constitution with which they are born. But we can give them equality of opportunity and more; for we can provide the best opportunity for each and improve the environment for all. Even though it may be difficult to alter people after they are born, it may ultimately be possible to select the kind of people that we want to be born.

"The harvest truly is plenteous, but the laborers are few." And this is in large measure because we limit ourselves to the solution of St. Matthew: "Pray ye therefore the Lord of the harvest, that he will send forth laborers into his harvest." We do not use tested business policies to organize our work, but wait for the lords of the harvest to find us and to care for us.

> The fault, dear Brutus, is not in our stars,
> But in ourselves, that we are underlings,

or, in modern terminology, it is not the situation, but our failure to apply scientific methods to our own work, that makes us a feeble group gathered in Chicago when we might be a dominant force throughout the world. We should be practical men and see to it that we have a practical psychology.

J. McKEEN CATTELL

JOHN NELSON STOCKWELL

JOHN NELSON STOCKWELL, mathematician and astronomer, was born in Northampton, Massachusetts, April 10, 1832. When he was a little more than a year old his parents moved to Ohio, and at eight years of age he went to live with an uncle and aunt on a farm in Brecksville, not far from Cleveland. In speaking of his early education, he says he took very little interest in his studies until just before the outbreak of the Mexican War, when he became interested in history and, at the same time, began to solve arithmetical problems published in a weekly Philadelphia paper which found its way to Brecksville. It soon appeared that he could solve these problems readily and for a number of years he sent the answers to the paper week after week; he also worked every arithmetical problem he could find in old arithmetics which came into his hands. Algebra was not studied in the country schools in those days, and it was not until 1849 that he was able to begin work on this subject. He could find no teacher, but the subject proved to be so easy that he did not need one.

A total eclipse of the moon which occurred in November, 1844, first called his attention to celestial phenomena. From that time he was an ardent student of old almanacs and any other works which he could acquire dealing with astronomical events. When he was seventeen years of age, he secured a text-book on practical geometry and a year later began the study of general geometry, again without a teacher. So absorbed was he in mathematics that he found the work on the farm irksome and arranged to give less time to that and more to his studies. Olmsted's "Astronomy" and Dr. Thomas Dick's works gave him much practical information, but failed to satisfy him because they did not give enough theoretical work nor did they contain the mathematics necessary to predict astronomical events. The books he read frequently spoke of "La Place" and the "Mécanique Celeste." Young Stockwell, being determined to own this work, ordered it of a bookseller in Cleveland and received it in 1852, when he was twenty years of age. He found then, to his great surprise, that it consisted of four large quarto volumes and the cost was far in excess of anything he had imagined. But his desire for the work was so great that he was perfectly willing to give a half summer's work to get the money to pay for it. Before this time he had become somewhat familiar with calculus and was, therefore, able to understand much, if not all, of the content of these volumes.

From 1849 to 1851 he devoted all of his leisure to the study of geometry, trigonometry and higher mathematics, and in 1852 published a "Western Reserve Almanac of the Year of our Lord, 1853." By a mistake of the publishers his name was omitted from the title page and few, if any, knew the author. Soon after this he became acquainted with

Dr. B. A. Gould, who had recently begun the publication of the first astronomical journal in the country devoted to research work. In 1854, through the influence of Dr. Gould, Mr. Stockwell was appointed a computer in the Longitude Department of the United States Coast Survey and moved to Cambridge, Massachusetts, in order to carry on his work under Dr. Gould's direction.

Eight months later he returned to his uncle's home in Brecksville and resumed his farm work, giving all of his spare time, as before, to mathematics and astronomy. Before 1860 he had mastered the methods of computation of the orbits of planets and comets, and had computed the orbits of two comets which appeared in 1853. He computed the orbit, the perturbations and ephemeris of Virginia, the fiftieth asteroid, for its opposition in 1859. These results were published in the *Astronomical Journal*. In 1860 he published a new method of solving a set of symmetrical equations having indeterminate coefficients. In addition to these investigations, by 1860 he had begun a very extensive and elaborate computation of the secular variations of the planetary orbits arising from mutual attractions of each other. This work was interrupted by the war, however, and was not completed until 1872, when it was published in the Smithsonian Contributions to Knowledge. In 1861 he was given the position of computer in the United States Naval Observatory and continued in this work until 1864. At that time the United States Sanitary Commission, which had collected a large quantity of statistics in regard to sanitary conditions, requested Dr. Gould to reduce and discuss them, and he in turn asked Mr. Stockwell to assist him.

One day, while in Cleveland, he was inquiring in a bookstore in regard to the non-arrival from Europe of some books on the theory of probabilities. Shortly after that the book dealer mentioned this to Leonard Case, afterwards the founder of Case School of Applied Science, who said that he would loan these books to Mr. Stockwell as he happened to have them in his library. This act led to the acquaintance and friendship between these two men which continued for many years. Through the influence of Mr. Case, Mr. Stockwell soon afterwards moved to Cleveland and lived there during the remainder of his life. Mr. Case, a graduate of Yale University and a great lover of mathematics, persuaded Mr. Stockwell to undertake a complete discussion of the mathematical theory of the moon's motion. This work was never wholly finished but many specific problems in relation to the subject were completed and published from time to time.

During 1891 and later, Mr. Stockwell pubished a series of articles in various astronomical magazines on the subject of the ancient eclipses. If the theory of the moon's motion used in such computations is correct, then the predicted time of an eclipse will agree with the historical time, but if there are errors in the theory, the computed time will evidently differ from the historical time. Mr. Stockwell was able to prove that in a large number of cases the historical times agreed very closely with the theoretical times computed by his tables, and this proved that his theory of the moon's motion was substantially correct. Nearly a hundred ancient eclipses were computed and many of the results were published.

In 1881, after the death of Mr. Case, Case School of Applied Science was opened. It was but natural that the board of trustees should invite Dr. Stockwell (he had received the degree of doctor of philosophy from Western Reserve College in 1876) to become professor of mathematics and astronomy. He continued to serve in this capacity until 1887, but his tastes were for research and not for teaching and in the latter year he resigned his professorship and through the remainder of his life, devoted himself to that science which he had cultivated for so many years.

Among the many articles contributed by him to the journals, we find that a large proportion have to do with the theory of the moon's motion or the computation of eclipses based upon such theory. There are, however, many articles upon the orbits of comets,

chronology by means of ancient eclipses, inequalities in the motions of many of the planets, the procession of the equinoxes, and the mutual perturbations of planets.

In 1919 he published a new solution of the problem of the tides. In the preface to his work he says:

> The cause of the tides was sufficiently and correctly explained by Sir Isaac Newton in the year 1687; and the mathematical development of the effects produced by that cause upon the waters of the ocean has been the great unsolved problem before the scientific world for more than 230 years.

Mr. Stockwell believed that he had solved this problem, and in his recent pamphlet he gives two different solutions and a set of tables of the solar and lunar tidal waves, together with the method of computing the tides at any point on the earth's surface.

In 1855 he was married to Sarah Healy, a foster-daughter of his uncle, and they lived together for over sixty-one years until she died, at the age of eighty-three. Their life together was an ideal one. Besides taking upon herself much of the burden of domestic cares in order that her husband might devote himself more fully to his scientific work, she sympathized fully with him in all that he was doing and gave him her encouragement.

Dr. Stockwell continued his mathematical work up to within three weeks of his death. Although he lived to be eighty-eight years of age, his mind was perfectly clear, and until attacked by his last illness, he was able to carry on his work with much of the vigor which had always characterized his investigations. Occasional visits by him to my office kept me in touch with what he was doing, and I was very glad to be able to loan him, from the college library, some books which he did not possess. He was a natural mathematician and acquired his knowledge without a teacher because his clear, analytical mind was able to grasp and understand any mathematical or astronomical theory which intereted him. The long list of his published papers shows that he was also possessed of that rare type of mind—the type which can work out for itself new things in mathematics and science which clearly interpret the great laws of our universe.

CHARLES S. HOWE

SCIENTIFIC EVENTS

CHAIR OF LOGIC AT THE UNIVERSITY OF LONDON

DR. C. A. MERCIER, the distinguished London alienist, in his will offered $100,000 to London University to endow a chair under stipulations, sent us by Dr. E. E. Slosson. They are:

Scheme for the establishment of a Professorial Chair of Rational Logic and Scientific Method. The purpose of this foundation is that students may be taught, not what Aristotle or any one else thought about reasoning, but how to think clearly and reason correctly; and to form opinions on rational grounds: the better to provide that the teaching shall be of this character, and shall not degenerate into the teaching of rigid formulæ and worn out superstitions, I make the following conditions:

The professor is to be chosen for his ability to think and reason and to teach, and not for his acquaintance with books on logic, or with the opinions of logicians or philosophers. Acquaintance with the Greek and German tongues is not to be an actual disqualification for the professorship, but in case the merits of the candidates appear in other respects approximately equal, preference is to be given first to him who knows neither Greek nor German; next, to him who knows Greek but not German; next, to him who knows German but not Greek; and last of all, to a candidate who knows both Greek and German.

The professor is not to devote more than one twelfth of his course of instruction to the logic of Aristotle and the schools, nor more than one twenty-fourth to the logic of Hegel and other Germans. He is to proceed upon the principle that the only way to acquire an art is by practising it under a competent instructor. Didactic inculcation is useless by itself. He is, therefore, to exercise his pupils in thinking, reasoning and scientific method as applied to other studies that the students are pursuing concurrently, and to other topics of living interest.

Epistemology and the rational grounds of opinion are to be taught. The students are to be prac-