RESEARCH FACILITIES AND PROGRAMS

Architectural Acoustics

A method for simulating the acoustics of auditoriums and concert halls with the aid of a digital computer and an anechoic chamber has been developed by M. R. Schroeder of the Acoustics and Visual Research Department at Bell Telephone Laboratories. As reported in November at the 62nd meeting of the Acoustical Society of America, the technique allows the acoustic effects of planned architectural arrangements to be heard and evaluated before a structure is built.

The first step in the procedure is to draw, on a plan of the proposed hall, all of the paths that sound waves may follow (including single and multiple reflections) from a chosen point on the stage to a typical seat in the audience and to determine the times of flight for the sound waves over the various paths. Calculations can then be made of the structure's reverberation time (the period required for a sound impulse to decay to 1×10^{-6} of its initial intensity. The information thus gathered is used to program a computer so that it will operate upon a sound in the same way as the actual auditorium. Samples of speech or music are recorded on digital magnetic tape and fed into the computer. After the computer has performed the programmed alterations, the output tape is translated into a sound track suitable for playback on a tape recorder. By playing this tape in the echo-free environment of an anechoic chamber, the planner can hear how the sample would sound in the projected auditorium and draw any necessary conclusions about changes required in the architectural design.

The system not only represents a possible saving of effort and expense in the construction of new halls, but also can be used to aid the alteration of existing ones. The computer can be programmed to simulate the effects of proposed architectural alterations. After a recorded sample containing the effects of the changes is made, it is played back in the unaltered room. This combination allows the acoustic effect of both the existing structure and the proposed modifications to be heard.

In cases where acoustical modification through changes in construction is impractical, electronic systems may be used to add artificial reverberations to the sound. The computer method is also useful for simulating the effects of these systems while they are still in the planning stage.

Low-Energy Facilities

Yale University's new, million-dollar electron linear accelerator was formally dedicated September 14. Designed to operate normally at 40 Mev, the linac may reach energies greater than 80 Mev for currents smaller than its normal 25 kw. Under the direction of Howard L. Schultz, professor of physics, and associate physicists Charles K. Bockelman and James E. Draper; researchers will use the new facility for studies in such areas as photonuclear reactions, nuclear structure, neutron bombardment, and high-energy electron scattering. Designed and built by the Applied Radiation Corporation of Walnut Creek, Calif., a subsidiary of High Voltage Engineering Corporation; the linac is housed in the Yale Accelerator Laboratory.

Recent advances in the theoretical description of the atomic nucleus, together with recent design improvements in cyclotrons and Van de Graaff accelerators, have stimulated a special National Science Foundation program for the establishment of low-energy nuclear physics research facilities and for the improvement of existing low-energy equipment. The Foundation announced in late November that the first six grants awarded under the new program will provide a total of more than $4 million to support the construction of accelerators at the University of Chicago, Michigan State University, the University of Pittsburgh, the University of Washington (Seattle), Ohio State University, and the State University of Iowa.

Three of the grants provide for medium-power Van de Graaff machines. The University of Chicago's 4-Mev accelerator will be used primarily in collision experiments involving bombardment by heavy particles. The use of accelerated lithium ions was initiated by the Chicago group in 1956, and even more complex particles are expected to be available with the new equipment. At Ohio State, a new 5.5-Mev machine will be used in conjunction with a 6.5-Mev cyclotron and a 3-Mev Van de Graaff and is expected to add great versatility to the research effort. The cyclotron group has been engaged in studies of proton and gamma-ray correlations, and with the new machine they will be able to extend the measurements to other energies and include similar deuteron interactions. A 5.5-Mev Van de Graaff will also be built at the State University of Iowa and will be used for heavy-ion bombardment in an effort to gain more information about cross sections and nuclear energy levels.

The new Michigan State machine, a 40-Mev sector-focused cyclotron, is designed to achieve higher intensity and sharper energy resolution and collimation for proton beams in the 20–40-Mev range. The design involves a new "resonant-deflection" technique developed by the Michigan State group. Oscillations of the particles about the center of their path will become unstable at full cyclotron radius, and this feature, com-

bined with special shaping of the magnetic field, will allow protons to be extracted after only a single turn in their acceleration.

Two very powerful Van de Graaff machines will be constructed with the help of the remaining two grants. A 22-Mev Van de Graaff at the University of Washington will be used in conjunction with a fixed-energy cyclotron to extend the range of energies available for studies of alpha-particle scattering. Pittsburgh's 18-Mev, three-stage Van de Graaff will replace a 47-inch cyclotron which has been used for a number of years in a study of deuteron-induced reactions. The new accelerator will make possible the resolution of closely-spaced energy levels to test the conjecture of the Pittsburgh group that the nuclear structure of the heavy elements may be less complicated than has been supposed.

Research Support

February 1 is the deadline for receipt of applications for grants-in-aid offered by the American Academy of Arts and Sciences. Amounts ranging between $500 and $1500 are available for research in any scientific field, including the mathematical, physical, biological, and social sciences. Preference is generally given to applications from individual scientists, especially those at the beginning of their research careers and those handicapped by inadequate resources or facilities. Support is not usually provided for bibliographic research, preparation of manuscripts for publication, studies intended to fill the requirements for an academic degree, or purchase of nonexpendable equipment that is ordinarily available in an institutional laboratory.

Applications must be filed on forms supplied by the Academy. Correspondence should be addressed to the Chairman, Committees on Research Funds, American Academy of Arts and Sciences, 280 Newton St., Brookline 46, Mass.

Hydromechanics research projects considered of importance to the Navy are conducted annually by nongovernment laboratories under a financial support program maintained by the Bureau of Ships. The program, which is technically administered by the David Taylor Model Basin, is formulated in the early part of the calendar year and the next deadline for submitting proposals is the middle of March. Areas of interest are resistance, propulsion, stability, control, seakeeping characteristics, radiation of underwater sound, and other hydromechanics problems which may be applicable to surface and subsurface Navy craft.

Proposals for contract research under the program should be submitted in quadruplicate by March 15 to the Commanding Officer and Director, David Taylor Model Basin, Washington 7, D. C. (Attention: Code 513); requests for additional information about the program and the form to be followed in preparing proposals should be sent to the same address.