Bagnall Poulton Fund," to be applied at the discretion of the Hope professor of zoology at the University of Oxford, in the promotion of the study of evolution, organic and social. Professor Baldwin has also announced his intention of leaving by will money for the sustentation of such a fund.

DR. D. A. ROTHROCK, professor of mathematics, has been elected dean of the college of liberal arts of Indiana University.

PROFESSOR H. E. HAYDEN, JR., formerly associate professor of biology in the A. & M. College of Texas, is now professor of biology in the University of Richmond, Va. Mr. Paul R. Merriman has recently been added to the staff as associate professor of botany.

DR. JOHN STEPHENSON, until recently professor of zoology in Government College, Lahore, has been appointed lecturer in zoology in the University of Edinburgh.

DISCUSSION AND CORRESPONDENCE

POSITIVE RAY ANALYSIS OF MAGNESIUM

USING the apparatus for positive ray analysis described in *The Physical Review* for April, 1918, I have recently succeeded in analyzing the element magnesium (atomic weight 24.36) into three isotopes of atomic weights 24, 25 and 26. The method is an adaptation to positive rays of a method previously used for measuring the ratio of charge to mass for electrons. The three components of magnesium appear suddenly together as the magnesium anode is heated to vaporize slightly. Their masses may be compared accurately with the molecule of mass 28 due either to occluded nitrogen or carbon monoxide, which is driven off at lower temperatures. The method also gives the relative amounts of the rays; the components at 25 and 26 are of about equal intensity, and that at 24 approximately six times as strong as the others. The average atomic weight 24.375 agrees as closely as is to be expected in these first experiments with the chemical atomic weight.

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ON RECORDING APPARATUS FOR METEOROLOGICAL RESEARCH WITH ROCKETS

MR. S. P. FERGUSSON of the Weather Bureau has recently published several ingenious suggestions regarding the development of recording apparatus free from pivots, and hence useful in devices that are subject to jar. These suggestions are described in the *Monthly Weather Review* for June, 1920, pp. 321–322.

In this connection it is worth while remarking that tests with the model at present being made, using a mass carrying a recording pencil and held by a spring, show that the jar need at no time during the ascent be greater than would be experienced by a body striking the ground from a fall of 31 inches. This figure may be considered as representative of practical working conditons, but it is the jar, however, without any springs or shock-absorbing devices to protect the instruments.

Recording instruments for this particular work may be divided into two classes: First, instruments recording temperature, pressure and humidity by means other than the use of pivots, as already mentioned, the recording taking place both during ascent and descent. If records are to be had during the ascent, however, care must be taken so to support the various masses that there is no tendency to vibrate in a vertical plane. In general, this will not be a simple matter.

To the second class of instruments belong those involving the use of pivots which are kept separated from the bearings until automatically brought into contact when the descent begins, or at least after the propelling impulses have ceased. Instruments of this type need not differ fundamentally from devices at present in use, except that any considerable moments of force on delicate parts should be avoided.

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THE HISTORY OF SCIENCE SECTION AND THE PROGRESS OF SCIENCE

TO THE EDITOR OF SCIENCE: In view of the approaching meeting of the American Asso-

ciation for the Advancement of Science, to be held in Chicago on December 27 to January 1, with its anticipated large attendance of sections and affiliated scientific societies, it is desirable to call attention to the fact that a symposium of papers or conference upon the History of Science will be held.

It is desirable at this time, also to formulate some plan for reorganizing section "L" to be known in time as the History of Science section, and to receive the report of the executive committee of the Council of the Association relative to the original plan of the History of Science section, to whom application and letters of endorsement have been sent.

It is also an appropriate time for those interested in this field of research and study to give some expression for a more progressive and effective means of advancement, which can only be done by cooperation through a well organized section.

The idea of the formation of an organization of this sort has been in the minds of the students of the history of science for some few years. During the early part of 1919 a number of communications were published in SCIENCE[1] advocating the desirability of such a section, and, urgent as the communications were, no action was taken. However, the Executive Committee of the Council is quite ready to do all in its power to the furtherance of this movement, providing a sufficient demand is forthcoming. Therefore, it is greatly desired that all those interested in this proposed section, express themselves in some definite manner, preferably by being present at the symposium at the Chicago meeting.

From the very foundation of the Royal Society of London, in 1662, cooperation was the prevailing spirit; which gave strength and impetus to further scientific progress. Our own venerable institutions, namely: The American Philosophical Society and American Academy of Arts and Science, founded in the intellectual and scientific centers of Colonial life, were also imbued with the principle of cooperation, which laid the foundation of America's preeminence in science today. The National Research Council is in itself the highest spirit of cooperation. In fact, all scientific and literary societies realize the value of cooperation. It is, therefore, only too evident what note cooperation plays in the history of science, and the same idea must prevail in the study and research in the history.

Heretofore the development and encouragement of the study of the History of Science has been left solely to individual efforts, and much remains to be accomplished if the subject is to have the same relative standing as the study of physics, chemistry, astronomy and other divisions of the sciences. The question of a new section among the already large number of sections affiliated with the American Association for the Advancement of Science is not a cause for amazement—quite to the contrary, but one indicating a healthy state of intellectual growth—in science, and to the "Association."

That we need more historical background for our ever growing technical subjects is so apparent to scholars that no further recognition of this fact will be taken here. Nor do we need to dwell upon the place science occupies in the history of civilization. What we are interested in wholly at present is the subject itself, in the field of scholarship and the need for a more decisive impulse and sympathetic understanding.

In the spirit and faith of a modern Humanist, who says:[2]

> It is true that most men of letters, and, I am sorry to add, not a few scientists, know science only by its material achievements, but ignore its spirit and see neither its internal beauty nor the beauty it extracts continually from the bosom of nature. Now I would say that to find in the

[1] SCIENCE, N. S., Vol. XLI., March 5, 1915, pp. 358–360; Vol. XLIX., April 4, 1919, pp. 330–331; Vol. XLIX., May 9, 1919, pp. 447–448; Vol. XLIX., May 9, 1919, pp. 447–448; Vol. XLIX., May 23, 1919, p. 497; Vol. XLIX., July 18, 1919, pp. 66–68.

[2] Dr. George Sarton, "The Faith of a Humanist," *Isis*, No. 7, Tome III., January, 1920, p. 5.

works of science of the past, that which is not and can not be superseded, is perhaps the most important part of our own quest. A true humanist must know the life of science as he knows the life of art and the life of religion.

The life of a science is not its daily practise in technic, building theories, testing hypotheses and handling results as worth so much—it is the story of trials and errors—the struggle of the mind for new concepts of nature and man's relation to this progress, and in the words of another true humanist,[3]

> The student should be led to see that human history is a continuous process, not a succession of catastrophies. The real growth of humanity takes place in quiet; by war it is interrupted or reversed. For war is never the motive force of progress, and the spread of great ideas is not often facilitated by it. The forward trend of civilization is largely conditioned on science—itself a product of peace.

With each new advance in science, each phenomenon of event shows only too conclusively how closely knit is the history of the discovery bound up with it, that no discussion of the theory or final result can be clear without its antecedent proceeding. The evolution of scientific progress clearly shows that there is no finality in science. The recent work in "Relativity and Gravitation" is the best example of concomitancy of theory and history—from the philosophical concept of the Greeks, to the present most rigorous and complex mathematical and physical understanding of Einstein's theory. The whole field of physical science has been reset with historical importance which has never been realized since Newton.

And surely our own progress in science in America warrants us to become more introspective, namely—viewing the present in the light of the past. If we are to have a distinct type of culture, worthy of any great intellectual epoch, it must depend upon our ability for introspection. To this end, then, it is interesting to note, that throughout the country there is awakening a new interest in the history of science. This movement is but natural and in conformity with the growth of science progress itself.

Some few years ago it was pointed out to what extent the interest in the history of science had grown, especially as an educational factor in our colleges and universities.[4] Fortunately the "great war" has not lessened the interest, but it may have retarded the developments.

From a recent survey over practically the same field of investigation, it is extremely encouraging to note a few prominent features of this development. These facts will be given in order that a clearer understanding may be had for one of the many reasons why the History of Science work should be organized to form section "L" (Historical and Philological Sciences). Heretofore section "L" has not functioned, so that the field is open for organization and for productivity.

The most prominent and effective step in this growing movement was the establishment of a full professorship at the University of California in 1918 in the history of mathematics. The well-known scholar and historian of mathematics, Dr. Florian Cajori, has for two years offered courses in the history of mathematics and history of physics, besides for graduate work two seminar courses are offered in the history of algebra and of infinite series.

The next forward step of equal importance was the establishment of the post of research scholar in the history of science in the Carnegie Institution of Washington. The new position (Associate in the History of Science) was eminently filled by the appointment of Dr. George Sarton, who has for the last few years been offering courses in the history of science in Harvard University. From an extract concerning Dr. Sarton's work[5] it is of value to note the importance the authorities of the Carnegie Institution place upon the future of this movement.

[3] David Starr Jordan, "Building for the Future," *The Public*, May 3, 1919, p. 462.

[4] SCIENCE, N. S., Vol. XLII., No. 1091, pages 746–760, November 26, 1915.

[5] Year Book No. 18, Carnegie Institution, Washington, D. C. (1919), pages 347–349.

In recognition of the fact that the progress of astronomy in America has made magnificent contributions to that science, it is befitting that we should find in the oldest school for astronomical graduate work a course pertaining to the history of astronomy in America. The Detroit Observatory of the University of Michigan has in itself a wonderful history, in respect to training astronomers who have all been leaders in astronomical research. Dr. W. Carl Rufus's work in the history of astronomy consists of two courses—the first being the general history of astronomy and the second following with the history of astronomy in America. The second course is of particular interest to us now, since it is building the framework upon which the history of science in America must rest.

A cooperative course in the history of science is now being offered for the first time at the Northwestern University. It is given in two divisions, namely: the history of the physical sciences, given by Dr. Henry Crew, and the history of the biological sciences, by Dr. William A. Locy.

We may venture here to state that this form or division of the history of science teaching is probably the most satisfactory form in which to conduct the whole subject, since it is becoming more apparent that no single individual will be able to teach the subject as a whole.

At the University of Chicago we find a rather unique institution in the form of two historical courses being offered in the correspondence-study department by Dr. G. W. Myers. The history of mathematics and the history of astronomy are given primarily with emphasis placed upon the cultural value. Aside from the regular established course in the history of mathematics and biology, and a new course being offered in the history of astronomy, Yale University has announced a series of public lectures in the history of science.[6] These lectures clearly emphasize this growing movement for a more sympathetic understanding of the past, a regard for the past human relationship of those whose labors have prepared the way.

And, finally, it is to be accepted as a recognition of the worth and importance of the history of science when we read of the successful conference the American Historical Association carried on in December, 1919.[7] The interest the historian of the social and political sciences has in the history of science, is decidedly different from the historian of the sciences themselves. One may be termed the cultural interest, whereas the other is the technical interest. That is, the former is interested in the history of science from the point of view of methodology and the influence science has had on civilization—the latter is mainly concerned in the development of the concepts in science, and the growth of the subject matter and its influence upon related problems. It is evident that the interest can be, with profit, fostered by two widely different organizations, which never meet in common.

Such has been the progress of the movement to cultivate the history of science in the United States within the last few years. The remarks concerning these various steps of the progress are necessarily brief, but sufficient has been quoted to indicate that a new cultural epoch in the intellectual history of America is dawning. This cultural epoch must, from the very fact of its influence and interpretation, come to be known as the "new Humanism."

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[6] Science, N. S., Vol. LII., No. 1347, p. 383–384, October 22, 1920.

[7] Science, N. S., Vol. LI., No. 1312, pages 193–194, February 20, 1920.

SPECIAL ARTICLES

OPTIMUM NUTRIENT SOLUTIONS FOR PLANTS

During recent years numerous investigators have devoted considerable time and resources to the study of the salt requirements of various plants. Plans have been proposed for the extension of this work, with the hope that certain fundamental data may be obtained which shall indicate the composition and concentra-