discouraged and delayed. Thus American mathematics has suffered not only in reputation, through the suppression of what are perhaps the greatest American achievements in mathematics, but also in that encouragement necessary to the establishment of a strong school. The same may be said of the essentially mathematical researches of other men still living, whom I hesitate to name,[2] whose work is scattered through journals on general science, journals on astronomy, journals on life insurance, journals on engineering, and so forth.

Already there have been published by the *Monthly* articles of research on topics in insurance, on mathematical history, on mechanics, and on other applied branches of mathematics. In the first annual meeting, Professors Wilson and Webster presented their own studies on the mathematical theory of the dynamics of the air. At the last summer meeting Professors Huntington and Hoskins presented studies on the foundations of mechanics. Such work, though deserving of high praise, has long had no suitable center for exposition and for encouragement. This association has afforded a means for exposition, as within the field of mathematics in its broader meaning, of papers in applied branches of mathematics. I trust that we shall continue this policy, and that we shall no longer rule out of our circle in mathematics, those who find the problems of applied mathematics peculiarly attractive. It should be our aim to encourage them and their students; to hear their work and to print it; to listen to their counsel on the needs of our traditional mathematical courses, to learn from them ourselves to appreciate more keenly the significance of mathematics as a whole.

In both these ways—by reorganizing our own instruction under the auspices of this association, and by the recognition and encouragement of workers in the various fields of applied mathematics, we may, and I think we should, increase the appreciation of the significance of mathematics among our students, among the public and even among ourselves. Incidentally we shall have done a service, not only to the public, in the increased emphasis upon phases of mathematics of real public service, but also to the advancement of mathematics itself, in that a better insight into the significance of mathematics will prevent or nullify mistaken attacks on the subject as one of little public worth.

Such to my mind should be one function, if not the chief function of this association; the regeneration of a significant mathematics, the encouragement of workers in applied mathematics, and the effort to obtain recognition of the true public worth of mathematics in every phase.

E. R. HEDRICK

UNIVERSITY OF MISSOURI

[2] One of the men I have in mind is in attendance at these meetings.

AN INSTITUTE FOR THE HISTORY OF SCIENCE AND CIVILIZATION

TO THE EDITOR OF SCIENCE: The appeal concerning "an Institute for the history of science and civilization" published in SCIENCE, March 23—ill-timed as it was—has met with the most encouraging response. Two communications relating to it have been published in SCIENCE, June 22 and July 6,[1] and a great many more have been privately addressed to me. Most of them, however, lay so much stress on some special feature of our plan that I feel it necessary to state again, briefly, the fundamental idea that underlies it, lest the real purpose of the institute be lost sight of.

But let me say first of all that there is at least one point upon which an unanimous agreement seems to have been reached. The whole budget of letters which I have received

[1] *Cf.* also F. S. Marvin in the *Positivist Review*, London, June, 1917.

from all over the country, points to the conclusion that there is already a wide-spread, though scattered interest in the history of science, and that it is high time to organize it and to devote to these studies at least as much attention as is given to the history of other aspects of human life. The wretchedness of present conditions will be best depicted by remarking that, whereas there are hundreds of scholars who earn a living by teaching general history, or the history of art, of literature, of religion, there is not yet in America a single chair exclusively devoted to the history of science! From my very extensive correspondence on this subject, I gather, however, that before long an irresistible pressure will fortunately put an end to this paradoxical situation.

The purpose of the institute can only be accomplished if its activities be constantly inspired by a close coordination of the three following points of view.

There is first *the point of view of the historian*: The progress of mankind is a function of the development of science. Indeed science is the only process which is really cumulative; it is also the most international. Hence to give a true picture of the development of civilization, it must be focused on the evolution of scientific thought and practice.

Secondly, *the point of view of the scientist:* The evolution of science must be studied to better understand the interrelations of all its branches, and the principles and real signification of each of them. The elaboration of science into an organic whole implies such historical research. A continuous criticism of the foundations of science is equally necessary, lest it degenerate into empiricism or into a system of prejudices. This critical work is essentially of an historical nature. The point of view involved is splendidly illustrated in the works of Pierre Duhem and Ernst Mach.

Thirdly, *the point of view of the philosopher,* which could also be called *the encyclopædic point of view,* the philosopher whom I have in mind being of course a man highly trained in scientific thought and research, but whose interest is mainly a coordinating, a synthetic one. It is clear that the more science is specialized, the more it becomes complex and extensive—the more also do some kind of synthetic studies become necessary to preserve its organic unity and indeed its very existence. A work of this kind has been more or less successfully accomplished at different periods by such men as Aristotle, Thomas Aquinas, Kant, Comte, Cournot, Spencer. It needs must be undertaken over and over again, but it becomes increasingly difficult and is now perhaps beyond the grasp of any single man. It is not simply a matter of genius—such synthesis does not require more genius now than it did in the fourth century B.C.—but the initial stock of knowledge to be mastered is so much greater that the process of classification and assimilation previous to any new synthesis must be partly effected on a cooperative basis.[2]

I beg to repeat that the fundamental idea of the institute is to coordinate these three converging points of view; that is, to organize —for the first time—a systematic collaboration between scientist, historian and philosopher, and so to make the accomplishment of their highest task possible, despite the increasing wealth and intricacy of specialized knowledge. These points of view complete and balance each other. He who separates them simply proves that he has failed to understand the purpose that we try to accomplish.

One may object that the cooperative work which we are advocating is already possible now—without a new institute—and that our universities already bring together some of the men whose collaboration is needed. The objection, however, is not valid, because, even if the right men happen to belong to the same university, economic conditions will generally prevent them from devoting themselves entirely to an activity of great amplitude and duration which does not pay. Besides, we can not depend on such chance combinations: this synthetic work must be carried through in a systematic way, with sufficient completeness

[2] This is especially true for all the historical material. The encyclopædist must take the whole past into account; yet, he has no time to pursue historical investigations.

and thoroughness, extreme accuracy and reasonable speed.

Hence, I believe that the creation of such an institute—either as a department of an existing university or other institution, or independently—is the only practical way to make possible this intimate collaboration of historian, scientist and philosopher which is becoming more and more necessary. Moreover, the institute would also provide one of the most effective ways of preparing a much needed reorganization of our educational system, the internal vice of which is clearly proved by the ever recurring controversy "science versus the humanities." It is obvious that the importance of science in education can but increase, but this can not be safely done without introducing a little of the humanistic spirit—*i. e.*, essentially a historical and disinterested point of view—in our scientific and technical studies. There should not be any rivalry between scientific and humanistic studies, but only cooperation to a common end; more knowledge, beauty, justice. Now, the proposed Institute would become the natural center of this *New Humanism* for which I am pleading; it would train men imbued by this new ideal —not one easily made up of vague generalities, but an idealism constantly rejuvenated and checked by intimate contact with the best available knowledge and the most exacting scholarship. Its humanizing influence would soon be felt all over the country.

I think that I can say, without any impertinence, that one of the shortcomings of this country—one that may imperil the accomplishment of her higher destiny—is the relative scarcity of broad and accurate scholarship. This is partly caused by economic conditions discouraging disinterested studies, but it also is due to the absence of a congenial tradition. The institute would establish such a tradition.

The reader who is in sympathy with the purpose of the institute will find no difficulty in appreciating the interesting suggestions published in these columns by Mr. Bert Russell and Mr. Aksel G. S. Josephson.

Mr. Russell suggests (June 22) that to the activities of the institute be added the following: "the facilitation of prompt and reliable judgments upon all questions of novelty arising in connection with the administration of the patent laws, thereby aiding in the placing of the administration of such laws upon a secure scientific foundation."

There should be indeed as close and friendly a collaboration as possible between the institute and the Patent Office. But we must not forget that the collections of the Patent Office refer almost exclusively to the technical end of science—taking all in all, not the highest one (a scientist does not generally patent the original combination of instruments that have led him to a discovery). Besides they refer only to the most recent times.

It is noteworthy in this connection, that I have also received two other interesting communications insisting on the importance of the study of primitive science and suggesting therefore a closer collaboration with ethnographic museums. As a matter of fact, the institute should try to consider not simply the beginnings or the latest developments of science and technology, but the entire development. After all, in the whole evolution, it is impossible to point out one step forward which is more important than the others; each is indispensable and there is no common measure between them.

If the institute is to be associated with another institution, the most useful association would perhaps be one with a great museum, such as the U. S. National Museum, the American Museum of Natural History or the Harvard Museums. The objects of a museum can not be easily moved or duplicated, whereas it is not difficult to move or photograph books or manuscripts. Moreover, the eventual creation of a museum of science such as the *Conservatoire des Arts et Métiers* or the *Deutsches Museum,* would be easier and less expensive if the institute were already connected with another museum.

Mr. Aksel G. S. Josephson lays special stress (July 6) on the bibliographical activity of the institute. The historians of science should be grateful to him for the valuable bibliographical work which he has undertaken in

their behalf, and I, for my part, am much in sympathy with most of what Mr. Josephson says.

Still, we must not forget that bibliography is not an end, but simply a means, a method. I am, of course, chiefly concerned, not with external bibliography such as is needed in libraries, but with internal, critical bibliography. From this point of view, it is quite clear that the matter of essential importance is not the mere bibliographical technique—however important it may be—but a deep knowledge of the subject matter to be criticized.

I am quite agreed with Mr. Josephson, that many scientists show a deplorable lack of bibliographical method. Yet, I do not think it possible, as a rule, to train bibliographers for very special critical work. Anyhow it should be easier to teach bibliographical consistency to the scientists, than to make the bibliographers omniscient.

I hope that Mr. Josephson will be pleased with the following conclusion. There should be on the staff of the Institute at least one highly trained bibliographer, whose duty it would be to distribute the books and articles among expert critics and to see to it that their work, as far as external bibliography is concerned, be as accurate and uniform as possible. His functions would chiefly be those of a bibliographical editor.

At the present time, excellent critical bibliographies are periodically published for almost all the branches of science, but there is none really satisfactory for their history, philosophy or for the organization of the whole. I had tried to organize such a bibliographical service in *Isis*, but unfortunately this publication was stopped by the war, just when I was beginning to see my way to do it well. The publication of such a bibliography would naturally be incumbent on the institute; considerable pains should be taken to make it as perfect as possible—but it would only be a means to a higher end.

GEORGE SARTON

HARVARD UNIVERSITY

THE MEDICAL SCHOOL OF THE UNIVERSITY OF PENNSYLVANIA AND WAR SERVICE[1]

THE same splendid equipment and patriotism that enabled the graduates of Pennsylvania's medical school to take a preeminent position in the surgical and medical work of the Civil War, both in the north and south, promises to produce similar results in the present great war. It is too early to compile any trustworthy records of the great army of physicans and surgeons who are now in the service, but the lists grow longer every day.

Aside from what the medical alumni as a class are doing, the medical school as a whole is giving to the utmost of the skilled men on its faculty. Already between sixty and seventy members are in the government service, many of them occupying positions of the utmost importance. In fact, so many have gone that the teaching staff is maintaining its high standard only by the self-sacrificing effort of those who have remained.

Pennsylvania can take a pardonable pride in the fact that five of the base hospital units which have gone or are prepared to go from this city are under the direction of Pennsylvania men, while graduates of the University comprise most of their staffs. The University Base Hospital Unit No. 20, which has been ready to sail for several weeks, has Dr. J. B. Carnett for its director. Episcopal Base Hospital is under the direction of Dr. A. P. C. Ashurst. Dr. John H. Jopson occupies a similar position with the Presbyterian Base Hospital, while Dr. Robert LeConte, a member of the Board of Trustees, is director of the Naval Base Hospital No. 5 from the Methodist Hospital. Dr. Richard H. Harte is director of the Base Hospital No. 10, which the Pennsylvania Hospital sent to France last June.

In addition to the foregoing, Lieutenant Colonel Henry Page, '94 M., is commander of the Medical Training Camp at Fort Oglethorpe, Ga. On this staff are such men of national repute as Dean William Pepper, of

[1] From *Old Penn.*