## AN INSTITUTE FOR ACOUSTIC RESEARCH

THERE is much to be said against too elaborate an organization of scientific research. We carry our highly prized individualized democracy into our experimental endeavors and shun therein all actual or even apparent control "from above." And this attitude if not carried to an extreme is as it should be. We train our young graduate students, for example, to observe the dependence of their problems on past performances of others while at the same time we encourage them to obtain an orientation in the general history of science. It would not do much harm to go further in the latter direction than we do. But above all we unmistakably teach them also the power of self-reliance and attempt to inculcate in them the sense of aggressive initiative in connection with their problems of investigation. The young possessor of the doctorate is distinctly respectful of historical accomplishment and in that light he envisages the present. But from that point on he dares independently to face what lies before.

That assertiveness, displayed in the mature adventurer after truth as well as in the youthful pioneer, does not gainsay the need of cooperation. The problem in science is the same as that in political government: the individual needs the state, the state needs the union of states, and the union of states needs the world confederacy. So the individual investigator needs the stimulus of his colleagues. This extensive sort of organization we have already abundantly recognized in science in the combination of our specific scientific associations into state academies, sectional conferences, national bodies, and international councils.[1]

The present scope of scientific inquiry is developing to such an extent, however, that this type of extensive cooperation and organization is not the only desirable one, for we have already begun to establish what I should like to call an *intensive* form of scientific organization. To draw a comparison this time with industries in the commercial world, it appears that not only are there associations of insurance companies, of automobile manufacturers, of dry goods merchants, and the like, but between these establishments there are associations that group together only certain interests, *e. g.*, the employment managers, the credit men, the buyers, the salemen, *etc.* So as our scientific knowledge increases and our scientists of various persuasions are beginning to explore contiguous territory, we are finding it necessary to obtain an outlet for our common interests. Physicists, chemists, astronomers and mathematicians may to-day be at work on a kindred group of subjects, but from widely different angles of approach. An intensive cooperation among such workers affords often mutual respect, appreciative understanding of the several points of view, real fellowship, and above all more authentic results. It is noteworthy in this connection that many hospitals are inviting groups of scientists to cooperate in a similar way on specific problems presented in such institutions.

There is one field which to the writer's knowledge has already made pronounced progress in intensive cooperation. This is the field of optics and visual phenomena. The photographic and illuminating industries and professions have for some time enlisted the aid of men from several allied sciences. In one of the largest plants for the manufacture of electric incandescent lamps a physicist, a physiologist, and a psychologist have cooperatively undertaken and completed significant problems. While these problems are rarely conjointly solved, there is ample opportunity for mutual consultation. Illuminating engineers are consulting some of the best trained men psychology has to offer; some are entered as regular members of the staff. One of the largest manufacturing concerns of photographic appliances and supplies employs a group of men representing several sciences including psychology.[2]

[1] Dr. W. R. Whitney, director of the Research Laboratory of the General Electric Company, has ably brought out the international character of research in a brief article entitled, "Science—A World Partnership," published in the *Scientific American*, 127, 1922, 100 (August).

[2] Other instances of cooperative research that

Public attention is just now attracted, moreover, to the field of another sense-department, one which, indeed, has usually followed vision both in historical discussions and genetically in the race, *viz.*, hearing. We have lately witnessed an immense development in the photographic and cinematographic industries; now comes the prospect of an even wider application of wireless telephony. With its problems added to the problems that are already facing us in acoustics, it would be wise, it appears to the writer, to provide a sort of clearing-house for work done in acoustics by the various sciences. There are constantly occurring phases of problems and partial problems that need to be referred to the authority of those whose training and equipment guarantees satisfactory envisagement and promises sound conclusion. Not only would the various sciences have something to contribute to an acoustic symposium, but with closer cooperation, a pace could be set, an impetus given, toward more intensive investigation. With this we do not want the type of overhead organization that will throttle endeavor and spontaneous effort, but we need the kind that will inspire research and provide intelligent aid.

Already there are a considerable number of institutions where work of a highly valuable nature is being done in the auditory field. Some of this is cooperative. The acoustical laboratory at the Case School of Applied Science has become an outstanding post of research under the direction of Professor D. C. Miller. At the State University of Iowa Dean C. E. Seashore has for many years done noteworthy work in supervising research in several branches of the auditory field and has recently enjoyed the cooperation of Professor G. W. Stewart in some of these undertakings. At Harvard the late Professor W. C. Sabine contributed largely to an understanding of the auditory properties of architectural interiors, a problem which Professor F. R. Watson, of the University of Illinois, has also largely and ably devoted his attention. The psychological laboratories of Clark, Cornell, Illinois, Missouri, Ohio State have added considerably to our store of knowledge on the subject, while Professor G. E. Shambaugh, of the University of Chicago, stands among those who have done original work in connection with the physiological theory of audition. The private laboratory of Colonel Fabyan at Geneva, Ill., has busied itself to a large extent with auditory phenomena, and a number of industrial enterprises, like the phonographic laboratories, have carried on investigations allied to their work. This brief résumé is doubtless inadequate but serves to show many of the separately organized establishments in acoustic research.

Some of the problems that would lend themselves advantageously to cooperative investigation are summarized below:

(1) *Sound localization.* Further investigation of intensive and qualitative factors in the binaural ratio as applied to the detection of the direction of the source of tones and noises throughout the ranges of intensity and quality; experimental study of sound localization through all three types of media, gaseous, liquid and solid; phantom sounds; polarized sound.

(2) *Qualitative and quantitative thresholds of sound.* Careful scrutiny of the liminal values for both tones and noise; standardization of intensive units of sound; re-investigation of the upper and lower pitch limits of tone with carefully calibrated instruments.

(3) *The attributes of tone and noise.* Systematic review of the tonal manifold with an empirical attempt at classification of the variable characteristics; distinction between noise and tone; question of vowel tones.

(4) *Consonance and dissonance.* Working out the higher difference and summation tones; further analysis of harmony; question of beat-notes.

occur to the writer are: (1) the Mellon Institute of the University of Pittsburgh; (2) the Research Bureau for Retail Training and the Bureau of Personnel Research, both at the Carnegie Institute of Technology at Pittsburgh; (3) the American Institute of Baking of Chicago, and (4) the newly organized Department of Engineering Research at the University of Michigan. Some of these undertakings are entirely, some only in part, financed by commercial corporations which are interested in the problems investigated. In addition mention should be made of a considerable number of industrial fellowships of various descriptions that are maintained by industrial concerns at our larger universities.

(5) *Membranous sound production and transmission.* Improvement in the fidelity of sound production through telephonic and phonographic reproducers; reduction of inherent membraneous tones and noises; problem of sibilants and aspirates.

(6) *The acoustic qualities of confined areas.* Question of proventing leakage of sound through ventilating systems and wall-supports; reflecting and absorbing qualities of various building materials to be used from time to time; acoustic properties of halls, rooms, etc.; "sound-proof" rooms.

(7) *Auditory theory.* Further investigation of the human auditory mechanism and its pathology; intracranial conduction of sound; tonal gaps and "islands."

Specifically, then, it is the opinion of the writer that there exists in this field a threefold need:

I. There should be a closer affiliation of workers in acoustics. An association of those interested might be assembled under some such title as the American Acoustical Society.

II. A journal with this society as sponsor would become an outlet for the publication of papers on the general topics of acoustics.

III. If in the course of events progress is recorded, an endowment fund should be raised with perhaps industrial assistance for the purpose of erecting a central laboratory or institute where apparatus would become available for precise and intensive work. It would save the expense of multiplying elaborate research pieces in our various laboratories where they frequently lie idle for long periods of time. It might serve further for the exchange and loan of apparatus under a system of adequate guarantee against mishandling and breakage.

A number of our leading men working together at such an institute would not only lend zest to their own endeavors, but would offer a place for the training of younger men in the field. The institute would, moreover, provide for the industries that are concerned in the manufacture of acoustical apparatus a fund of information for their guidance and an attentive and trained "ear" for problems that arise in their practical work.

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## PROPOSED FEDERATION OF AMERICAN BIOLOGICAL SOCIETIES

A CONFERENCE was held in Washington in April, 1922, at which a number of biological organizations were represented, to discuss plans for a federation of American biological societies. This meeting was held in pursuance of instructions given by the several societies at their annual meetings at Toronto and elsewhere in 1921. The Washington conference, after some debate, affirmed its belief in the desirability and feasibility of a federation of biological societies, and adopted a general plan in accordance with which such a federation might be established. An outline of this plan has already been published in this journal[1]. A committee was raised to work out the details of the plan and to prepare a constitution embodying these details.

This committee, which consisted of F. R. Lillie, C. W. Greene, I. F. Lewis, C. E. McClung, A. Franklin Shull, R. W. Thatcher, H. B. Ward, and B. E. Livingston representing the American Association, met in Woods Hole, Massachusetts, August 4 and 5, 1922. Professor Herbert Osborn substituted for Professor Livingston at this meeting.

For its own guidance, after some deliberation, the committee adopted certain fundamental principles upon which, in its opinion, any federation should be based. These principles are stated in the following resolution which was adopted by the committee.

Resolved, That it is the judgment of the society representatives considering the formation of a federation of biological societies that certain principles should be observed in setting up relations with existing organizations. These principles are:

1. The federation should, for its benefit, utilize other organizations in accordance with their nature and purposes.

2. The federation should, on the other hand, so direct its policies and methods as to strengthen the efforts of organizations with which it is affiliated.

3. The federation should avoid unnecessary duplication of effort and expenditure.

[1] SCIENCE, Vol. LVI, p. 184.