and appears to be interrupted near the center. The extent of the trough is thus in closest correspondence with that of the rising mountain range on the coast, and it is recognized to be the synclinal portion of the fold in the range, of which the visible portion on shore is the anticline (see sectional inset in map). Such trough-shaped deeps are the locus of seaquakes represented by individual drops of the bottom, each amounting to tens and even hundreds of feet, and these cause seismic sea waves, or tsunamis, which invade the neighboring shores and cause much loss of life and property. In all thirteen such waves have been recorded from this coast, a figure equalled only by that from two other segments of the entire Pacific border (Dutch East Indies and Japan to Kamchatka).[5] That the zone which lies just outside the trough proper also takes some part in the growth of the fold is indicated by the distribution of epicenters upon the map.

The circumscribed area of this rising mountain range (1,500 miles by 200) is probably surpassed for instability, if at all, only by the two other segments of the Pacific coastland which are cited above. Here we are able to note great geological changes brought out of past "eons" and encompassed within centuries. The belt is thus for human activities most dangerous.

It is not without interest that the future second Isthmian Canal, certain to be constructed, should not take its course through Nicaragua, since that route would intersect the rising range and require locks at Managua, already rebuilt seven times after its destruction by earthquakes.[6] As the map shows, the Tehuantepec project is immune from this supreme hazard because of the break in the rising range at the Gulf of Tehuantepec. As the second map shows, the belts of earthquakes and of active volcanoes, as well as the deepening sea trough, are all interrupted at the Isthmus of Tehuantepec. The newly born range is thus shown to be a twin, even if of the Siamese variety.

The next great earthquakes of the twin-range will in all probability occur within the northern portion of the northern twin and in the very near future.

[4] N. H. Heck, Pub. 108, U. S. Coast and Geodetic Survey, 1824, pp. 3–17, Fig. 1; *Bul. Seis. Soc. Amer.*, 14: 200, 1924. Also *ibid.*, 16: 182–186, map Fig. 1, 1926.

[5] From a list compiled by N. H. Heck.

[6] The city of San Salvador a little farther to the northwest on the rising range has a similarly disastrous history of seven destructions in three centuries. The latest destruction of Managua was in 1931 when 2,000 persons perished.

OBITUARY

WILLIAM GEORGE MacCALLUM

DR. MACCALLUM was born in Dunnville, Ontario, and died in Baltimore on February 3, 1944, at the age of 70. He took his B.A. degree at the University of Toronto in 1894, and his M.D. degree at the Johns Hopkins Medical School in 1897. After a year's interneship at the Johns Hopkins Hospital, he became assistant in pathology under Dr. William H. Welch, and successively associate professor of pathology, professor of pathological physiology, a chair created for him in 1908, and in 1917, on the relinquishment of the professorship of pathology by Dr. Welch to assume the directorship of the School of Hygiene and Public Health, MacCallum was chosen his successor. In the interval between the two professorships, MacCallum was professor of pathology at Columbia University from 1909 to 1917.

There was something precocious about MacCallum which marked him out in the medical school. He came to the school exceptionally well prepared for the career in scientific medicine which lay ahead of him. He grew up in an environment of science. His father, Dr. George Alexander MacCallum, besides being a busy general practitioner, was an accomplished naturalist and a collector of birds and Indian relics. His house in Dunnville, in which he had set up a laboratory, was virtually a museum. Later, when he had retired from practice, the elder MacCallum was to write on and collect parasitic worms, concerning which he was an authority. At the University of Toronto, William MacCallum came under the tutelage of Ramsey Wright, an Edinburgh man, zoologist and professor of biology, whose particular field was comparative anatomy. At an early age, therefore, MacCallum was given that bent toward biological science the influence of which is apparent in all his published work.

While still a medical student, MacCallum made a fundamental discovery in biology and medicine. The disease, malaria, was very prevalent in the environs of Baltimore at the close of the nineteenth century. Dr. Osler and his staff became deeply interested in the study of the malarial parasite, which Laveran had discovered in 1880, the life history of which was being actively investigated in Italy and elsewhere at the time. The observation in 1885 that birds harbored a similar parasite (a haematozoon) stimulated the studies at Hopkins, and MacCallum was one of the undergraduates who devoted themselves in the summers of 1896 and 1897 to the investigation of avian malaria. On his return to Dunnville in 1897, and through the study of infected crows, he succeeded in witnessing and in interpreting the phenomenon of flagellation of the parasite, which had baffled all investigators beginning with Laveran. The phenomenon, which had been regarded

as an indication of degeneration, was recognized as part of the sexual cycle of the parasite, in which the flagella function as the male element in the manner of the spermatozoon. Convinced of the significance of the fertilizing process, MacCallum predicted its occurrence in human malaria and actually observed it there a few months later on his return to Baltimore.

At the end of the nineteenth century, the thyroid and parathyroid glands were under study, both surgically and experimentally. The fact had been observed that the condition called tetany—twitchings, quiverings and vibrations of the muscles—followed sometimes on the extirpation of these glands. It could be shown that the symptoms arose from the loss of the parathyroids, and it was thought that they arose from a poison-toxin generated in the body, the neutralization of which was a function of these glands. MacCallum and his associates devoted themselves to an investigation of the problem and, in a research extending over several years and through a series of ingenious and convincing experiments, determined that the hyperexcitability of the nervous system, the immediate cause of the symptoms, arose from a deficiency of calcium and could be abolished by injections of that substance. The parathyroids, therefore, were shown to exercise a special influence over the calcium metabolism of the body.

MacCallum was a teacher who attracted many advanced pupils to his laboratory, students looking forward often to academic careers in pathology and in clinical medicine. His attitude toward pathology was a broad one. As early as 1905, he developed at the medical school practical courses in pathological physiology, an innovation the purpose of which was to bridge a gap between pathological anatomy and the clinical subjects. As pathological anatomy deals chiefly with the end results of disease, he aimed by experimental means to reproduce in animals pathological conditions which could be observed directly by the senses and studied through the use of every possible instrument of precision, in the same way as the physiologist investigates the normal functions of the tissues and organs.

MacCallum was the author of an original and admirable text-book of pathology, which reflects his point of view and sets forth his methods of teaching. Published first in 1916, it has gone through seven editions. The plan he adopted was that of following the effects of the various causes that disturb the natural functions and produce the gross and microscopical changes in the tissues and organs, the basis of disease and the resulting physical and chemical changes which interrupt life. Since, therefore, pathology accompanies and even is the foundation of all clinical phenomena, he sought to consider the two sets of occurrences together.

The diseases of other countries and other climes than Europe and America had a fascination for MacCallum. He made three journeys to the South Seas and the Far East, visiting Australasia, the Dutch Indies, including Bali, Borneo, Singapore, Siam, Manila, China, Japan, the Celebes, Saigon and Ankor, Rangoon, Calcutta and Bombay. While he observed these distant countries with the eager eye of the tourist, he was attracted to the hospitals, where he was warmly received and where the facilities of the pathological laboratories were placed at his disposal. He performed many autopsies, collected many pathological specimens, which rich booty he brought back with him to Baltimore, where it served for study and for instruction. In Jamaica, he investigated an epidemic of alastrim—a mild form of smallpox—which provided material for a monograph on that interesting disease. During World War I, he investigated the pneumonia which prevailed in the Army camps in the winter of 1917–1918, the results of which were also brought together in a monograph.

Those who knew MacCallum well were impressed with his strong individuality and his delightful personality, and came to know something of the philosophy of his professional life. In the seventh edition of his pathology, published not long before his last illness, he expressed the latter in a characteristic way: "The advances in medicine and related sciences have again been very great since the last revision of this book four years ago, but it still reminds us of Goethe's statement that 'it is only when we know very little about a subject that we are quite sure; and with knowledge doubt grows.' We must not be dogmatic, for it seems that before us paths lead into a dark forest of mystery, and it is only when we shall have followed them into outer light that we can feel that we have cleared away our doubts."

SIMON FLEXNER

RECENT DEATHS

DR. ROBERT ANTHONY HATCHER, until his retirement with the title emeritus in 1935 professor of pharmacology at the Cornell University Medical College, has died at the age of seventy-six years. He had been connected with the college since 1904, when he was appointed instructor of pharmacology.

HENRY LLOYD SMYTH, professor of mining and metallurgy emeritus of Harvard University, died on April 1 at the age of eighty-two years.

LEWIS W. WATERS, vice-president in charge of research and development and of scientific relations for the General Foods Corporation, died on March 31 at the age of fifty-five years.

HENRY C. RAVEN, curator of comparative anatomy at the American Museum of Natural History, associate