though not until 1870, Pasteur's great work, perhaps his greatest, "Études sur le vin" (1866), came into his possession and the already loosened scales soon fell from his eyes. It became clear that the souring of stock ales was comparable with the souring of wines. When Pasteur's "Études sur la bière" was published in 1876, he had little to learn from its microscopy. Meanwhile, he had perfected a method of "forcing" beers. This involved the use of a rectangular copper box or tray containing water, kept at a regulated temperature, considerably above the average atmospheric (80°-85° F.). Samples of the beers, in small closed flasks, provided with a side tube dipping into a mercury seal, were kept on the tray during several days; the deposit was then examined with the microscope and the extent determined to which pirate organisms had developed. It was then easy to forecast the behaviour of the beers in store and so determine the order in which they should be put on the market. The monetary value of the method to the industry was very great.

Largely owing to Horace Brown's work and influence, brewers quickly learnt to appreciate the value of Pasteur's teachings and soon began to put their houses in order. The progress of bacteriology in Great Britain, especially its application to water supply, was also hastened. Horace Brown, in fact, played the same part in brewing, in leading brewers to clean up their plant and adopt aseptic methods, that Lister played in surgery—he was even in advance of Lister in appreciation of Pasteur, though a much younger man. He became manager of the whole of the manufacturing department of Worthington's in 1873, at the age of twenty-five, and occupied this responsible post until 1889, when he became one of two managing directors on the incorporation of the firm as a limited liability company. He resigned in 1893 and left Burton for London, after which time his work was done privately.

What more Horace Brown accomplished before and after he left the brewery cannot usefully be told here. Suffice it to say that he was recipient in succession of the Chemical Society's Longstaff Medal, of a Royal Medal and eventually of the Copley Medal of the Royal Society—only given in recognition of outstanding service to science. His work is noteworthy on account of its thoroughness, the elegance of his methods and the philosophical manner in which he discussed the fundamental problems which engaged his attention. He was one of the few chemists who have done pioneering work of real importance in the biological field, notably in botany.

In the interval since Brown and I became friends, science is certainly risen: its power is certainly proven. Still, it is in some measure fallen—the public effect is not that anticipated by Huxley, Tyndall and others. The clerics openly scoff at our failure and do not sense our one supreme object—the discovery of truth, how infinitely superior belief through such discovery must be to all belief through mere faith, how perfect a religion must eventually be framed through it.

The lesson of Horace Brown's education and life is to be pondered by those who realise how complete a failure is the teaching of "science" in our schools and even in our universities, as a means of inculcating in the community an appreciation of its method and majesty and its usefulness. HENRY E. ARMSTRONG.

DR. E. KLEIN, F.R.S.

WITH the death of Dr. E. Klein at Hove on February 9, one passed away who had played an important part in English medical science for more than half a century. It is not an easy thing to give a complete account of him or to estimate accurately the value of his work. He had been with us so long that but few of his early contemporaries survive, while the younger workers from whose lives the War subtracted years knew him merely as a name, and had probably never seen him. Indeed, he was a somewhat elusive personality to all of us, as he kept a good deal to himself. The present writer knew him as a fellow-worker in the same branch of study, and had also dealings with him of a scientific kind. Much of what has been written of him since his death will be found to be incomplete and inaccurate. Our claims to write of him rest on information derived from two friends who knew him intimately half a century ago, on a personal acquaintance with him for half this time, and on an intimate study of almost all his works, a study with which we have refreshed our memory since his death.

Emanuel Klein (the name Edward was assumed only after his arrival in England) was born in 1844 at Osijek (Essek), the chief town of Slavonia, situated near the junction of the Drave and Danube. His father was a tanner of Russian leather. Nothing is known of his early years, but he related himself that he was in London when about eighteen—possibly in the capacity of a tutor. His medical education was in Vienna, and after graduation he carried out original investigations, chiefly embryological, in the laboratory of Salomon Stricker (1834–98), at that time professor of general and experimental pathology in the University. In 1871–73 Stricker was publishing his great "Handbuch der Lehre von den Geweben des Menschen und der Tiere," and for this work Klein wrote the articles on the thymus gland, the external generative organs, the serous membranes, and, in collaboration with Verson, the article on the histology of the intestinal canal, and, with Stricker and Stieda, on the conjunctiva and sclerotic. Klein's original work was, however, mainly embryological in connexion with the development of the vascular system of the chick. Stricker's Handbuch was translated into English by Henry Power for the New Sydenham Society, and Klein came into contact with several English workers.

When the Brown Institution was started in 1871–2 by the purchase of two houses in Wandsworth Road, Burdon-Sanderson applied to Stricker for a suitable resident assistant director, and Klein being recommended, he came to England and lived in one of the houses (now turned into shops). He was well received, and proved a *persona grata* from the start. In those days a number of the more ardent young consultants, such as J. F. Payne, Cavafy, and Pye-Smith, used to forgather at his house to discuss science, and incidentally to play whist. Klein had also some private pupils, among whom were Francis Darwin, Frederick Treves, Jeremiah MacCarthy, and James Adams. In 1873 he was appointed to give a course of lectures on histology in Morrant Baker's physiological course at St. Bartholomew's Hospital, and thus began his long association with this ancient and noble institution, first

as teacher of histology and later of advanced bacteriology. Here also was done most of his work for the Medical Department of the Local Government Board after he left the Brown Institution.

Almost all Klein's early work was on histology, a branch in which he was and is an acknowledged authority. In 1873 he wrote the section on histology for the "Handbook for the Physiological Laboratory," edited by Burdon-Sanderson, Foster, Brunton, and Klein. In the same year he published an authoritative work, in two parts, entitled "Anatomy of the Lymphatic System." These volumes were profusely illustrated with beautiful drawings by Klein from his own preparations, and he exploited with great success the method of silver impregnation which was introduced into histological technique by von Recklinghausen (1860). In 1875 Klein was elected a fellow of the Royal Society. His reputation as a histologist was greatly increased by the publication, in conjunction with the orthopædic surgeon Eldred Noble Smith (1847–1906), of the classical "Atlas of Histology" (1880). The forty-eight magnificent plates in this work were drawn by Noble Smith from Klein's preparations, and some of the illustrations have been copied into almost every English book on anatomy and physiology down to the present time. Klein also published a standard "Elements of Histology," which ran through many editions and was translated into several foreign languages.

We have dealt in some detail on Klein's activities in histology because we feel convinced that, although this occupied chiefly his earlier years, it is the work by which he will be best and longest remembered. He was brought to England not as a normal histologist, but to engage in the histological problems connected with disease, and he drifted into experimental pathology and bacteriology, as we think, *malgré lui*. He lived and worked untiringly throughout the whole of the classical period of bacteriological science from 1876 to 1900, and it is greatly to be regretted that his name cannot be placed alongside those of Pasteur, Lister, Koch, Loeffler, Roux, Pfeiffer, Weichselbaum, Kitasato, Behring, and Ehrlich, as the discoverer of any really important ætiological agent of disease. Indeed, it may sound like a paradox, but on more than one occasion he failed at first to confirm work which has become part of established bacteriological knowledge. This is difficult to understand, for, at any rate in his later years, he was a splendid technician, and frequently exhibited beautiful cultures of bacteria. We are inclined to think that his failure to make any bacteriological discovery of the first rank was due to the fact that he arrived on the field just a few years too soon. When he began the investigation of disease the methods in vogue were microscopic only. Cultivation was practically unknown or carried out by methods now admitted to be insufficient. Bacteriology really emerged through the genius of Koch, and at a time when Klein was labouring with the old methods. Had he been in a position to become associated with a master of technique like Koch, he must with all his skill have succeeded in grasping at least one of the golden prizes which were falling into the hands of the workers in Germany and France.

There is a good deal of evidence in Klein's writings that his control experiments were too scanty or incomplete, and this led him to hasty conclusions on more than one occasion. Although it is to be regretted that Klein had not the luck to make a really important discovery in bacteriology, he exercised a profound and beneficial influence in England on the applications of the science to public health problems, and may be said to have controlled this branch for nearly half a century in a manner which was greatly to his credit. In personal intercourse with the younger workers he was always most helpful and generous, and placed his great experience at their service. All the memories of him in the country of his adoption will remain favourable. He was a tall, handsome man who spoke broken English to the end. Of affable manners, he was often polemical, but took defeat in a thoroughly sportsman-like fashion. Throughout life he showed the characteristics of his race in a passion for music and chess.

W. B.

HUGO VON SEELIGER, who died on December 2, was born at Bielitz-Biala, Austria, on September 23, 1849. After studying at the universities of Heidelberg and Leipzig, he was appointed observer at Bonn Observatory in 1873 and remained there for four years, taking part in the observations of the zone 40°-50° for the Astronomische Gesellschaft Catalogue, and being a member of the expedition to observe the 1874 transit of Venus. After a short period at Gotha he went to Munich in 1882 as Director of the Observatory and professor of astronomy. He remained there for the rest of his life, and became famous as a teacher, Schwarzschild having been one of his pupils. He also made several theoretical researches both on stellar problems and those relating to the solar system. He was a pioneer in the application of statistical methods to the study of star density, and the size and shape of the stellar system; his estimate of the absorption of light in space was 0·3 mag. in 12,000 light years. He was interested in the excess of the motion of Mercury's perihelion over its theoretical value. He examined whether any distribution of the matter forming the zodiacal light could explain this, without introducing other anomalies in the motion of the nearer planets. Another study related to the brightness of Saturn's ring. Basing his work on Maxwell's deduction that the ring was composed of small particles, he obtained expressions for its change in brightness at different distances from opposition, which were verified by Müller's photometric observations.

WE regret to announce the following deaths:

The Right Hon. Sir Thomas Clifford Allbutt, K.C.B., F.R.S., Regius professor of physic in the University of Cambridge since 1892, on February 22, aged eighty-eight.

Mr. T. H. W. Idris, president in 1903 and 1904 of the British Pharmaceutical Conference, on February 10, aged eighty-two.

Sir T. Edward Thorpe, F.R.S., emeritus professor of chemistry in the Imperial College of Science and Technology, South Kensington, and president in 1921 of the British Association, on February 23, aged seventy-nine.