meeting during convocation week in 1908–9 be held in Baltimore.

The officers elected for the ensuing year were:

President—Professor E. L. Nichols, Cornell University.

General Secretary—President F. W. McNair, Michigan School of Mines.

Secretary of the Council—Professor Wm. Harper Davis, Lehigh University.

Vice-presidents of the Sections:

A—Professor E. O. Lovett, Princeton University.

B—Professor Dayton C. Miller, Case School of Applied Science.

C—Professor H. P. Talbot, Massachusetts Institute of Technology.

D—Professor Olin H. Landreth, Union College.

E—Professor J. P. Iddings, Chicago University.

F—Professor E. B. Wilson, Columbia University.

G—Professor C. E. Bessey, University of Nebraska.

H—Professor Franz Boaz, Columbia University.

I—Dr. John Franklin Crowell, New York City.

K—Dr. Ludvig Hektoen, Chicago University.

L—Hon. Elmer E. Brown, U. S. Commissioner of Education.

Secretary of Section B—Professor A. D. Cole, Ohio University, for five years.

Secretary of Section I—Professor J. P. Norton, Yale University, for five years.

Secretary of Section L—Professor Edwin G. Dexter, University of Illinois, for five years.

The Sectional Committee of the New Section, 'L' (Education)—President, David Starr Jordan, Leland Stanford University; President Charles S. Howe, Case School of Applied Science; Professor Thomas M. Balliet, New York University; Professor E. L. Thorndike, Columbia University; Professor C. M. Woodward, Washington University.

The minutes of the opening general session in Earl Hall on December 27, together with the addresses, are appended to this report.

John F. Hayford,
General Secretary

PROCEEDINGS OF THE OPENING SESSION

PRESIDENT C. M. WOODWARD IN THE CHAIR

Professor Woodward: The American Association for the Advancement of Science will please come to order. In opening this meeting, ladies and gentlemen, and before I perform my simple official duty of introducing the new president, I can not avoid saying what a joy it is, what a delight it is, to meet such a congregation of scientific men. As one looks down the fifty-nine years which this association has lived and has seen how from a few hundred it has grown to four thousand members, and how many splendid things it has performed in one way or another all in the interests of science and making that science meet the needs of man in this great community, it is a time for congratulation; and I feel especially proud to be for the moment a representative of such an organization. And with this word of greeting to you and of congratulation for the association, I take great pleasure in presenting to you the president-elect, who will preside over our deliberations and lead us forward during the few days that we now meet together, Doctor W. H. Welch, of the Johns Hopkins University, who is to be president for the coming year—Doctor Welch.

Doctor Welch: *Ladies and gentlemen,* this is not the first meeting of the association over which I have had the honor to preside, inasmuch as the old custom of holding a midsummer meeting was revived last summer. Before this larger gathering of the association I desire to renew the expression of my thanks and of my profound appreciation of the honor conferred upon me by election to this high office. I interpret this honor above all as a recognition of the position held to-day by medicine in its relations to general science, and it is especially as an honor conferred upon the science of medicine that I beg to acknowledge your action in selecting me to preside

over this association of scientific men and women.

We shall now have the pleasure of listening to words of welcome from the president of Columbia University, Dr. Butler.

PRESIDENT BUTLER: *Mr. President, ladies and gentlemen:* It is a pleasure, and no small satisfaction, speaking on behalf of my colleagues in the university—trustees, faculties, alumni and students—to offer you a cordial and hearty welcome to our home. Nowhere in America, perhaps, could you by any possibility receive a warmer or more sympathetic welcome than here. We are so fortunate as to count among our university membership a very considerable proportion of the membership of your association, and we look to them to lead and to guide and organize our university policies and opinions in the field of the sciences of nature and of man. Whatever facilities we may have for making you comfortable and happy are wholly and entirely at your service, and our part will be played to our own satisfaction if, when the hour of adjournment comes, you shall feel that nothing has been left undone that thought or care could do to provide in every way for the success of this gathering and for this most important meeting.

I might perhaps stop here, because, after all, there is not much to be gained by repeating a formal invitation that is once given with sincerity and heartiness; but I can not resist the opportunity to say just a word in addition to my word of welcome. I am one of those who now for nearly thirty years has observed at first hand the slow, and then the rapid, advance of the sciences to their present place in the school and college programs of this country. It has been my fortune to listen to and sometimes to participate in the discussions and debates which have accompanied that advance. So far as I now recollect, every vote that I have had to give has been given in its favor. But now at the end of this period I can not help feeling, as I observe from reading the literature of the subject that the same feeling is shown in England, in France and in Germany, that we have not yet succeeded in so organizing the sciences as instruments of general education as to fulfil the high expectations which some of us formed for them nearly a quarter of a century ago.

This is a subject which I respectfully commend to the study of this most representative and competent body. What is it that remains to be done, and what should we here do, so to correlate and organize and present the subject matter and the methods of the sciences as to increase their effectiveness as educational instruments?

I say with great frankness that if we did not know that we are going through what is doubtless a period of transition, the movement in which we have all been participating has cost us something and gained not much. But we are going through a period of transition. Perhaps we are expecting too much and too soon, but my purpose in saying what I now say is to bring to your attention the fact that to many of us the consideration of the educational effectiveness of the sciences touches the whole field of human interest, of human knowledge and of human activity.

There can be little doubt that the sciences of nature and of man, properly organized and presented as educational instruments, are destined to be classified as true humanities. I can not help feeling that in addition to their power to instruct and inform they have a power to refine, to uplift and to guide; but I am quite confident that as yet we are very far short of having so organized this material as to attain these ends.

I hope very much that the next decade may see intensive study of this aspect of these scientific problems and of scientific work; and that out of it all may come, not a larger place in the educational program

for the sciences, because that would hardly be possible—but a more effective and more uplifting and a more humanizing result of teaching the sciences, in order that we may pass on to the next generation this new educational instrumentality organized and perfected for true educational work, which never can be limited to the passing of information from hand to hand or mere instruction in method by master to pupil.

I throw out this suggestion, because here, in this association, are men and women devoting their lives to the study and investigation and presentation of truth, to whom in the colleges and universities, and to whom in the nation at large, we must look for the formulation of the answer to just such questions as this. To them I commend the question as to the proper organization of the sciences as instrumentalities in general education.

I say again you are heartily and completely welcome to this university and whatever hospitality it can offer and every act of friendliness which you will give us the privilege to show.

President Welch responded to the address of welcome as follows:

Ladies and Gentlemen: In behalf of the members of the American Association for the Advancement of Science and of the Affiliated Societies I thank you heartily, President Butler, for your cordial words of welcome, and I assure you and your colleagues that it is most gratifying to us to have the opportunity of meeting in this city and at this university.

It was not until nearly forty years after its foundation that this association met first in the city of New York, whereas this third meeting in New York follows only six years after the preceding one in the same place. These events in their periods of sequence indicate in a measure the rate of growth of science in this city and its increase of attractiveness to men of science. While for a century and more there have been eminent scientific men in New York City, it is, nevertheless, true that for a long period of time letters and science were not represented in this city in a degree at all commensurate with its position in other respects, and New York thereby lacked a note of distinction in its civic and educational life possessed by several smaller cities and even small towns in this country.

In recent years, indeed in the short interval since our last meeting here, the conditions have changed rapidly, and New York is taking a position in education and the promotion of science more nearly approaching its leadership in commerce and other material interests. The most powerful instrumentality in bringing about this great advance has been Columbia University with the influences which have gathered about it, and it is most gratifying to the members of this association to witness, where we are now assembled, the marvelous growth of this great university. A worthy share in this development of the higher learning has been borne also by New York University, and in our visit to the new buildings of the College of the City of New York, where a general meeting of the association is to be held on Saturday, we shall have the opportunity to behold the visible evidences of the most enlightened liberality of a municipality in support of higher education for the people.

Those interested in natural science will find nowhere a more impressive illustration of municipal liberality in support of an institution for the instruction of the people and the advancement of natural knowledge than the American Museum of Natural History, where on Saturday evening we are to be the guests of the trustees of the museum and of the council of the New York Academy of Sciences, this latter organization ranking also among the important forces contributing to the development of

science and of the scientific spirit in this city, and adding much to the interest of our meeting by the admirable exhibition and demonstrations of recent scientific progress which it has arranged in the museum. No feature of our meeting will afford greater pleasure and inspiration than the ceremonies attending the unveiling of the busts of American men of science presented to the museum by Mr. Morris K. Jesup, to whose generosity, public spirit and individual efforts American science is so deeply indebted. I wish to acknowledge at this time the courteous thoughtfulness of the trustees of the museum not only for their hospitality but also for selecting the time of our meeting for these interesting ceremonies.

The Metropolitan Museum of Art, with its magnificent collections in art and archeology, like the American Museum of Natural History, sets an example to the national government in the cultivation of the sciences and the fine arts.

Our botanical members at their meeting at the New York Botanical Garden will find there, as well as in the adjacent Zoological Park, in the opportunities afforded for the study of science and for the delight of the people, another and kindred illustration of the wise liberality of this city.

The New York Public Library, with its magnificent new building approaching completion, is another splendid foundation, resting upon both private and public munificence, which ranks among the great educational institutions of this city, whose growth and widened usefulness in recent years are significant of the progress of learning and science.

The holding of meetings of one of our sections and of affiliated societies in the new building of the Rockefeller Institute for Medical Research will afford opportunities to inspect laboratories unsurpassed in their arrangement and equipment for investigation in those branches of medical science to which they are devoted. In this connection I may state that New York City leads the world in the application by its department of health of the great discoveries of the last quarter of a century in bacteriology to the prevention of disease.

Time forbids further illustration of recent scientific progress in New York City. I have cited as examples mainly institutions with which the association will be brought, during our meeting, into some personal contact through their hospitality, and they will suffice to demonstrate the rapid and most gratifying development of higher education and of interest in the sciences of man and of nature in this city.

President Butler in his opening remarks has touched upon a subject most timely and important for the consideration of such men and women as constitute the membership of this association, and we shall do well to ponder carefully words on this theme coming from so high an authority upon education. While expressing sympathy with the aims of the natural and physical sciences, recognizing their importance and supporting them, as he has done, he also expresses the opinion that science in the general scheme of education and as an educational instrument has not fulfilled the expectations which he and others entertained regarding it a quarter of a century ago. While it is not possible to discuss this subject adequately on this occasion, I may be permitted to say a few words regarding it.

It is doubtless true that during the relatively short time since the natural sciences were admitted to the curriculum of a liberal education the teaching of these sciences has not attained to that agreement of opinion and fixity of method which centuries of use as instruments of education have secured for the classical languages and mathematics. It must be admitted that methods of teach-

ing the natural sciences have often been unsatisfactory and have, therefore, yielded unsatisfactory results. The subject is one for serious consideration, to which many of our teachers are, I think, alive, and it is a satisfaction to announce that the council at its meeting this morning, in response to a wide-spread and influential demand, recommended the formation of a new section of this association to be called the 'section on education,' which, we may hope, will contribute to the best methods of teaching the sciences.

It may also be admitted that exaggerated claims have sometimes been made as regards the position which the natural sciences should hold in the scheme of general education and as regards the extent and kind of mental discipline, culture and knowledge which, when pursued in such a scheme, they are capable of imparting. Without attempting to assign to these sciences their exact share in a plan of liberal education, and this share, I need hardly say, I deem an important one, I should be sorry to see eliminated from the education of even those looking forward to scientific pursuits the study of the languages, history and philosophy, which give a culture not to be derived solely from the study of the natural sciences and which should add greatly to the intellectual pleasure, satisfaction, breadth of vision and even efficiency of the man of science. Natural science should take its place in a plan of liberal education by the side of the older learning, the so-called humanities; each affords a kind of culture not to be obtained from the other, and any scheme of higher education which does not recognize the equal value of both kinds of culture is one-sided.

The full recognition of the part thus assigned to natural science in liberal education requires an adjustment on the part of the exclusive advocates of the traditional system handed down from the middle ages to new ideals of what constitutes liberal training, but in this field science has won its victory and will not be dislodged. It is, however, not enough to be content with this victory. Science should see to it that in its own field it becomes an instrument of education certainly not less powerful than the older humanities, and President Butler has very properly urged the need of improvements in this direction.

Standing here, as I do, as a representative of medicine in an association devoted to all the sciences of nature the relation of medicine to general science comes prominently to my mind. Medicine has been called the mother of the sciences. There was a time when the leading cultivators of natural science were physicians and when the medical faculties of universities were the homes of about all the science that then existed. In subsequent history physicians have played no small part in the development of the natural and physical sciences. Such important contributors to physical science as Black, Young, Mayer and Helmholtz were all actively identified with the medical profession, and are important figures in the history of medicine as well as of physics. From the study of chemical and physical phenomena of living animals and of man, whether by chemists, by physicists or by physicians, have come important additions to the sciences of chemistry and of physics, and medicine is constantly finding new and important applications of chemical and physical discoveries. We realize to-day as never before the fundamental unity of the biological sciences, and answers to the deepest and most far-reaching problems of medicine, not less than of other biological sciences, are to be sought in the properties of living matter, wherever it exists, whether in plants or in animals or in man.

Medicine has during the past half cen-

tury entered irrevocably upon the true paths of science. Dogma and transmitted authority are no longer its guides, but it seeks for truth by the only methods found fruitful for all science—experiment, observation and just inference.

The domain which has been opened to medicine during the last quarter of a century by the introduction of new methods and resulting discoveries in the causation of infectious diseases has greatly increased our power to cope with disease, and the masterful pioneers in this new field, Pasteur and Koch, rank among the greatest benefactors of mankind. The wider recognition by governments and by the people of the humane, the economic and the social value of this power of preventive medicine to check incalculable suffering and waste of energy from disease is urgent. One of the most gratifying exemplifications of the useful functions of this association is the initiation by the section on social and economic science of an influential movement for the establishment by the national government of a bureau or department of public health.

This leads me, in closing, to say a few words concerning the scope and aims of this association. Our retiring president, in his introductory remarks, spoke of the great growth of the association, which has more than doubled its membership during the six years since we last met in New York. At its foundation and for many years afterward this association supplied all that was demanded of a national society representative of the various natural and physical sciences. In later years specialization, at once a cause and a result of the great progress of science, has led to the formation of many special scientific societies of national scope, and the end is not yet in sight. It became evident several years ago that the association, in order to retain its usefulness, if not its life, must adjust itself to the new conditions, and this it did by taking the position of a central organization of science with which the various special societies, while remaining autonomous, should become affiliated and constituent units. It can not be doubted that the broad conception underlying this readjustment is the correct one and that its application has already been attended by a large measure of success.

There remain, however, certain difficulties to be overcome and certain problems to be solved before this association shall have attained that ideal of organization and of usefulness to which we may reasonably look forward. The need of such a central, national organization as a coordinating, unifying, harmonizing influence, as an authoritative representative and exponent before the public of scientific opinion and of scientific workers, as an instrument to secure cooperation among scientific investigators, to influence public opinion, to advance the interests of science as a whole as well as to inaugurate and to secure support for special scientific undertakings and lines of investigation, and as a means of securing that most desirable purpose, placed first among the objects of the association in its constitution, 'to promote intercourse between those who are cultivating science in different parts of America'—the need, I say, of a central organization with these aims and others which might be specified demands, I think, a wider and deeper appreciation among the scientific men and women of this country. Especially should our leaders in science realize, as many of them do, the great possibilities of usefulness of this association and work actively for the promotion of its welfare. Larger financial resources are needed to perfect the organization and to enable the association to cultivate more fruitfully the fields which it already occupies and to enter new ones. Within the near future the membership should rise to at least ten thou-

sand. With its history of honorable achievement and its present success this association may confidently look forward to a future of greatly increased power and usefulness for the advancement of science.

I now declare open this fifty-seventh meeting of the American Association for the Advancement of Science, and in so doing I express the hope, which our program indicates to be indeed an assurance, that the sessions and social functions of the association, of the various sections and of the affiliated societies may be full of interest, pleasure and profit to those in attendance.

Our program now calls for announcements by the general and local secretaries. Has the local secretary any announcement to make?

Doctor Cattell: The local arrangements are announced in the general program, which may be obtained in the entrance hall. Notices in regard to excursions and receptions which concern only sections or affiliated societies will be made in those societies' meetings. Perhaps the only thing that needs to be said is that ladies accompanying members are very cordially invited to the receptions that have been arranged. These include the reception by President Butler, of Columbia University, in Earl Hall, at 9 o'clock this evening, a luncheon and general meeting on Saturday at the College of the City of New York, the unveiling of ten busts of pioneers of American Science at the American Museum of Natural History, on Saturday afternoon, and in the evening a reception given by the trustees of the museum and the New York Academy of Sciences, with an exhibition of scientific progress by the academy.

Doctor Welch: We will now hear from the general secretary, Mr. Hayford.

Mr. Hayford: A letter which has just been received from the secretary of the building committee of the United Engineering Societies, which is the holding corporation for the Engineering Society's building. (Reading) "It gives me pleasure as secretary of the United Engineering Society, which is the holding corporation for the Engineering Societies' building at No. 29 West 39th Street, to extend an informal invitation to the members of the American Association for the Advancement of Science to visit our building during the week of the meeting." Signed by F. R. Hutton, secretary.

Doctor Welch: Our printed program contains the detailed announcements. It is in order to move an agreement on the hours of the meeting.

Doctor Smith: I move that the hours of the meeting of the various sections be as specified in the printed program. (The motion being seconded, the president put it to a vote, which being unanimously in the affirmative, the motion was declared carried.)

Doctor Welch: The session is now adjourned. The association will meet again on Tuesday morning at ten o'clock in this hall.

THE POLICY OF THE CARNEGIE INSTITUTION[1]

Since the trend of development of the institution still hinges to some extent on the relative merits of large projects carried on under the direct supervision of the institution itself and of small projects committed to individuals whose affiliation with the institution may be only temporary, a large amount of attention has been given to this question during the year; much more in fact than to any other. It is a matter of daily correspondence, of daily interviews and of daily importunities. With a desire to see all sides of this question and to hear

[1] Concluding part of the report of the president, 1906.