA-Vol. 7.

For WAM '90 in Dallas, Dr. Shung Sung of General Motors Research Laboratories is taking the lead for the committee to organize a Symposium on Vehicle Noise which is to be co-sponsored by the Ducts and Silencers Committee (Dr. John Lamancusa of Penn State) and Dr. Bruce Walker. The committee is also looking ahead for the WAM '91 in Atlanta. A Symposium on Structural Acoustics is being proposed for WAM '91. This Symposium will be jointly sponsored by the Analysis Techniques and Structural Acoustics Committees. Prof. Andy Seybert of the University of Kentucky will be taking the lead for the Analysis Techniques Committee and Professor Richard Keltie of the North Carolina State University will be taking the lead for the Structural Acoustics Committee. Participation by other NCA committees in this symposium will be welcomed.

The committee will continue its schedule of annual committee meetings in conjunction with the ASME WAM. All committee members and other interested parties will be notified of the committee meeting by mail approximately one month before the scheduled date. Committee membership remains open to all who have interest in analysis techniques in acoustics and wish to help guide our efforts in this field. The committee is pleased to add to its members Dr. P.K. Raju of Auburn University and Dr. Yang-Ham Kim of Korea Institute of Technology. Please contact K.H. Hsu, Babcock & Wilcox (216) 860-2653 if you are interested in joining the committee.

K.H. Hsu

Industrial Acoustics

The Technical Committee on Industrial Acoustics was established to address issues associated with engineering acoustics and noise control as it relates to the industrial

environment. The scope of activities is limited to "in-plant" noise measurement, analysis, and control. Engineering solutions to industrial noise problems will be stressed over personal protection. Applied engineering and practical solutions to noise control are preferred over the more theoretical evaluations, sophisticated technology leading-edge, and measurement schemes which require further research to make them useful for the practicing mechanical engineer responsible for resolving industrial noise problems.

The Technical Committee on Industrial Acoustics met at the Winter Annual Meetings in Chicago and again in San Francisco to discuss member interests and determine the preferred focus of future technical sessions. The consensus was that noise control is the subject of greatest importance to this group. Specific topics considered most important were cost-effective applications, materials, and noise control as it relates to productivity.

The Technical Committee will meet again at the Winter Annual Meeting in Dallas, Texas on November 28, 1990. If you are interested in this subject, please plan to attend to discuss WAM-91 and to consider technical sessions for future meetings. We need more representation from the industrial sector and consultants whose clients are concerned with industrial noise control.

William J. Hanson

Turbomachinery Noise Committee Objectives

1. To constitute a Professional Committee of the Noise Control and Acoustics Division, in accordance with the Division's Constitution, Bylaws and Rules, in the field of turbomachinery noise.
2. Serve as forum for presentation and publication of new research, technology and design information in the field of turbomachinery noise.
3. To organize workshops, symposia, short courses and other educational meetings and curricula on topics as indicated by needs of engineers in the field. These meetings may be separately or jointly sponsored with other societies, divisions, committees or educational institutions.
4. To survey the needs of the profession in turbomachinery noise and to disseminate the results of such surveys to pertinent government bodies, the profession, and the public.
5. Encourage, foster, and influence future areas of study in the field of turbomachinery noise.

6. Promote and encourage interchange of information between researchers and designers or users of turbomachinery technology.
7. Recognize and reward outstanding contributions to the field of turbomachinery noise.
8. To promulgate the highest possible technical standards in practice of noise control and engineering acoustics.

Scope

The above objectives are accomplished through technical paper sessions, symposia, forums, panel discussions, and special workshops at the Annual Winter Meeting of ASME, publication of professional papers and surveys in the journal and symposia volumes of the ASME, and the publicity releases to appropriate departments in engineering colleges, government agencies, research institutes, industrial firms and the public. Similar activities are engaged in jointly with other Committees of the Division and other Divisions of the Society.

William Swim

Summary of the WAM 90 Technical Program - Noise Control and Acoustics Division

The Noise Control and Acoustics Division (NCAD) is organizing three symposia and a number of technical sessions for the WAM 90 meeting. The symposia topics are: "Active Noise and Vibration Control", "Fan Noise", and "Vehicle Noise". The symposium on "Active Noise and Vibration Control" is organized jointly by the Divisions on Dynamic Systems and Control and on Applied Mechanics. In addition, the NCA Division's preliminary program includes the following technical sessions: (1) Acoustical Techniques for Flow Measurements (Biomedical Use of Acoustics), (2) Flow-Induced Vibration, (3) High-Frequency Structural Acoustics, (4) Structural Damping, (5) Outdoor Noise and Its Abatement, (6) Numerical Methods in Acoustics, and (7) Experimental Methods in Acoustics.

Anna Pate

International Symposium on Numerical Techniques in Acoustic Radiation

At the 1989 Winter Annual Meeting, the Noise Control and Acoustics Division was host to an International Symposium on Numerical Techniques in Acoustic Radiation. Twenty papers were presented in six sessions starting on Thursday morning and ending Friday at noon. Nine of the papers were contributed by international authors. The subject of the papers ranged from studies of new variational formulations which can be used to model acoustic radiation problems to

methods which can be used to reduce computational cost of numerical methods in order to improve their utility in design applications. A bound volume of the 22 papers submitted for the symposium has been published and is available from ASME as volume NCA-6, "Numerical Techniques in Acoustic Radiation".

As organizer of the symposium, I would like to especially thank the authors who contributed papers, Dick Keltie who handled the review process and all the reviewers who participated in the process. I feel the symposium is unique in its coverage of numerical radiation prediction techniques and the bound volume should be a useful reference for many years.

Robert J. Bernhard

Call for Papers WAM '90

Structural Acoustics Symposium - A Symposium Structural Acoustics is being planned for the 1991 WAM to be held in Atlanta, GA. This symposium is being jointly sponsored by the Structural Acoustics and the Analysis Techniques in Acoustics Technical Committees. Sessions are being planned in each of the following topic areas:

Statistical energy analysis
Wavenumber conversion in structures
Sound radiation and scattering
Experimental methods
Numerical methods
Composite structures
Adaptive structures

Contributions are solicited in these particular technical areas, as well as on other aspects of structural acoustics. Prospective authors are requested to send three copies of abstracts (approx. 100 words) to either:

Professor Richard F. Keltie
Center for Sound and Vibration
Box 7910
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Raleigh, NC 27695-7910
(919) 737-3024

or
Professor Andrew F. Seybert
Dept. of Mechanical Engineering
242 Anderson Hall
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(606) 257-2662

R.F. Keltie

Hydroacoustic Facilities and Instrumentation Techniques - 1) Symposium on Hydroacoustic Facilities and Instrumentation

Techniques - Organizers: Professor Roger Arndt (Currently on Sabbatical, address to be provided in a future call for papers) or Dr. Theodore M. Farabee David Taylor Research Center Code 1942 Bethesda, MD 20084-5000 Tel: (301) 227-1731.

The conduct of hydroacoustic research generally requires that experimental studies be conducted in specially designed and constructed hydroacoustic facilities. The unique features of these facilities are low background noise levels and the incorporation of transduction techniques that allow the hydroacoustic phenomena of interest to be measured. For the purposes of this Symposium, the term *hydroacoustic facility* is not restricted to water facilities. Papers are solicited that deal with the design and construction of hydroacoustic facilities, with the calibration and use of such facilities, and with the instrumentation/analyses techniques utilized for the acquisition of data in a hydroacoustic facility.

2) Symposium on Flow Noise Modeling, Measurement and Control - Organizers: Dr. Theodore M. Farabee David Taylor Research Center Code 1942 Bethesda, MD 20084-5000 Tel: (301) 227-1731

The purpose of this Symposium is to provide a forum for the discussion of issues relating to the various aspects of flow noise modeling, to the fluid-structure coupling of a turbulent flow, to measurement techniques utilized in quantifying flow noise characteristics, and to flow control technique techniques that may also control flow noise performance. For the purpose of this Symposium, the term *flow noise* entails both flow noise and flow-induced noise issues. The subject flow field is not restricted to that developed over a classically smooth flat plate, but may be of the type resulting from flow over rough surfaces, from flow past surface mounted devices, or any type of flow configuration that is considered to be of interest. Theoretical, analytical, numerical and experimental studies addressing any of these issues are solicited.

T.F. Farabee

Akay Elected Fellow

During the traditional Wine and Cheese Party which took place on Wednesday evening, Professor Dan Mote had the obvious pleasure of announcing that Professor Adnan Akay had been elected to the rank of Fellow and presented him with the appropriate certificate. It may be recalled that both men were co-founders of the Division and instrumental in its initial development.

Maurice Sevik

Blackstock To Give Rayleigh Lecture at WAM 1990

We are pleased to announce that David Blackstock, a professor at the University of Texas will be giving the Rayleigh Lecture at WAM 1990 in Dallas, Texas. The subject of Prof. Blackstock's lecture will be non-linear acoustics. More to come in the autumn newsletter.

Industrial Support for NCAD

The NCAD Wine and Cheese Reception following the Rayleigh Lecture is becoming a major event. Over 200 people attended at WAM 89 in San Francisco. We wish to thank the following companies for their generous support of our social fund:

Applied Acoustic Reserach Inc., State College, PA
Briel & Kjaer Instrument, Inc., Marlboro, MA
Larson-Davis Laboratories, UT
Ono Sokki technology, Inc., Bensenville, IL

Notices and Reminders

•Delinquent members - now is the time to renew your membership to keep you on our roles for the coming events.

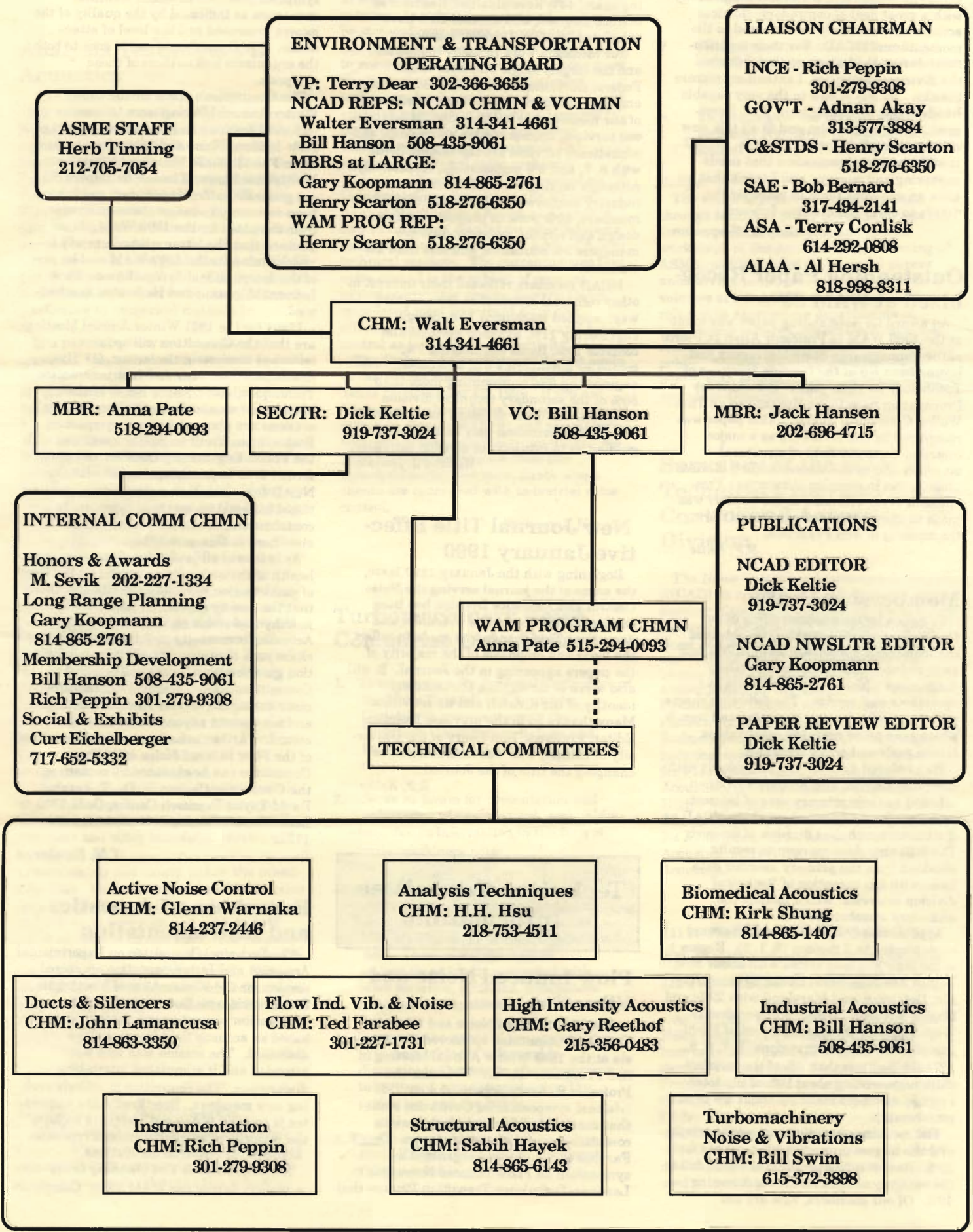
•Students - If you are applying for membership in the the Noise Control and Acoustics Division, please remember to mark #32 as your divisional preference.

Calendar of Events

June 3	ASME Summer Annual Meeting Minneapolis, MN
July 27	3rd Cong. on Acoustic Intensity Senlis, FRANCE
Aug 8	Tire/Road Noise Conf. Gothenburg, Sweden
Aug 13	Internoise '90 Gothenburg, Sweden
Aug 27	Structural Intensity and Vib. Energy, Senlis, France
Sept 9	Intl. Conf. on Rotor Dynamics Lyon, France
Sept 17	Exper. & Num. Dynamic Anal. Leuven, Belgium
Oct. 15	NoiseCon '90 Austin, TX
Oct. 15	Vibration Control State College, PA
Oct. 22	Intl. Machinery Monitoring Conf. Los Angeles, CA
Nov. 25	ASME Winter Annual Meeting Dallas, TX
Nov. 26	ASA Meeting San Diego, CA

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