be profoundly affected by this method; for by it we can develop an instinctive disposition to rely upon the aids which science can afford in practical affairs.

The aim of a good educational system is to engender an interest in the world of mind and in its physical environment so as to ensure our being advised as to what is already known, and being endowed so as to be able to utilize the resources of nature, thus making us alert to the opportunities about us; this assuredly not in order that we may live more luxuriously, but that we may live—so to speak—more expressively.

The more advanced elements of this system will be a good series of text-books, appropriate apparatus for schools and colleges, qualified teachers, well-equipped and adequately staffed technical colleges and universities, so that the staffs shall have abundant time for research and for guiding post-graduate work. The means for carrying out such research is also sorely needed. Beyond this the scientific departments of government—*e.g.*, agriculture, etc.—would require staffs to carry on their appropriate researches, in addition to their routine duties. Finally, as before said, we need institutes for pure research, and also institutes concerned both with research and with all applications of science to industry. To these institutes persons interested might go freely for guidance, at a payment only of such fees as are needed to prevent unreasonable use of the institution. If the world be so organized as to admit of it, it were better to find hundreds of millions for such work as this than for perpetual readiness to destroy. The education and control of peoples; the means of solving the social, economic and financial problems of international life; the question of control and distribution of populations; the inauguration of a scheme of national and international life in which a spirit of service shall take the place of the spirit of merciless competition—these will need all the elements of the problems to be under review, and will call for the exercises of the most complete knowledge both of external nature and of human character. The alternative would appear to be wreckage and the spread of poisons and of disease, and these might even destroy civilization, so that knowledge, instead of having rendered noble service, would have cursed the world whose genius had called it into being.

Our hope is to see a new spirit born here. One may ask, to what end? It may be that we can not say. No one knows what lies on the knees of the gods. But there is something within the mind and heart of any great people that responds to the dream of excellence, and inflames when the vision of national destiny is before it. Our mother-land has had a great past. Is its offspring here in southern seas, illumined by "the gem-pointed cross and the blazing pomp of Orion," to rise to material, to intellectual and to moral greatness among earth's peoples? If so, the path is strenuous but glorious. All visions of ease and luxury are but opiates and lead to destruction. We shall need to gird ourselves for the task, and create for ourselves a world where our sons, knowing something of the splendid mysteries of the boundless universe, and also of our own little world, will excel in the art of using to the full the heritage our nation has given us. Then, indeed, will science have rendered noble service to the sons of Australasia.

GEORGE H. KNIBBS
INSTITUTE OF SCIENCE AND INDUSTRY,
AUSTRALIA

H. FREEMAN STECKER

IN the death of Dr. H. Freeman Stecker, ranked as one of the leading mathematicians of the world, which occurred after six months of illness, in the Mercy Hospital, Baltimore, on October 29, the Pennsylvania State College lost one of its best known scientist faculty members. He had served the college for twenty years, and in that time presented over twenty papers on mathematical subjects.

The following memorial was spread upon the minutes of the faculty organization of the School of the Liberal Arts at the Pennsylvania State College at a recent meeting:

The School of the Liberal Arts of the Pennsylvania State College, wishing to place upon its records a memorial tribute to the worth and work of Dr. Henry Freeman Stecker and to give expression to the distinct sense of professional loss which the college and school have sustained in the passing of our friend and colleague, adopts the following minute:

Dr. Henry Freeman Stecker was born at Sheboygan, Wisconsin, June 3rd, 1867, and died in the Mercy Hospital at Baltimore, October 29th, 1923. He entered the University of Wisconsin in 1889, receiving the degree of Bachelor of Science in 1893; Master of Science in 1894, and Doctor of Philosophy in 1897. He was also fellow in mathematics 1893 to 1895, and honorary fellow in 1897. During the academic year, 1900–1901, he studied at the Universities of Göttingen and Berlin. He also spent the summers of 1911 and 1912 in Paris attending lectures on mathematics, and on the latter occasion participated in the meeting at Cambridge, England, of the International Congress of Mathematicians.

His career as a teacher began in his undergraduate days, as assistant in mathematics, 1890–1895. He served at Northwestern University from 1897 to 1900, and after his year of study abroad was called to Cornell University as instructor in mathematics, where he remained until 1903. In the fall of that year, he was elected to an instructorship at the Pennsylvania State College, and by zeal and devotion to his profession rose in academic rank and preferment to a full professorship in mathematics. Dr. Stecker was a member of Sigma Xi, and of the fol-

lowing professional associations: American Mathematical Society, London Mathematical Society, Société Mathématique de France, Mathematischer Verein, and Circulo Matematica di Palermo. By his professional peers, Dr. Stecker was ranked as among the leading mathematical scholars of his time. His principal researches were in pure mathematics, geodetic lines, non-Euclidean geometry, foundations of geometry, line geometry and integral equations.

As we, his colleagues, think of Dr. Stecker, the quality uppermost in his twenty years of service at the Pennsylvania State College was the combination in a rare degree of scholar and teacher. He exacted of himself the highest standard of thoroughness and mastership, and he expected and received in a marked way like response from his students. Rigidly intolerant of sham anywhere, he has contributed his part to our Penn State spirit of honest, consistent work in the tasks of each day. A certain temperamental reserve and dignity of demeanor in his relations rendered all the more significant that deeper spirit of helpfulness and friendly cooperation which so many students and teachers have shared with him. He always stood for high standards of scholarship and moral conduct. Thoroughness, the discipline of mastering difficulties, the value of intellectual work fairly possessed him.

With all this, Dr. Stecker valued the amenities of life as well as its severe science; and his study of art, to choose one example, bore fruit in the community. It is no mere accident that his most intimate contact for many years with college athletics was with those who strove in the closest hand-to-hand encounters in boxing and wrestling. His whole career as student and teacher, even his heroic attitude in fatal illness, reveal a personality which loved the struggle of life, and which valued a man who strove with and conquered all difficulties with a brave heart and an earnest soul.

We, his colleagues of the School of the Liberal Arts, point with just pride to Dr. Stecker's twenty years of faithful service for Penn State, to his professional zeal which made him so widely known as a mathematician, and to his qualities as a man, whose thoroughness, faithfulness and honest toil are now a part of our college heritage.

It is further voted that a copy of this Memorial of the School of the Liberal Arts be transmitted with sincere expressions of deepest sympathy to Mrs. H. F. Stecker.

By the Committee,
JOSEPH H. TUDOR,
LUCRETIA VAN TUYL SIMMONS,
ERWIN W. RUNKLE,
Chairman

November 3rd, 1923

SCIENTIFIC EVENTS

THE SILLIMAN LECTURES AT YALE UNIVERSITY

IN the Silliman lectures delivered at Yale University on November 6, 7, 8, 13, 14 and 15, Niels Bohr, professor of physics at the University of Copenhagen and winner of the Nobel Prize in Physics in 1922, developed the fundamental concepts underlying the application of the quantum theory to problems of atomic structure and showed how it has been possible to account to a considerable extent for the characteristic relationships between the elements, as summarized in the periodic table.

The first lecture was devoted to a discussion of the nature of these relationships and a statement of the program of atomic physics in accounting for them. The pioneer work of Dalton, Mendeleeff and Lothar Meyer has given us the natural system of the elements, and more recent work has shown the fundamental significance of the atomic numbers for the arrangement of the elements in this system. The combination rule and the simplicity of the formulas for series point to the basic importance of spectroscopic data for the interpretation of the properties of matter. The discovery of the electron and the atomic nucleus have led to a definite picture of the constitution of the atom, and we now know that the number of electrons around the nucleus in the neutral atom is equal to the atomic number. Due to the peculiar nature of the atomic system, it is possible to distinguish between two classes of properties—the radioactive properties, which are located in the nucleus and the ordinary physical and chemical properties, which are located in the outer electronic system and depend only on the total nuclear charge or atomic number. The program of atomic physics in the future is, then, to attempt to account for the characteristic relationships between the elements by means of considerations based on pure numbers. To do this, however, it is necessary to depart from the classical concepts of mechanics and electrodynamics which are unable to account for the stability of atoms or the origin of spectra.

The character of these new concepts as pointed out in the second lecture is suggested by Planck's theory of temperature radiation and Einstein's work on specific heats and the photoelectric effect in which it is necessary to introduce the hypothesis of the emission and absorption of energy in quanta. By means of two fundamental postulates proposed by the lecturer in 1913 which are based on the ideas of the quantum theory it has been possible to account immediately for the stability of atoms and to obtain an interpretation of the combination principle which makes possible the use of spectroscopic data for the investigation of the structure of atoms. These postulates assume the existence of stationary states within the atom which are fixed by certain conditions, and the emission of radiation by transition between them. It is possible to account in this way for the spectra of hydrogen and ionized helium in all details and to obtain an understanding of the general character of the relationships between the elements.