SCIENCE

A WEEKLY JOURNAL DEVOTED TO THE ADVANCEMENT OF SCIENCE, PUBLISHING THE OFFICIAL NOTICES AND PROCEEDINGS OF THE AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE.

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THE AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE.

A NATIONAL association for the advancement of science occupies at the beginning of the twentieth century a dominant position. The greatest achievement of the nineteenth century was the progress of science; its most definite tendency was towards the voluntary organization of individuals for the accomplishment of certain ends. The advance of science, the movement that is of the greatest importance for civilization, requires for its guidance the strongest association of individuals. Such an association will certainly arise, and will develop from existing institutions.

The organization of science in America has progressed parallel to the advance of science. Local societies concerned with the whole field of knowledge, and especially with its utilitarian aspects, were first established in Philadelphia, in Boston and in other cities. These societies were modeled on the similar institutions of Europe; the Philosophical Society of Philadelphia following the Royal Society of London, and the Academy of Arts and Sciences of Boston, the Paris Academy of Sciences. As centers of scientific activity increased in number,

as the postoffice and railways developed, as general scientific journals were established—*The American Journal of Science* began publication in 1818—the need of a national organization was felt, and here again the older nations had established the precedent. The meetings of German scientific men and physicians began in 1828, and the British Association for the Advancement of Science was established in 1831. An Association of American Geologists and Naturalists was organized in 1840, and became the American Association for the Advancement of Science in 1848.

Fifty years ago the sciences were comparatively undifferentiated. Special societies and special journals were not required. It was possible for students of science and friends of science to meet together and take a common and intelligent interest in the scientific progress of the day. Somewhat later, however, the need became apparent for a more select national society. The local academies in the European capitals had become national institutions in a way that was not possible for the similar societies in the United States, owing to the lack of centralization. Our National Academy of Sciences was organized in 1863 with a membership at first limited to fifty, and still under one hundred. The Academy was intended to be the adviser of the Government in scientific matters, and has to a certain extent fulfilled this function. At first, when there were but few scientific men in the United States and their interests were more or less common, the National Academy was an organization fitted to its environment. But it has scarcely adjusted itself to the growth and specialization in science of the past twenty-five years.

The organization of science that was adequate for the third quarter of the century did not suffice for the fourth quarter. About twenty-five years ago it became necessary to meet the specialization becoming inevitable for scientific advance. Special societies and special journals were organized. The American Society of Naturalists, organized in 1883, and the *American Naturalist*, established in 1867, covered a limited, but still wide, field. SCIENCE, a weekly journal, was established in 1883 to keep the sciences in touch with each other and men of science in touch with the general public. The American Chemical Society was organized in 1876, The American Ornithologists' Union in 1883, The Geological Society of America and the present American Mathematical Society in 1888, and there are now national societies for almost every science. Special journals were established during the same period—*The Bulletin of the Torrey Botanical Club* (1870), *The Botanical Gazette* (1876), *The American Journal of Mathematics* (1878), *The American Chemical Journal* (1887), *The American Journal of Morphology* (1887), *The American Journal of Psychology* (1887), *The American Geologist* (1888), *The National Geographic Magazine* (1888), *The American Anthropologist* (1888) and so on, in increasing numbers, to the present time. A similar movement toward specialization is evident in the development of elective courses in our colleges, of advanced work in our universities, and in many other directions.

The American Association for the Advancement of Science did not fail to adjust

its organization to the growth and differentiation of science. In 1875 a formal division was made into two sections, one for the exact and one for the natural sciences, and in 1882 nine sections were established. At this time, when the Association had fitted itself to existing conditions, it enjoyed a most prosperous period in its history, the meetings being large and fruitful. Thus the attendance at Boston in 1880 was 997; at Montreal in 1882 it was 937, and at Philadelphia in 1884 it was 1261. But with the organization and growth of the special societies and journals referred to above, the Association did not maintain its commanding position. The American Society of Naturalists, with a more compact membership, chose midwinter as its time of meeting, and other societies became affiliated with it. The special societies, consisting of groups of experts, appealed to the loyalty of their members more directly than did the larger and more amorphous Association. There was lack of sympathy between these societies and the Association. The attendance at the meetings became smaller, and the total membership decreased. Many eminent men of science and many younger workers were not regularly in attendance at the meetings and were perhaps not even members of the Association. The programs of the sections became heterogeneous and sometimes did not reach a very high standard. The amateur and picnic elements were rather prominent, while at the same time they were mediocre. Many men of science regarded the Association as a survival that had outlived its usefulness.

But to-day no one acquainted with the most recent work of the Association will deny that it has entered on a new period of its history. This began with a change of attitude toward the special societies, replacing rivalry with cooperation. There was much opposition to the plan of letting the American Chemical Society meet in affiliation with the Association, but when this was accomplished chemistry at once became its strongest section. So it has been in other cases, where special societies have met in affiliation with the Association. At the recent New York meeting there were sixteen such societies, including practically all national societies that hold summer meetings. Other improvements in the organization of the Association have been effected. The council has been strengthened and made a truly legislative and executive body. The permanent funds have been increased, and appropriations for research have been granted to committees. Care has been exercised in the election of fellows, and in the admission of titles to the programs. This Journal is sent free of charge to all members, thus increasing and consolidating interest in the Association and in the advancement of science, giving even those unable to attend the annual meetings an adequate return for membership, and tending to unite all men of science and those interested in science in the Association and in the ends that it represents. The last three meetings, held at Boston, Columbus and New York, were all excellent, representing different types adjusted to the occasion and place. The meeting at Denver this year will be equally typical and

equally successful. The membership of the Association is now larger than it ever was before, over eight hundred new members having been elected within the past year.

There is every reason for satisfaction at the present condition and outlook of the Association. But this does not mean that we need not be on the alert to increase its usefulness under the circumstances confronting us at the beginning of the twentieth century. Evolution occurs by natural selection, but with boundless waste, regardless of time and careless of the individual. Human development must henceforth be guided by forethought and reason. It is the object of this article to make some definite suggestions regarding the organization of science in America under the auspices of the Association. They have been carefully considered by some of those most interested in the Association and, though they may not meet with universal approval, they are thought to be worth careful consideration.

The objects of the Association are said in its constitution to be "by periodical and migratory meetings, to promote intercourse between those who are cultivating science in different parts of America, to give a stronger and more general impulse and more systematic direction to scientific research, and to procure for the labors of scientific men, increased facilities and a wider usefulness." This statement may be somewhat systematized and amplified. The legitimate objects of the Association may be said to be (1) the presentation and discussion of research work in the different sciences and the publication of such research. (2) The promotion of research by grants of money and by providing the means for cooperation. (3) The encouragement of addresses, reports and publications on the progress of different departments of science, sometimes of value to the specialist, but more especially important in keeping the sciences in touch with each other. Joint meetings, discussions and publications should be arranged on subjects common to different sciences, relating the pure and applied sciences or concerned with science as a whole. (4) The presentation of such addresses, reports, discussions and publications in a form that will so far as possible keep the general public informed on the advances of science, interest them in the opportunities of scientific work and its needs, and impress on them the dignity and supreme importance of science. Here should be included whatever will secure recruits to scientific workers and the money and support that scientific work requires. (5) Offering an opportunity for men of science in different departments to become acquainted personally and by publication, and encouraging sympathy and loyalty to their common interests, and performing, so far as possible, the same function for scientific men and the intelligent public. (6) The guidance of scientific organization in America, which includes the coordination, establishment and arrangement for the meetings, etc., of special scientific societies; the publication and circulation of scientific books and journals; the place of science in education and all external means for the advancement and diffusion of science; the direction of public opinion and legislation

on science, more especially when connected with the national government, and the different states and municipalities; the promotion of conditions required by science and of reforms recommended by science—in general, whatever will promote the advancement, diffusion and usefulness of science.

1. The first of these functions has in large measure been assumed by the special societies and journals, and this is in accordance with necessary conditions. Special research must be presented before, and discussed by, small groups of experts and must be published in journals that are of interest only to specialists. The special societies have compact organizations; they are most competent to select their membership, to arrange their programs and to conduct their publications. It seems inevitable that the Association must relinquish its function of providing sections for the presentation of special papers, except in the rare case that a special society does not exist and may be formed by the aid of the Association. In a joint meeting of a special society and the corresponding section all the valuable papers will be presented both before the society and the section, and only such papers will be presented to the section alone as the society will not admit. There is, however, no reason why the present general organization should not be maintained, and the papers read before the affiliated societies be made part of the proceedings of the Association. The Association may, however, render important assistance to the special societies in the ways indicated below.

2. The promotion of research by grants of money and by providing the means for cooperation is a function that should be undertaken both by the special societies and by the general Association. The latter is, as a matter of fact, more likely to secure funds for this purpose by bequests and gifts, owing to its national character, its long history and its permanence. It can to special advantage further researches in which more than one science is concerned and in which independent societies might fail to cooperate. Efforts should be made to increase the number of patrons of the Association and to secure bequests and gifts, in order that the American Association may not be behind the British and French Associations, which appropriate annually $5,000 or more for the direct encouragement of research. Invested funds yielding an income for this purpose would add greatly to the stability, influence and usefulness of the Association, and to the interest of the meetings at which the grants are made and the reports of the work accomplished are presented.

3. The special societies may with advantage present addresses and reports on the progress of a science, and, when the societies meet at the same time and place, their value is increased by the opportunity afforded for a larger group to be present. In this direction the Association has, however, an important work. The address of the president, the most eminent man of science in America who has not yet held this office, should be an event of national importance. It should be worth publication, and should be published in full in all the important daily newspapers, as actually happens in

England in the case of the president of the British Association. The addresses of the vice-presidents should be as nearly as may be of the same importance and interest. These should not be addresses such as are presented before the special societies, but should be intelligible and interesting to all men of science and to the great mass of men and women who have had a college education or an equivalent training in affairs. The afternoons through the week might with advantage begin with these addresses, not more than two being given simultaneously, and these might be followed with reports or discussions of problems of general interest. The sectional committees and the council should pay special attention well in advance to the arrangement of a program. Care should be taken, if necessary by invitation to those not members of the Association, to secure the adequate presentation of subjects in which the Association needs strengthening. Thus applied science should be given more prominence than hitherto. Those eminent in public life, in educational work and the like, and distinguished foreign men of science, might be invited to address the Association or to take part in its discussions. Funds should be available to defray at least the traveling expenses of such invited guests.

4. The addresses, reports and discussions should, in part at least, be of such interest as to attract the general public, securing a large local attendance and being reported widely by the press. It is not possible, least of all in a democratic country, for science to isolate itself from common life. There must be special research that can be appreciated only by the expert, but as quickly as possible the progress of science should be made a part of the world's common stock of knowledge. The American Association should be one of the chief factors in the diffusion of science, and its annual meetings should be looked forward to by the general public as the occasion when for its benefit the year's progress in science and the contemporary state of science are exhibited in their outlines and in correct perspective. The meetings should typify the dignity and weight of science, so as to impress these on the minds of all. The sympathy and support of all the people are absolutely essential for science. Only so can recruits for scientific work be secured; only so can endowments and material support be obtained; only so can scientific work under the government be placed on a secure and permanent basis. We have in these needs not only the justification, but the absolute necessity of an Association with a large membership—it should be at least ten thousand—drawn from the intelligent people of the whole country.

5. The social intercourse and personal contact of scientific societies and meetings are among their most important functions. Men in isolation become selfish and incompetent. Even a great genius does not work in solitude, and certainly the ordinary man requires the interest and enthusiasm that is only evoked in the give and take of personal acquaintance and conversation. Eating together, drinking together, smoking together, may have physiological drawbacks, but the psychological stimulus has war-

ranted the origin and survival of these practices. Those studying similar problems, and those working in diverse directions; the university professor, the school teacher and the government officer; those who call their science pure and those who seek to make it useful; the beginners and the old benchers, all should be thrown together, ready to learn and help, to agree and differ. Each should be prepared to profit much, and if need be to sacrifice a little for the common good. The meetings of the Association do, of necessity, accomplish a great deal in bringing men together, but perhaps not all that could be desired. The cultivation of personal acquaintance between professional men of science and the amateur and outsider is also important, but more difficult to manage. The social features of the British Association seem to be more successful than our own. A thousand or more of the leading citizens of the place become temporary members for each meeting, and freely offer entertainments of one sort or another. The social conditions are, of course, different in America, but it seems that the entertainments and excursions might be made more pleasant and profitable in the future.

6. Of all the important functions of a national scientific association, the most essential is the general organization of science. The science of the country absolutely requires a central legislative body. Such bodies exist in other nations, having varying degrees of usefulness, and there is more need of an active and efficient representation of scientific interests in the United States than in any other country. London, Paris and the other European capitals, with their societies, clubs, etc., bring together all the scientific men of the country, whereas here they are widely scattered, and will become still more so as the East loses its intellectual precedence. Washington will doubtless be our chief center for scientific research, but under our system of State governments and with our privately endowed institutions, it is not likely that it will occupy the position of European capitals. The great development of scientific work under the national government, the numerous smaller centers under the State governments at their capitals and universities, the municipalities with their increasing tendency to support museums, libraries, etc., and to undertake functions requiring scientific experts, the great incorporated universities developing special research, the applications of science in industries, transportation, etc.—all these represent an extraordinary activity, and, at the same time, a dispersion of tendencies and interests that require here more than in any country some unifying and centralizing organization. The functions of such a body are only limited by its efficiency. Our government recognizes a division into executive, legislative and judicial functions, but does not recognize the coordinate importance of expert opinion. As the judicatory interprets the laws made by the legislature, so the legislature requires impartial advice and scientific knowledge as the basis of its enactments.

The question now arises as to what body or bodies should perform the functions thus outlined. In the first place, it is evident that we need numerous and partly inde-

pendent institutions. Each university, museum, survey, observatory, botanical garden, laboratory and the like is a unit, requiring its special organization. Each city should have a local academy, or alliance of societies, which in its field should perform most of the functions that we have been considering. Similar academies, or groups of societies, are needed for a State or region. National societies are required for each science. But what should be the national organization that will bring all the local and special societies together, and accomplish for the nation and for science as a whole what these institutions and societies do for a locality or a single science? We have at present the National Academy of Sciences and the American Association for the Advancement of Science, both of which have to a certain extent filled these requirements, but only in a partial and imperfect way. The Academy is legally the adviser of the government, the Association has brought into its organization a majority of the scientific men and many of the scientific societies of the country; but it seems probable that neither a small self-perpetuating body of eminent men nor a plebiscite of all scientific men will perform the duties required. Representative government, in spite of its partial failures, is the kind of government under which we should live and must live. We find this most nearly embodied in the council of the American Association. This council might be made the representative body for science in America.

If it be asked what the American Association and its council should do to assume the position assigned to them, the reply may fortunately be made: Let them continue the work that they have already begun. The whole matter is one of attitude and spirit, rather than of constitution and by-laws. Let all scientific men be fellows of the Association, make the members representative of the intelligence of the country, unite all scientific societies and institutions in the organization of the Association, make the meetings important and interesting, let the council assume and deserve authority.

While the position of the Association must depend chiefly on natural fitness and development and on the spirit and character of its members, there are certain changes in organization that deserve consideration. We shall suggest some modifications which appear to be either desirable at present or objects to be kept in view.

Affiliated societies should be represented on the council, and all scientific societies, whether national or local, should be affiliated with the Association. The number of representatives allowed from each society should be proportional to the number of members of the society among the fellows of the Association. For example, each institution having ten fellows might be allowed a representative and an additional representative for each additional twenty-five fellows. This plan includes the representation of local academies, universities, government departments, etc., on the council, but might begin with the societies meeting with the Association, in accordance with an amendment to the constitution now pending. It might be well for the

council to elect each year three additional members to serve for a term of three years. Those so elected would probably be among the most efficient members of the council. The council would thus be considerably enlarged, but its authority would be greatly increased. It is of course understood that the real work of legislative bodies is done by committees, and the committees of the council should be organized with special care.

The executive officer of the Association is the permanent secretary, and his influence should be very great. He should either be paid a reasonable salary, say $5,000, and devote his whole time to the Association and the organization of science in America, or should be, as our present secretary, a man of unusual executive ability, having under him one or two assistant secretaries who should devote themselves to the work. The secretaries of the sections should be among the most efficient members of the sections, and should be elected for a term of three years and reeligible.

The meetings should be more thoroughly organized in advance, more authority being vested in the permanent secretary and council. As suggested above, public lectures and discussions on the important advances and current problems of general interest should be arranged. For example, this year there should be reports on the relation of mosquitoes to disease, on the newly established Bureau of Standards, on the conduct of a national observatory, on the natural history and resources of the West Indies and the Philippines, and, in view of the place of meeting, on mining and irrigation.

The time of meeting has always interfered with success. Men of science will not and and can not come together at midsummer. If a week can be set aside at the beginning of the year, it is probable that the scientific character and weight of the meetings will be greatly forwarded. The importance of obtaining a convocation week in midwinter has been emphasized in a recent editorial (April 26, 1901), and we are now able to report that, of the fourteen universities comprising the Association of American Universities, all but two either already have no exercises at the time or have altered their calendars in the direction of setting aside the week in which New Year's Day falls for the meetings of scientific and learned societies. It might, however, be well to have, say once in three years, a summer meeting in which the social and excursion elements should be emphasized. It must be remembered that the National Educational Association can bring together 10,000 members in this way. Or perhaps, it will be found with experience that the winter meeting is so advantageous that the summer meetings can be omitted altogether. Meanwhile there might be suggested a special meeting at Chicago next year at Christmas time in conjunction with the Naturalists and affiliated societies, the usual meeting at Pittsburg in midsummer, and a meeting of unusual importance at Washington at the end of the year.

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*A KINETIC THEORY OF EVOLUTION.**

IN 1895† the opinion was expressed that the differentiation existing in certain fami-

* Read before the Biological Society of Washington, May 4, 1901.

† *Proc. U. S. Nat. Museum*, 1895, 18 : 64.