Physiological duration depends entirely on the presence in the universe of organized living matter. It appears as soon as a portion of space containing metabolizing things becomes relatively isolated from the surrounding world. At all levels of organization, in the body of a minute cell as well as in that of an elephant, the cause of duration seems to consist of the modification of their medium produced by living structures, and of the secondary changes undergone by these structures under the influence of the modified medium. Time is recorded by a cell community only when the metabolic products are allowed to remain around the tissue. The simplest artificial system which shows the phenomenon of aging consists of a colony of tissue or blood cells living in a medium limited in quantity. In such a system, the medium is progressively altered by the products of cell activity and, in its turn, reacts on the cells. Then aging and death take place. The rate of aging of a given colony depends on its size and metabolic activity, and on the volume and composition of the medium. The fate of a tissue differs profoundly according to whether it lives in a small drop of plasma in the limited atmosphere of a hollow slide, or in a flask containing a large quantity of plasma and gases. It is the accumulation of metabolites in the medium which determines the duration of the system cells-environment. If these metabolites are removed at short intervals and the composition of the medium is kept constant, the cell colonies remain indefinitely in a same state of activity. They do not record time qualitatively. In fact, they are immortal. In the simple systems which we have so far considered, the existence of the process of aging must be attributed to the capacity of the environment to be permanently altered by tissue metabolism.

The relations of the tissues and organs to their environment are infinitely more complex in the higher animals than in these artificial systems. Although lymph and blood plasma which constitute the *milieu intérieur,* to use an expression of Claude Bernard, are continuously modified by metabolic products, they maintain a nearly constant composition, owing to the work of the lungs, kidneys, liver, intestines, etc. However, in spite of such an elaborate regulatory mechanism, slow changes, as stated above, take place in the composition of plasma and, under the influence of these changes, the tissues themselves become modified. Such phenomena are bound to a certain constitution of the organism. The fact of duration necessarily depends on the nature and mode of association of the metabolizing elements of the body and of the *milieu intérieur.*

We may conclude that physiological time is a succession of irreversible changes of the system cells-medium; that it can be measured by the rate of these changes and expressed in special units; and that the fundamental constituents of duration are structural and physiological processes bound to a certain type of organization, and specific of each species, of each individual and of the age of each individual. As living organisms are immersed in the physical universe, their duration must either be placed in the frame of physical time or be used as a frame for physical time. In fact, physical time is referred to physiological duration. Then, an important phenomenon takes place: physical time loses its constant value. It extends during infancy, and contracts during old age. Let us suppose two trains starting with the same speed and running on parallel tracks. The first train represents physical time and moves at a constant speed. The second train, on which we travel, represents physiological time and moves at a decreasing speed. At the beginning, the first train remains immobile, because we run as fast as it does. Later, as we advance less rapidly, its speed increases. Finally, when in maturity and old age we slow down, the train symbolizing physical time acquires great velocity and flies away. In the same manner, one year is far longer for a child than for his parents. Young and old people, although spatially united, live in separate universes where the value of physical time profoundly differs. It does not appear that educators and psychologists have as yet realized the importance of the unequal temporal value of the successive periods of life. Although these inequalities are clearly shown only by the measurement of physiological duration, it is certain that they are also a datum of consciousness. During youth, one year seems to be very long, and in old age, very short. Both psychological and physiological times flow in the same direction. But their reciprocal relations remain as mysterious as those of consciousness and cerebrum. Physiological time has the advantage over psychological time of being measurable. Hence, a more complete knowledge of its nature can easily be acquired. Such a knowledge is indispensable to a real understanding of the constitution of the body, which is composed not only of organs, bones, lymph and blood, but also of duration.

OBITUARY

MEMORIALS

THE *Journal* of the American Medical Association reports that a medical and surgical building was completed at the Johns Hopkins Hospital, on November 6, giving the institution a capacity of about 1,000 beds. Half of the building, the Osler Clinic, was com-

pleted and occupied in January; the other half is the Halsted Clinic. These clinics are memorials to the late Dr. William S. Halsted, first professor of surgery, and the late Sir William Osler, first professor of medicine, at the Johns Hopkins University School of Medicine. The addition, which provides about 300 beds, will house only ward patients. The building cost $1,740,000, provided by a gift of $500,000 from the General Education Board and an appropriation from an anonymous gift of $3,000,000.

To honor the memory of a late leader in the field of x-ray work in medicine, a bronze plaque in bas-relief of Dr. Preston M. Hickey, for many years director of the department of roentgenology at the University of Michigan Hospital, will be presented to the university by the American Roentgen Ray Society. The plaque is the work of Mr. Heinz Peter and the presentation will be made by Dr. Leopold Jaches, of New York City, president of the society.

AN oil portrait, painted by William Wirtz, of the late Dean Edward Vernon Howell, of the School of Pharmacy of the University of North Carolina, has been given to the school by Mr. J. Edward Murray, vice-president of the Emerson Drug Company of Baltimore.

A PORTRAIT of the late Edward Mallinckrodt was recently unveiled at the Mallinckrodt Institute of Radiology at St. Louis. Mr. Charles Nagel and Dr. Evarts Graham were the principal speakers.

A MARBLE bust of Thomas Alva Edison, presented by the principal associations of electrical engineers in the United States, has been placed in the Hall of Electrical Engineering in the German Museum (Deutsches Museum) in Munich, next to a bust of Werner von Siemens. Edison was a member of the committee of the museum. Edison exhibits at the museum include pictures and blue prints, original models and exact reproductions covering many of Edison's inventions in the sphere of electricity, as well as several exhibits in connection with some of the other fields of physical science in which he worked.

ACCORDING to the *Journal* of the American Medical Association the British Medical Association has opened a fund to establish a memorial to its founder, Sir Charles Hastings, in celebration of its centenary, which occurs in 1932. A stained glass window in his honor will be placed in the cathedral at Worcester, the city with which Hastings was most closely identified; a tablet will be placed on the house in Worcester where he practiced, and his grave in the Astwood Cemetery in that city will be restored and cared for. Any balance remaining after these objects have been attained will be turned over to the Sir Charles Hastings Fund, the income of which is distributed for the benefit of members of the medical profession and their dependents according to the discretion of its trustees. The opening ceremony of the centenary meeting of the association will be a pilgrimage to Worcester, July 24, 1932, when the memorial window and plaque will be unveiled.

ACCORDING to *Nature* the Polish Physical Society, the Polish Chemical Society, and the Society of Polish Electrical Engineers, with the support and assistance of the Polish Academy of Sciences, Cracow, the Polish Academy of Technology, the scientific societies of Warsaw and Lwow, and various other Polish scientific institutions, arranged for a celebration of the Faraday centenary, on November 6, at Warsaw, in the large hall of the Technical High School. The president of the Polish Republic, Professor Moscicki, and three members of the government were present; the British Embassy was also represented. After a short introductory speech, made by Professor St. Pieńkowski, Dr. Ladislas Natanson, professor of natural philosophy in the Jagellonian University, Cracow, delivered a lecture on the "Life and Discoveries of Michael Faraday." Addresses were also delivered by Professor W. Swietoslawski, of the Warsaw Technical High School, who discussed and explained Faraday's chemical and electrochemical researches, and Mr. T. Czaplicki, who chose for his subject, "Faraday and the Modern Science of Applied Electricity." The proceedings concluded with an exhibition of pictures connected with Faraday's life and work.

RECENT DEATHS

DR. CLARENCE L. E. MOORE, professor of mathematics at the Massachusetts Institute of Technology, died on December 5, at the age of fifty-five years.

PROFESSOR GEORGE HERBERT LAMSON, JR., dean of the division of Arts and Sciences in Connecticut Agricultural College, at Storrs, died suddenly on December 4.

PROFESSOR CARVETH READ, professor emeritus of philosophy and comparative psychology at the University of London, died on December 8 at the age of eighty-three years.

SCIENTIFIC EVENTS

THE WELLCOME RESEARCH INSTITUTION

LORD MOYNIHAN, president of the British Royal College of Surgeons, on November 25 laid the corner-stone of the new buildings for the Wellcome Research Institution which are to occupy the frontage upon Euston Road immediately north of University College.