Now this is a short summary of the discovery of the cause of the "tsetse-fly disease," and one point I want to bring out is that at that time, and for some time after, there was supposed to be only one "tsetse-fly disease" and one species of tsetse fly. The disease was called "the fly disease," and the fly "the tsetse fly." Now all this is changed, and "the fly disease" is now a generic term for several diseases, and the tsetse flies are found to be made up of several more or less well-marked species.

But the taking for granted that there was only one tsetse-fly disease of course led to much confusion and many mistakes. For example, when Koch studied the fly disease in German East Africa in 1898, naturally he considered he was dealing with the Zululand disease, nagana. But was he? Lately, I have studied a trypanosome from the East Coast which causes a more or less mild disease in horses and other animals. Is it not possible that Koch was dealing with this East Coast species when he said that Masai donkeys were not susceptible to nagana? So it can be easily understood how a great number of erroneous notions have crept into the literature of this subject.

It is evident that what is true of nagana, the disease caused by *Trypanosoma brucei,* need not be true of the diseases caused by *Trypanosoma theileri, dimorphon, pecaudi, congolense, vivax, nanum,* &c. But an observer comes in contact with one of these diseases in a place where there is no big game and no tsetse fly, and he at once thinks that "the fly disease" does not depend on big game or tsetse flies. When I say that "the tsetse fly" disappears from a district when the big game are killed off, and with the extinction of the big game that "the fly disease" also disappears, I only mean that *Glossina morsitans* disappears, and that a particular "fly disease"—that called by me nagana, and caused by *Trypanosoma brucei*—becomes extinct. I do not mean that the diseases caused by *Trypanosoma dimorphon,* &c., will be blotted out by the same means.

With the exception of nagana and sleeping sickness there is little real knowledge as to how the other African trypanosome diseases are spread. That they may spread by other agencies than tsetse flies is probable, since surra spreads in India, although there are no tsetse flies in that country. It is quite possible that many of these diseases in Central Africa may not be spread by the agency of tsetse flies and may not depend on the big game as a reservoir of the virus. The cattle themselves may be the reservoir, and the disease may be spread in the herd by means of any of the common biting flies, such as stomoxys or tabanus. In sleeping sickness, so far as we know, the native himself is the reservoir of the disease.

It is therefore, in my opinion, very important that, in the first place, these trypanosome diseases should be more thoroughly studied as to their distribution, their carrying agent, and the reservoir of the virus. When this is done it may well be that, by the use of this knowledge alone, owners of stock may escape damage. Now that we know the natural history of sleeping sickness, its distribution, its carrying agent, &c., any intelligent person has only himself to blame if he contracts it.

These few sentences will show how complicated a subject "the fly disease" has become, and in what a state of confusion and chaos the classification of this family of diseases at present is.

Lastly, in regard to the suggested destruction of big game. To begin with, it may be said that civilisation and big game cannot exist together. As soon as a new country is divided off into farms, either for agricultural or stock purposes, the great mass of the wild animals must go. Take, for example, the destruction of the fences by stampeding herds of zebra, wildebeeste, or buffalo, not to speak of the probability that there is not enough food to go round. Even in exceptional cases, where the wild animal has been protected from sentimental and picturesque reasons, as in the case of the herd of hippopotami preserved until lately in Natal, a time came when the neighbouring farmers could no longer put up with their destructive habits, and they had to be destroyed. We may say, then, that when a country becomes settled and civilised, the big game go. This has occurred in Cape Colony, the Orange River Colony, Transvaal, and Natal, and will occur in Zululand when that country is opened up.

But this inevitable disappearance of wild animals before the advance of civilisation is very different from the instant carrying into effect of an international measure for the wholesale destruction of big game all over Africa. Such a measure, in the present state of our knowledge, would be quite unjustifiable, and would probably fail to a great extent in its object. *Festina lente.* Let local authorities frame regulations from time to time as the exigencies of the place demand. But there ought to be room for the next thousand years in many parts of Africa for game reserves in which all the varieties of big game may live, thereby gladdening the eye and enriching the imagination and fancy of many future generations, and delaying the day when man will have for his sole companions the domestic hen, the cow, and the motor.

DAVID BRUCE.

THE LATE HENRI BECQUEREL.

ON Tuesday, August 25, 1908, died suddenly Antoine Henri Becquerel at Croisic, in Brittany, at the comparatively early age of fifty-six.

Henri Becquerel was the third of the scientific dynasty of that name. His grandfather, Antoine César Becquerel (1788–1878), a contemporary of Faraday, was a most prolific investigator of electrical and electrochemical phenomena. He was for forty-nine years a member of the Academy of Sciences, and from 1837 until 1878 professor of physics at the Musée d'Histoire naturelle in Paris. The second Becquerel, Alexandre Edmond (1820–1891), who is known chiefly for his researches in phosphorescence, which are embodied in the two volumes of his book "La Lumière," also made important investigations on thermo-electricity and on underground temperatures. He was professor at the Conservatoire des Arts et Métiers, and succeeded his father as professor and administrator of the Musée d'Histoire naturelle.

Into this distinguished family Henri Becquerel was born on December 15, 1852. He was educated first at the Lycée Louis le Grand, and at the age of twenty entered the École polytechnique. In 1875 he entered the service of the French Government as an Ingénieur des Ponts et Chaussées. Three years later, on the death of his grandfather, when his father succeeded to the full professorship at the Musée d'Histoire naturelle (the duties of which he had discharged for some years), young Becquerel was appointed his assistant under the title of "Aide-naturaliste."

Already Henri Becquerel had begun to show his powers in original research. The *Comptes rendus* for 1875 and 1876 contain his earliest papers, researches on magnetic rotatory polarisation. These were continued in 1876 in the *Journal de Physique;* while in a fourth memoir he discussed the effect on the phenomenon of using different wave-lengths. In 1878 he announced the discovery of the magnetic rotation of the plane of polarisation of light by the influence of the earth's magnetism. During the years from 1879 to 1883 he was associated with his father in a series of joint memoirs on the temperature at the surface of the earth, and beneath the surface to a depth of 36 metres, using thermoelectric methods for the subterranean observations. In 1879 he investigated the temporary magnetic properties of cobalt and nickel, and further examined the magneto-optic rotatory power of gases. He also determined the specific magnetic properties of ozone. Then he turned to the subject of phosphorescence, which his father had studied for so many years. One of the phenomena of phosphorescence—discovered originally by no other than Goethe—was the hastening of the fading out of the light of a phosphorescent body when exposed to the red rays at the hot end of the spectrum. Becquerel saw in this fact a means of studying the distribution of the intensity of the invisible infra-red rays of the spectrum. These cannot be photographed by ordinary photographic means. The method of exploring the infra-red spectrum by the thermometer or the thermopile is too coarse to give satisfactory results. The bolometer of Langley had not yet been invented. Becquerel exposed a brightly-phosphorescing strip of prepared material—one of the sulphides of the alkaline earths, so much studied by his father—to the action of the invisible infra-red spectrum, and found it to become striated with dark and light lines and bands, according as the radiation had hastened the decay of the luminosity. These phosphorographic studies he extended to include an investigation of emission spectra, in the same region, of incandescent metallic vapours. From 1886 to 1890 he was conducting experiments on the absorption of light in crystals, and on the anomalies in this absorption in different directions.

In 1892, on the death of Edmond Becquerel, Henri became professor in the Musée d'Histoire naturelle. In 1894 he was named Ingénieur en chef des Ponts et Chaussées, and in 1895 he was given a chair at the École polytechnique. Beyond giving an account of the laws of emission of light by phosphorescent bodies, he published little in these years. But in 1896 came the chief of his scientific successes. At the close of 1895 Röntgen had described the rays of peculiar penetrating power which he had observed to be emitted from highly exhausted Crookes's tubes, rays which he discovered and investigated by their singularly effective action in stimulating the luminescence of phosphorescible bodies. Associated as these rays were, both in the tubes whence they were emitted and on the platinocyanide screens where they were received, with the phenomena of phosphorescence, the association seemed to suggest a further inquiry. Was it not possible that in the phenomena of ordinary phosphorescence and fluorescence there might also be an emission of penetrating rays? Such a query suggested itself independently to several physicists in more than one country. Henri Becquerel was the first to publish any certain facts. In the *Comptes rendus* of February 24, 1896, there is a note by him, "Sur les Radiations émises par Phosphorescence." His experiment was as follows:—A photographic dry-plate was enclosed in opaque black paper. Over it was laid a thin plate formed of encrusted crystals of the double sulphate of uranium and potassium, and the whole was exposed to the sun for several hours. On developing the photographic plate it was found that the uranium salt (which has a brief phosphorescence) had emitted radiations capable of traversing the opaque paper and of reducing the silver salts. Metallic objects such as coins, interposed, left their silhouettes printed on the photographic plate. Such was the first announcement. On March 2 came a second note, "Sur les Radiations invisibles émises par les Corps phosphorescents." He has now found that the crystals of uranium salt produce the same effect when shielded from exposure to the sun's rays, and even when kept in darkness, and concludes that the invisible radiations emitted by phosphorescence continue to act long after the temporary phosphorescence has ceased. He recognises that here is a new order of phenomena. One week later he sends a third contribution. He has discovered that, like Röntgen's rays, the radiations emitted from the phosphorescent salts can discharge an electroscope, and he begins to employ this electric test quantitatively. He also announces that these new rays can be reflected, and possibly refracted. He tries different substances as to the amount and duration of their activity, finding the uranium salts to surpass by far the alkaline sulphides and the zinc-blende preparations. By March 23 he communicates another notice, in the title of which it is significant to observe that he has dropped all reference to phosphorescence. It is called "Sur les Radiations invisibles émises par les Sels d'Uranium"; for he finds that a non-phosphorescent solution of uranium is also active. He has also been studying the absorption of these rays, and has, he thinks, confirmed their refraction. On March 30 he reads to the academy another note on the differences between the radiations of uranium and the Röntgen rays. He insists that the former can not only be reflected and refracted, but that they can show double refraction and polarisation if transmitted through tourmaline. He has also obtained them from non-phosphorescing compounds of uranium. That he was mistaken in respect of reflection, refraction, and polarisation does not detract from the merits of the great discovery. Before six months from the date of his first note he was able further to announce that metallic uranium, furnished by his friend Moissan, far surpasses its salts in activity, the first example, he declares, of a metal presenting a phenomenon of the order of an invisible phosphorescence.

The subsequent development of the new branch of physics—radio-activity—thus opened out by the discovery of the Becquerel rays is known to all students of science. In 1898 Schmidt and Mme. Curie independently observed that thorium was also radio-active. M. and Mme. Curie set out on a systematic examination of other minerals, and Mme. Curie, after finding that certain uraniferous minerals were more active than uranium itself, embarked on the laborious search which yielded her the successive discoveries of polonium and radium. Rutherford, in the Cavendish Laboratory, repeated and extended Becquerel's measurements on the electrical properties of the uranium radiations, and pushed the investigation into new regions by demonstrating the various stages of phenomena explicable only on the hypothesis of the degradation of the uranium atom and the successive evolution of new elements of transitional types. Becquerel continued to investigate the radiations, and their divisibility into three kinds which differ in penetrating properties and in the deviations which they suffer when subjected to magnetic and electric forces. In 1903 he united in a large quarto memoir of 360 pages, under the title of "Recherches sur une Propriété nouvelle de la Matière," his hitherto scattered contributions. This memoir, written with admirable lucidity of phrase and illustrated with many plates, remains a witness to his powers of investigation and scientific acumen. He had since 1889 been a Membre de l'Académie des Sciences; he was also Officier de la Légion d'Honneur; and with the reputation of his great discovery honours fell thickly upon him. He was president of the Société Française de Physique in 1897. In 1900 the Royal Society awarded him the Rumford medal. In 1903 the Nobel prize in physics was awarded to him conjointly with the Curies. In 1907 the National Academy of the United States decreed to him the Burnard medal. In 1907 he was president of the Société nationale d'Agriculture, and the Berlin Academy awarded him the Helmholtz medal. In the same year he was elected vice-president of the French Academy of Sciences, and only in June last he was elected perpetual secretary of the Academy in succession to M. Lapparent. He was a member of many foreign academies, and received honorary doctorates from the Universities of Cambridge, Oxford, Aberdeen, Manchester, and Göttingen. He was a foreign fellow of the Physical Society of London, and an honorary member of the Royal Institution, where, in March, 1902, he lectured on radio-activity. In NATURE of December 22, 1905 vol. lxxi., p. 177), in an article of the series Some Scientific Centres, by Mr. J. B. Burke, an account is given of the laboratory of the Musée d'Histoire naturelle, illustrated by a portrait of Becquerel amongst the apparatus used in his researches. Amiable and ever courteous, he was greatly endeared to all who knew him by his frank and sympathetic demeanour. He leaves one son, M. Jean Becquerel, Ingénieur des Ponts et Chaussées, who has already distinguished himself by important investigations on the absorption of light in crystals and other researches, the latest of which promises to elucidate the nature of positive electricity. He has honourably carried on the family tradition even in having been appointed assistant in the Musée d'Histoire naturelle.

THE DUBLIN MEETING OF THE BRITISH ASSOCIATION.

THE seventy-eighth annual meeting of the British Association for the Advancement of Science began yesterday, September 2, when Mr. Francis Darwin, M.A., LL.D., F.R.S., assumed the presidency and delivered his presidential address in the great hall of the Royal University of Ireland, Earlsfort Terrace, Dublin. More than 2000 members and associates are attending the meeting. In the afternoon of the same day the members met informally at the Dublin Mansion House, where the Lord Mayor, Alderman Gerald O'Reilly, bade them welcome in the name of the city.

The sectional meetings began this morning. They are mostly being held in the various schools of Trinity College, the sole college of Dublin University, which was founded some 300 years ago by Queen Elizabeth. The Educational Science Section meets in the Royal University building, which is shortly to be re-modelled for the accommodation of the new and as yet unnamed university founded by Mr. Birrell's recent Act. Other sections meet in the Royal Irish Academy, the Royal College of Science for Ireland (soon to be provided with new and handsome buildings), the historic Leinster House of the Royal Dublin Society, and the Royal Colleges of Physicians and Surgeons. A service of trams and a volunteer service of motor-cars have been arranged to facilitate the circulation of members among the various sections. The official journal, published every morning at 10, gives a list of papers to be read, and an intersectional telephone service announces the progress made with the reading of the various papers.

The examination hall in Trinity College has been fitted up as a reception-room, with the usual facilities as to postal and telegraphic business. Letters should be addressed to "British Association, Dublin." The names of persons for whom telegrams have been received are written on a blackboard at the post office. There is a liberal provision of writing, smoking, and lounge rooms, and drawing-rooms for ladies. There is an official luncheon-room in the dining hall of Trinity College, and luncheons and teas are obtainable in a marquee in the College Park.

The Royal Dublin Society and the Dublin Chamber of Commerce are offering the use of their rooms to members of the Association, and many of the clubs are giving facilities for temporary membership.

The "Handbook" to the city of Dublin and the surrounding district, prepared for the meeting and printed at the Dublin University Press, is an attractive work the production of which is creditable to the general editors, Prof. Grenville Cole and Mr. Lloyd Praeger. It contains 440 pages, numerous illustrations, and an excellent district map. Its contents deal with the geology, meteorology, botany, and zoology (the latter very fully) of the Dublin district. The history and archæology of Dublin are treated by a subcommittee of experts. A melancholy interest attaches to the sketch of the history of Dublin, by Mr. C. Litton Falkiner, late secretary to the council of the Royal Irish Academy, who lost his life mountain-climbing in Switzerland last month. A special chapter, edited by Prof. G. H. Carpenter, deals with the various scientific and other educational institutions of Dublin, and Prof. Adeney's work on Dublin industries and commerce concludes the volume, which will do much to bring the more exceptional features of the Irish capital before the scientific public in an informing and attractive manner.

E. E. FOURNIER.

INAUGURAL ADDRESS BY FRANCIS DARWIN, M.A., PH.D., LL.D., F.R.S., PRESIDENT OF THE ASSOCIATION.

BEFORE entering on the subject of my Address, I may be allowed to refer to the loss which the British Association has sustained in the death of Lord Kelvin. He joined the Association in 1847, and had been for more than fifty years a familiar figure at our meetings. This is not the occasion to speak of his work in the world or of what he was to his friends, but rather of his influence on those who were personally unknown to him. It seems to me characteristic of him that something of his vigour and of his personal charm was felt far beyond the circle of his intimate associates, and many men and women who never exchanged a word with Lord Kelvin, and are in outer darkness as to his researches, will miss his genial presence and feel themselves the poorer to-day. By the death of Sir John Evans the Association is deprived of another faithful friend. He presided at Toronto in 1897, and since he joined the Association in 1861 had been a regular attendant at our meetings. The absence of his cheerful personality and the loss of his wise counsels will be widely felt.

May I be permitted one other digression before I come to my subject? There has not been a Botanical President of the British Association since the Norwich meeting forty years ago, when Sir Joseph Hooker was in the chair, and in "eloquent and felicitous words" (to quote my father's letter) spoke in defence of the doctrine of evolution. I am sure that every member of this Association will be glad to be reminded that Sir Joseph Hooker is, happily, still working at the subject that his lifelong labours have so greatly advanced, and of which he has long been recognised as the honoured chief and leader.

You will perhaps expect me to give a retrospect of the progress of evolution during the fifty years that have elapsed since July 1, 1858, when the doctrine of the origin of species by means of natural selection was made known to the world in the words of Mr. Darwin and Mr. Wallace.