of the series published by the expedition and makes a stately volume of 666 pages. It is filled with extremely valuable material relating to the ethnology and dialects of the various tribes encountered by the expedition, especially in Patagonia, Polynesia, Australia, South Africa and the northwest coast of North America. The grammar and comparative vocabulary of the Polynesian dialects are especially creditable, and Mr. Hale's studies of the migrations of the Polynesians and the peopling of the islands of the Pacific ocean may be justly said to have laid the foundation for all subsequent researches in that field. In their main outlines they have stood the test of later inquiry, and are accepted to-day by the soundest anthropologists.

Ten years after the publication of this volume (1846–1856), he removed to Clinton, Ontario, Canada, where he resided the remainder of his life, practicing law, but always in touch with the progress of his favorite scientific studies. His contributions to these, though not very numerous, were ever marked by an intimate knowledge of facts and deep and original reflection.

One of the most important of his works was the translation and editing of 'The Iroquois Book of Rites,' forming the second volume (pp. 222) of the 'Library of Aboriginal American Literature.' This valuable native document was printed in the original text, with a learned introduction and notes.

Mr. Hale was the first to discover the presence of the Siouan stock on the Atlantic coast by identifying the Tutelo of Virginia as a dialect of the Dakotan family. In two essays, one on 'The Origin of Languages' and the other on 'The Development of Language' (1886 and 1888), he brought forward and ably supported a reasonable and probable theory for the rise and extension of independent linguistic stocks, many of which are often found in limited areas. It is enough to say of these papers that their argument is masterly and that no other theory more acceptable has yet been presented to the scientific world.

In a later essay (1893), on 'Language as a Test of Mental Capacity,' he defended the value of linguistics as a criterion for ethnic classification; though in the development of this argument, he was somewhat hampered by his opinions as to the relations of savage to civilized conditions. In the same year a paper by him, on 'The Fall of Hochelaga,' set forth for the first time the early history of the Huron-Iroquois tribes.

Mr. Hale was an active member of the American and British Associations for the Advancement of Science, and was one of the founders of the Anthropological Sections in both. In 1886 he was Vice-President of the former and Chairman of the Section on Anthropology. He was also a President of the American Folk-lore Society, and an honorary or corresponding member of many learned associations.

In his village home he was constantly active in educational plans and in those tending to the development of the best interests of the community. Personally he was affable and considerate, and in the warmth of scientific discussions never forgot the courtesies of life, several times in this respect setting a much-needed example to his opponents.

D. G. BRINTON.
UNIVERSITY OF PENNSYLVANIA.

EMIL DU BOIS-REYMOND.

EMIL DU BOIS-REYMOND, the eminent physiologist and philosopher, died in Berlin on December 26, 1896, at the age of 78. He was the last of those four bright stars which illuminated the horizon of natural sciences for more than half a century. They are all gone now. Brücke died first (1892); then Helmholtz (1894); then Carl

Ludwig; and now du Bois-Reymond, last but not least, has passed away. These four eminent men who made everlasting marks in science have been life-long friends. All four were pupils of that grand master Johannes Müller. All four started out on their phenomenal scientific careers in the beginning of the forties and, though each one worked in a different line of research, they all had one object in common, which was paramount to them, and that was the liberation of the biological sciences from the deadening grasp of the obscure natural philosophy of those days, and the building up of physiology on a scientific rational basis. In combating the paralyzing idea of a 'vital force,' none was as energetic, none as perseverant as du Bois-Reymond. Only recently the old warrior in service of rational science again entered the arena to fight the old enemy in disguise, the 'neovitalism' of a Bunge, a Rindfleisch and others. Du Bois-Reymond and the other great physiologists are no more, and there is at present no one to fill their places. Who will protect physiology against the onward course of these new 'vital forces.'

E. du Bois-Reymond was born on November 7, 1818, in Berlin. He received there his general education at the College Français, and in 1837 he entered the University of Berlin, where he registered at first in the philosophical faculty, attending various lectures on philosophy, history and even theology. An accidental attendance at one of the lectures of Mitscherlich on experimental chemistry, however, had a deciding influence upon du Bois-Reymond's future. He began to study mathematics and the natural sciences, and went over later to the study of medicine, thus coming in contact with Johannes Müller, who was at that time the professor of physiology and anatomy at the University of Berlin. Du Bois-Reymond became first the 'famulus,' and later on the assistant, of Johannes Müller. In 1846 he established himself as 'privat-docent' at the University, and in 1855 he was made 'professor extraordinarius.' In 1858, after Müller's death, the chair of physiology was separated from that of anatomy, and du Bois-Reymond was made professor of physiology and director of the physiological laboratory in the University of Berlin, a position which he held to the last day of his life. In 1851, at the proposition of Alexander von Humboldt and Johannes Müller, du Bois-Reymond was elected to the *Berliner Academie der Wissenschaft*, a very high honor for a young man of only 33 years, and since 1867 he was the permanent secretary of the academy. Du Bois-Reymond was an honorary member of numerous scientific societies all over the Old and the New World.

The brilliant scientific carer of du Bois-Reymond was again determined by a single accident. In 1841 Johannes Müller handed to his amanuensis Matteucci's paper (Essai sur les phénomènes électriques des Animaux, Paris, 1841) for the verification of the experiments on the so-called frog current of Nobili. It became the task of du Bois-Reymond's life, and he solved it by creating a new science, the science of animal electricity. Already, a year later, appeared his first short paper on this subject (Ueber den sogenannten Froschstrom und die electromotorischen Fische, Poggendorff's Analen der Physik, Vol. 58), and was followed by his thesis (Quæ apud veteres de piscibus electricis extant argumenta, 1843). Then years of silence followed, years of hard labor, of seclusion in his small private laboratory, where 'the frog and the multiplicator were the whole world' to that most energetic of all investigators. The problems, the methods, the instruments, were thoroughly worked out with unparalled energy, ingenuity, precision and self-criticism, before they were communicated to the world. But then, when his book on animal electricity came out, it was a revelation, it marked an

epoch in physiology. In 1848 appeared the first volume of that book, 'Untersuchungen ueber thierische Elektricität.' In 1849 followed the first part, and in 1860 the second part, of the second volume. It was not simply a communication of new striking facts and new methods; it was an exhaustive statement of the creation and completion of a new science, presented in a brilliant style and in a language unusually clear and full of life and force. His later contributions to the physics of nerve and muscle appeared mostly in the reports of the Berlin Academy of Sciences, or in the Archiv für Physiologie, of which du Bois-Reymond was the editor. Among the fundamental facts which were added by du Bois-Reymond to physiology we have to mention, in first place, the establishment and development of the laws of the muscle current, the discovery of the nerve current, the discovery of the so-called negative variations in muscle and in nerve, the discovery of the electrotonus, etc., etc. Du Bois-Reymond has devised and invented numerous important scientific apparatus, many of which are to be found in all well-equipped physiological laboratories; for instance, the induction coil, the electric key, the non-polarizable electrodes, etc., etc. Du Bois-Reymond's name will live forever in the science of physiology.

Aside from his special scientific work, we should not omit to mention the public speeches (Reden) delivered by du Bois-Reymond on many special occasions. In those speeches, as a rule, an important subject was treated in a classical style. They were models of clearness and brilliancy, and nearly every one of his speeches has been an event in its time, and many of them have been translated into all civilized languages. We need only to mention here the following: 'Darwin *versus* Galiani,' 'Die Lebenskraft,' 'Ueber die Grenzen des Naturerkennens,' with his *ignorabimus*, and 'Die Sieben Welträthsel.' He was as forcible a speaker as a writer. And both his pen and his speech have been employed only for a fearless propagation of high ideals and in defence of the rational principles underlying modern sciences.

His last work was one of love. Shortly before he died he finished reading the proofs of his carefully prepared memorial of his friend Helmholtz.

S. J. MELTZER.

CURRENT NOTES ON METEOROLOGY.

THE PLAGUE AND CLIMATIC CONDITIONS.

THE present outbreak of the plague in India suggests certain considerations with reference to the possible connection of its occurrence with climatic conditions. While it used to be thought that the plague could not occur in the Torrid Zone, it is now known, in view of outbreaks of the disease within the tropics in Arabia and India, that this rule does not hold rigidly. In Egypt the autumn seems to be the season in which the plague appears, and June the month in which it dies out. In Europe, outside of Turkey, the plague season has been summer and autumn. In India no direct connection with the seasons could be detected in the epidemics of 1815–21, the first outbreak concerning which we have trustworthy information, and of 1836–38. From all the data at hand, the general conclusion is that a moderately high temperature favors the development and extension of the plague, but extremes of heat and cold are unfavorable to its breaking out. Exceptions to this rule are many. For instance, in the epidemic at Smyrna in 1735 the heat was so excessive during the plague that many of the people who left the town for neighboring villages died of sunstroke on the way, while in Roumelia, in 1737–38, the plague continued in many places in which the temperature fell at times to 3° Fahr. Regarding the effect of atmospheric mois-