feature of recent work, and has illuminated many hitherto obscure problems in bacterial nutrition and bacterial metabolism in general. The fresh edifice has been solidly built upon the sound foundations that were laid by Robert Koch nearly seventy years ago. He was truly a master-builder in the domain of science, and it is a sinister and indeed a terrifying aspect of the character of the German people that, owing to ill-founded racial prejudice, their notorious anti-semitic Press should have stooped to disown him, on the ground not that he was a Jew—for this he was not—but that he was a *Judenknecht*, who chose for his intimates such members of the 'hated race' as Cohn, Cohnheim, Weigert and Paul Ehrlich. Detraction of this kind cannot disturb the estimates that have been formed of Koch and his distinguished friends and supporters by the rest of the world, which owes and will ever continue to owe an immense debt of gratitude to these great pioneers of a new science.

G. F. PETRIE.

THE RECENT EARTHQUAKE IN TURKEY

By ERNEST TILLOTSON

EARLY on November 27, 1943 (local time), another very strong earthquake occurred in the region east of Ankara between central Anatolia and the Black Sea coast. The earthquake caused much damage in the towns and villages of Samsun, Osmanjik, Tokat, Herek, Ordu, Amasia and Kastamuni. 1,439 buildings have been reported wrecked and 1,570 damaged, and damage was done to roads, railways and telegraph lines. On November 30 the Ankara radio stated that the deaths caused by the earthquake numbered 2,919. Many thousands more were injured.

At Istanbul Observatory the pulses were so violent that the seismograph was unhinged. At Kew Observatory on November 26, a very strong earthquake was recorded by the north-south, east-west and vertical component seismographs. On the vertical component the primary wave registered impulsively at 22h. 26m. 08s. U.T. and a further *iP* pulse registered on all three components at 22h. 26m. 15s. U.T. The maximum ground amplitudes at Kew were: on the vertical component, 960 μ at 22h. 35m. 47s. U.T. with a period 25; on the north-south component, 1040 μ at 22h. 42m. 35s. U.T. with a period 24; and on the east-west component, 1120 μ at 22h. 46m. 13s. U.T. with a period 25. From a preliminary interpretation of the seismogram the epicentral distance from Kew is estimated to have been 2,970 km., which would be consistent with an epicentre in Anatolia.

From the above evidence it would appear that the epicentre was very close to lat. $41^{\circ}1'N.$, long. $35^{\circ}E.$, which is north of Çorum and half way between Amasya and Kastamanu, and west of the Black Sea port of Samsun in Anatolia, Turkey. The time of origin of the shock would be near 22h. 20-5m. U.T. on November 26, or 0h. 40-5m. local time on November 27. It appears that the earthquake may have had an epicentral region occasioned by extensive faulting rather than a point epicentre; but if, for purposes of calculation, it is desired to envisage a point focus, this would seem to have been rather deeper than normal.

Strong earthquakes have occurred in this and adjoining regions as follow: 330 B.C., Niksar; A.D. 343, Niksar; 366, Niksar; 499, Niksar and Amasya; 1509, Çorum; 1754, Sivas; 1826, Erbaa; 1827, Tokat; 1875, Niksar, Bereketli; 1877, Mesudiye, Çavdar, Lâdik, Erbaa, Efte; 1890, Niksar; 1895, Çavdar; 1897, Efte; 1899, Erbaa; 1904, Ş. Karahisar; 1906, Reşadiye; 1908, Alucra; 1909, Ş. Karahisar; 1911, Mesudiye; 1913, Reşadiye, Niksar, Almus; 1914, Erbaa, Lâdik; 1919, Almus; 1937, Alucra; and 1938, Kirşehir. But by far the greatest occurred on December 27, 1939, at Erzincan (NATURE, January 6, 1940, p. 13). This latest earthquake mentioned was the forerunner of numerous other smaller shocks which happened throughout the remainder of December 1939 and January 1940, and then major ones on April 14, 1940, July 30, 1940, September 12, 1941, November 12, 1941, a swarm throughout November and December 1941, December 21, 1942, and on June 20, 1943, at Adapazar when 1,304 people lost their lives. Most of these have been mentioned in the "News and Views" columns of NATURE, and there have been scores of smaller shocks at intermediate times from the same epicentral region east and north-east of Ankara.

The present earthquake, though violent, appears to be one of the series which began on December 27, 1939. It exemplifies a well-established observational fact that earthquakes tend to recur in a region once affected. Whether this is due to the persistence of regional earth-forces and lines of crustal weakness, whether it is due to elastic afterworking in the sub-crustal layers of the earth, or to the readjustment of crustal blocks following a large-scale block-faulting movement, is not yet established. One or more of these may be important, and in particular cases other factors may be fundamental, but whatever the cause, it is instructive in view of acknowledged recurrence to examine past examples.

On April 19, 1938, at about 13 hr., an earthquake occurred in the region of Kirşehir, a village some 140 km. south-east of Ankara. The zone most affected was between the Delice Irmak in the north-east, the Kiliç Özü in the north-west, the route from Kirşehir to Ankara in the south-west and the depression formed by the Sife Gölü in the south-east*. In the surrounding villages and towns the following percentages of houses were destroyed: Aci, 85 per cent; Efendiköy, 82 per cent; Koçbeyli, 82 per cent; Ceritobasi, 81 per cent, and in other villages smaller proportions. The epicentral region enclosed within isoseismal 10 was elongated from north-west to south-east. The principal permanent movement occurred horizontally along a fault, the southerly portion being displaced to the north-west relatively to the northerly portion for throws ranging from 30 to 100 cm. The movement along this fault of Akpinar is aligned with orogenic movement in the region since Mesozoic times, but whether the movement was due to dying or growing earth-forces is not known.

The earthquake of December 27, 1939, at 2 hr. (Erzincan) which caused the deaths of some 35,000 people had an epicentral zone stretching from Erzincan to Amasya and from Carsamba to Artova, an area roughly rectangular in shape, 360 km. by 120 km.†. The towns and villages most affected

* Ed. Paréjas-Hamit N. Pamir, "Le Tremblement de terre du 19 Avril 1938 en Anatolie central". Publications de l'Institut de Géologie de l'Université d'Istanbul, No. 5, Nouvelle Série, Février 1940.

† Ed. Paréjas, I. H. Akyol, E. Altinli, "Le tremblement de terre d'Erzincan du 27 décembre 1939". Publications de l'Institut de Géologie de l'Université d'Istanbul, No. 10, Nouvelle Série, Avril 1942.

were Tokat, Samsun, Ordu, Giresun, Sivas and Gumushare. In the block-faulting associated with this earthquake, four east-west lines were prominent: (1) the line of the upper Yeşil Irmak; (2) the line of the Kelkit-Deliçav; (3) the line of the Yavlas and middle Yeşil Irmak; (4) the line parallel to the Black Sea about 15 km. distant from the shore.

These lines were in part old orogenic lines, and were called into play again to relieve accumulating stress. Two distinct earthquake movements were observed during this shock. The first was horizontal and the latter, separated from the former by a short interval of time, had a distinct vertical component. With these, but particularly the latter, strong low-pitched rumbling sounds were associated.

OBITUARIES

Prof. H. L. Lebesgue, For.Mem.R.S.

HENRI LÉON LEBESGUE, professor in the Collège de France, a foreign member of the Royal Society and an honorary member of the London Mathematical Society, was born at Beauvais, Oise, on June 28, 1875; news of his death during 1941 recently reached Great Britain.

Lebesgue was one of the greatest mathematicians of recent times, but more of a specialist than most great mathematicians. His work has not the variety and versatility of Poincaré's or Hilbert's; he did not, as they did, enrich almost every branch of mathematics with his contributions. He was rather a man with one outstanding claim to fame. He had other things to his credit; for example, he made one important contribution (the *Pflastersatz* or 'pavement theorem') to topology; but that, and all his secondary work, of which there is not much, is overshadowed by his work on integration. There, he was first: the 'Lebesgue integral' is one of the supreme achievements of modern analysis.

It is no exaggeration to say that Lebesgue remade the integral calculus. The theory of functions of a real variable, of which the differential and integral calculus are parts, has been rewritten since 1900. The revolution had been initiated by Borel, whose famous monograph "*Leçons sur la théorie des fonctions*" was avowedly the starting point of Lebesgue's researches; but it was Lebesgue himself who took the decisive steps. The older theories of integration, in spite of all that Riemann, Darboux and others had done, were radically defective at several vital points, and in particular in their relations to differentiation. It was not true that differentiation and integration were 'usually' inverse operations, that integration and differentiation, or differentiation and integration, usually restored the original function. Indeed the whole theory was aesthetically unsatisfying; it tended to be cumbrous, long-winded and full of untidy exceptions; and the conservative mathematicians who detested it had a certain amount of excuse for their distaste.

All this is changed; the theory is now one of the most beautiful in mathematics. It unfolds itself in a series of terse and comprehensive theorems, with all the smoothness and elegance of the best 'classical' analysis. In particular, differentiation and integration dovetail harmoniously together. It is a readily intelligible, almost a 'popular' subject, and for this, by the unanimous testimony of every worker in

these fields, it is to Lebesgue first that honour is due.

Lebesgue was a fine writer, with an admirably vigorous and lucid style. His two great memoirs, "*Intégrale, longueur, aire*" (1902) and "*Sur les intégrales singulières*" (1910), and his two books, "*Leçons sur l'intégration*" (1904 and 1928) and "*Leçons sur les séries trigonométriques*" (1906), rank among the classics of mathematical literature. It is sad that the second book should never have been re-edited, since the subject gives perhaps the finest illustration of the inevitability and vitality of Lebesgue's ideas.

G. H. HARDY.

Dr. George Washington Carver

DR. GEORGE WASHINGTON CARVER, the distinguished Negro scientific worker who died at Tuskegee Institute, Alabama, on January 5, 1943, was born of slave parents at Diamond Grove, Missouri, in 1864. He was educated at Minneapolis High School and later at Simpson College, Indianola, Iowa. Graduating in science at Iowa State College in 1894, he proceeded to the M.Sc. two years later. In 1896 he was invited by the late Dr. Booker T. Washington to take charge of the Department of Agriculture at Tuskegee. He discovered on arrival that his duties, apart from administration and normal academic lectures, entailed the reshaping of the entire economy of the district. In fact, he had to conduct mobile classes in the field in order to persuade a despairing and ignorant community that its only salvation lay in adopting a new agrarian economy. The soil, he found, was arid, eroded, unproductive, and the system of farming outmoded. Every farmer in the region was cultivating cotton as a staple crop. Carver's open-air lessons included the cultivation of crops, soil conservation, fertilization, insect control, plant pathology, and the canning and drying of fruits and vegetables.

Carver recognized the necessity for introducing the peanut, *Arachis hypogaea*, and the sweet potato, *Solanum tuberosum dulce*, because soil and climatic conditions were favourable, and the crops were already being grown sporadically for local consumption by large sections of the community. He realized early that the replacement of cotton by peanuts and sweet potatoes was not a complete solution, and that newer and more extensive uses for them had to be found. A long series of chemical experiments culminated in the development of face powder, pigments, paints, stains and ceramic materials from Alabama clays; milk, buttermilk, cream, cheese, condiments, coffee, paper, plastics, stains, insulating boards and more than three hundred by-products from peanuts; starch, tapioca, syrup, coconut substitute, breakfast food, stains, artificial rubber, vinegar and paste from sweet potatoes; paving blocks, insulating boards, rugs, and cordage from cotton. Peanut milk is now being extensively used in infant clinics in areas of tropical Africa where the tsetse fly is endemic.

Carver's scientific achievements have dwarfed his artistic work, but those who have seen his "Three Peaches" at the Luxembourg, or his "Yucca" at Tuskegee, are unanimous in their regret that he had not devoted more time to this department of life. As a man of science, he tenaciously refused to make profits from his inventions and discoveries, and never once took out a patent. It was characteristic of him to decline Thomas Edison's invitation to join his staff, preferring to work in obscurity among the simple folks he had come to know and love so much.