a hundredth of a second wherever they are on the earth; high-going planes carry photogrammetrical instruments of high standard for quick and exact mapping of even the most inaccessible regions; naval submarines can do peaceful geophysical work under the waves of the seas and give information about the material below the oceans; seismologists have found improved instruments for exact records of the moments of the earth's crust and of the earthquakes, the sound-waves of which pass through the interior of the earth and reveal the inner structure and properties of the globe—somewhat as a doctor does when he examines the inner organs of a human body by means of his stethoscope. Instruments for counting in less than a second how many ions swarm in each cubic centimeter of the air several hundred kilometers above our heads, and methods of analyzing the properties of large and small ions or even of small subdivisions of these ultra-microscopic particles, have been made available; certainly the tools which geodesists and geophysicists have to work with nowadays are not only useful, they are simply wonderful.

And now, gentlemen, the union is going to take up its pleasant work. We shall enjoy and profit from the personal contact with each other, we shall unite our forces in the study of scientific problems pertaining to the welfare of the 2,000 millions people who now live on the earth and of the unknown millions who will follow us, we will in a time of trouble give an example of the great value of collaboration among men, we will contribute to the conquest for mankind of the bounties of this beautiful earth, handsomely decorated as it is with radiant crowns of polar lights, with deep blue oceans, and with snow-covered volcanoes raised on its surface as signs of the fervency of its interior and as memorials of the birth of our star.

Expressing once more our most hearty thanks to our hosts for their hospitality and for the excellent arrangements of this meeting, and conscious that the union is now, *as ever,* going to work for truth, friendship and mutual understanding, I have the honor to declare this congress, the Seventh General Assembly of the International Union of Geodesy and Geophysics, to be opened.

La Septième Assemblée Générale de l'Union Géodésique et Géophysique Internationale et ouverte!

OBITUARY

WARREN PLIMPTON LOMBARD

ON July 13 America lost one of her early leaders in the field of physiology, for Warren Plimpton Lombard was among the small adventurous group who introduced experimental physiology to this continent. With that same death was lost a leader in humanity, for Dr. Lombard stood head and shoulders above his fellows in the better traits of man. He was truly a great gentleman.

A son of Israel and Mary Ann Plimpton Lombard, both descendants of early New England settlers, Dr. Lombard was born at West Newton, Mass., on May 29, 1855. It was here that he grew up and received his preparatory education in the Boston and West Newton public schools. This period of Lombard's life was a happy one, for his father had vowed that no son of his would experience the pangs of sorrow of his own childhood. This early training in happiness became a philosophy of Lombard's and guided him in his later life.

In 1878 he graduated from Harvard and continued there three years longer to receive his medical degree. Lombard realized how meager the facilities of this country were for physiological investigation and left for Europe to work in the laboratory of Ludwig. Three years later he returned to America to accept an assistantship in physiology in the College of Physicians and Surgeons in New York City. He left again for a short period of study abroad and then returned to become assistant professor of physiology at Clark University in 1889. In that same year Henry Sewall, who was then professor of physiology at Michigan, departed for the more friendly climate of Colorado. William Howell took Sewall's place. In 1892 when Howell accepted the professorship of physiology at the newly organized Johns Hopkins Medical School, Lombard was called to fill the chair of physiology at the University of Michigan. Here he remained in active charge for a period of 31 years, when he retired.

Dr. Lombard's appointment at Michigan was an important one, as may be gathered from his account of Henry Sewall and the department of physiology:

> When Sewall came to this university the whole method of teaching physiology changed. Not only did he know the subject as it is taught in the textbooks, but he was thoroughly acquainted with the most advanced methods of physiological investigation. . . . Nor did Sewall neglect the laboratory side of the subject. In the catalogue of 1884–1885 we read: "The equipment of the physiological laboratory contains most of the more essential instruments used in physiological demonstration and research." Then follows a list which is quite imposing, an equipment which was greater than that of any laboratory in the country, with the exception of the older laboratories of Harvard Medical School and the biological departments of Johns Hopkins. . . . This was the first laboratory course in physiology offered in any medical school in the country.

Under Lombard's directorship of the department

there were many changes, for physiology was prospering. With the growth of the Medical School at Michigan the physiology department was moved to larger quarters, which it shared with pharmacology. In this building Dr. Lombard's ingenuity stood him in good stead in developing an effective equipment for teaching and research. Lombard's main contributions were in the field of muscle and nerve physiology, reflexes, particularly the knee-jerk, the finer mechanics of muscles, tendons and joints in coordinated contractions, blood pressure, the pulse and the cardiac cycle and sensory endings. One of Lombard's first pieces of research appeared from Ludwig's laboratory in 1885. It dealt with the sequence and strength of contraction of the muscles of the lower extremity of the frog following on various forms of irritation applied to the skin. The simultaneous recording of contractions of as many as twenty muscles with the aid of a most ingenious mechanical system led to significant findings on the integration of spinal reflexes. Later studies of a purely mechanical nature complemented his earlier finding on nervous integration and revealed many unexpected uses of muscles, *e.g.*—"The fact that a two-joint muscle can make use of the tendon action of another two-joint muscle on the opposite side of the leg accounts for the paradox that a two-joint muscle, when in a position to have a stronger extensor than flexor leverage, may extend a joint of which it is a flexor." These studies were followed by the construction of models showing various complicated actions of two-joint muscles. Lombard was the first to construct a sensitive balance large enough to record the minute changes in weight accompanying each respiratory act in man, a method of investigation which has proven to be of value and of continuing promise. Another outstanding contribution was the visual inspection of the capillary circulation of man, a forerunner of innumerable important investigations in the field of circulation. The topographical localization of sensory endings in the skin with tattoo marks and plaster of paris impressions and their later identification at the original location is a striking example of the precision of his methods.

Historically Lombard's name will always be linked with American physiology. He not only brought the newer methods of investigation from abroad, but he was one of the charter members of the American Physiological Society. These incidents in his life were of unending satisfaction to him.

Dr. Lombard was married to Caroline Cook, of Staten Island, N. Y., on June 21, 1883. She died in 1923, the year that he retired. Her death was a great blow to him. He dropped physiology. He gave his valuable library to the Department of Physiology, set aside sufficient endowment to continue the subscriptions to the journals and turned his thoughts to art—drawing, water color and etching. Etching was his favorite, which he mastered with extraordinary ability. Those of the art colony at Monhegan, Maine, who saw his work each summer marvelled at his progressively increasing skill. Those who knew of his experimental ability understood. His work was shown in general exhibits and in one-man shows. In his later years art became his absorbing interest.

Friends who had the good fortune to know Dr. Lombard intimately will never forget his friendly and generous nature, which remained with him to his very last days. In "The Musings of an Old Man," written at the age of 84 and presented to a small scientific club at the University of Michigan, he makes the following statement:

> I have always been an optimist, and I can not claim to have ever been religious. I have thoroughly enjoyed life and feel that the finest one can do is to bring pleasures into the lives of others. In this I find a worthy reason for living, and shall be glad to live as long as I can enjoy life and help others to do so.

To those who admit the mechanistic forces of life and have faith in evolution, men like Warren Plimpton Lombard shine as rays of hope for the future happiness of mankind.

ROBERT GESELL

UNIVERSITY OF MICHIGAN

RECENT DEATHS

DR. HARVEY CUSHING, Sterling professor of neurology at Yale University from 1933 until his retirement with the title emeritus in 1937, died on October 7 at the age of seventy years. Dr. Cushing was Moseley professor of surgery at Harvard University from 1912 to 1932, when he was made Moseley professor emeritus.

DR. CHARLES STAPLES MANGUM, successively professor of physiology and materia medica, pharmacology and anatomy and from 1933 to 1937 dean of the Medical School of the University of North Carolina, died on September 29. He was sixty-nine years old.

DR. OSCAR HENRY PLANT, professor of pharmacology and head of the department at the State University of Iowa, died on October 2 at the age of sixty-four years.

DR. E. VICTOR SMITH, professor of physiology at the University of Washington, died on September 28 at the age of seventy-two years.

PROFESSOR JOHN RAYMOND LAPHAM, dean of the department of engineering of George Washington University, died on October 3 at the age of fifty-three years.

F. L. MUSBACH, professor of soils in the University of Wisconsin, who had charge of soil investigations at