It is inferred that the absorption of foreign protein by the nose causes the formation of two different antibodies. One of these is *allergic* and excites to anaphylaxis; the other is *protective* and leads to true immuuity. The relative amount of either antibody can be regulated by modifying the amount of serum instilled.

Added to a state of general allergy it is easy to produce, in the guinea pig, a special sensitization of the respiratory apparatus which leads, under appropriate stimulation, to attacks resembling those of bronchial asthma in man.

No conclusion can be drawn at present concerning the nature or mode of action of the protective or immunizing antibody; but the indications are that its relations to the circulation and to tissue fixation resemble those which have been developed by other investigators in regard to the anaphylactic antibody.

Evidence has been submitted that the living epithelium mediates between foreign protein and the organism in a way to favor specifically the elaboration of true immunity.

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SUPERFICIAL FACTORS IN EARTHQUAKES

IN considering the earthquakes in New England and eastern Quebec of this last winter, especially the quakes of January 7 and February 28, attention is called to a factor which has been too much neglected. Several writers have written on this subject of the superficial factors, such as barometric pressures, diurnal hours of high and low barometric pressures or the "so-called" tropical hours, the tides and rainfall. The earthquake of February 28 is particularly interesting in that two of these factors, barometric pressure and deficiency of rainfall, appear to have played an important part. Before going into details of this quake a few geological observations must be made.

During the ice advances of the Glacial period, the land of New England and adjacent territory was depressed considerably below its present stand by the tremendous weight of the great glaciers, which had an average thickness of about 3,000 feet. The land was more depressed in the region of Maine, New Hampshire and Vermont and southern Canada than in southern New England, on account of the greater thickness of the ice in the more northern region. In fact, in southern New England the ice pressure is supposed to have uplifted the land near the terminal moraines instead of depressing it, in the way that a ridge is produced around your boot when stepping in soft mud. Thus Long Island, Block Island and the Cape Cod region were higher than now at the close of the Glacial period. In the region about Montreal the land was depressed about 600 feet below its present stand. On the Maine coast around Penobscot Bay it was depressed about 300 feet. Since the ice left New England about 30,000 years ago the more northern part has been uplifted and the southern part has been depressed. There has been a kind of tilt, the northern part going up and the southern part going down. The northern part has risen much more than the southern part has sunk. At the present time, therefore, there is a tendency for most of New England to rise. It was Woodworth[1] who proved these facts in 1905 in his great work on the "Ancient Water Levels of the Champlain and Hudson Valleys," and since that time other workers have proved that Woodworth was right. It is to be noted that the tendency to rise is the important point to bear in mind in considering the superficial factors discussed, in these New England and Canadian quakes.

The earthquake of January 7 was probably to the east of Cape Ann, and not many miles off shore. The fault on which this movement took place has not been located. The earthquake of February 28 appears to have had its origin near the mouth of the Saguenay River. The large amount of destruction in the villages near the mouth of the Saguenay, and the records of the distance on the Harvard and Ottawa seismographs indicate that here the greatest intensity took place. Strains that finally result in earthquakes usually go on for a long period of time, sometimes measured in many years, before the final crack comes, so in the quake under discussion the release came suddenly when conditions were just right. If New England is a rising area, anything which would tend to make its land lighter would increase the strain along the fault. A deficiency of rainfall and a low barometric pressure would be the two most effective ways of making the land lighter.

According to the data collected at the Blue Hill Observatory, we had a deficiency of about 8.1 inches of rainfall in New England during the five months previous to March 1, 1925. Reservoirs had been low, hydraulic power plants had had to shut down in many cases for lack of water, wells had gone dry and in many places there had been good cause for worry. The quake of January 7 was preceded by three months of very dry weather and immediately followed by rain and a normal rainfall for that

1 Woodworth, J. B., "Ancient water levels of the Champlain and Hudson valleys," New York State Museum, Bull. 84, Geology 8, 1905.

month. Then during February there was a deficiency again in rainfall, and then the quake of the 28th, which was likewise followed by rain as in January. Just before the quake of the 28th, on the 26th, we had the lowest barometric pressure going over New England, recorded in two years, 28.96 inches at Boston. This low pressure area went northeastwardly and when it reached the Saguenay region, where there is a weak place in the crust, the crust gave way and we had the earthquake. It is true that the lowest pressure had passed on to the east before the shock came, but there is often a lagging effect in earth processes. In the opinion of the writer, the deficiency in rainfall and the very low pressure acting together was the straw that broke the camel's back.

At first thought it does not seem possible that a few inches of rainfall could affect the crust of the earth perceptibly, but when it is realized that the crust is so sensitive that seismographs can be used for predicting storm, which foretell their coming by a tilt in the ground great enough to swing the stylus connected with the pendulum in a direction opposite to that from which the storm is coming, it must be realized that the earth's crust is sensitive indeed. This tilting of the ground on the approach of a storm is due to the lowering of the air pressure over the storm center, which results in an extremely slight bulge in the ground over that area. When the barometer goes down one inch it means that .49 of a pound is taken off of each square inch of the earth's surface. This means that over each square mile in the area of lowest pressure before the quake of the 28th, the weight taken off the earth was over a million tons, so, as the area passed on northeastwardly, a great part of New England was relieved of a tremendous weight, and when the low pressure passed the weight came back again in higher pressure. So it is the alternate coming and going of low and high pressure areas that cause the stylus of the seismograph to swing slowly back and forth.

Now turning to the rainfall, the writer has calculated that the weight of eight inches of rain over all New England is a weight beyond comprehension. It is 38,260,224,000 tons. A deficiency of eight inches of rain, therefore, is equivalent to taking that same weight off New England. This, together with the abnormally low ground water, and last but not least the extremely low barometric pressure of February 26 to 28 over New England, might well be the set of circumstances which "set off" the shock of February 28. In making this calculation the area of New England was taken at 66,424 square miles, and the weight of one inch of rain for one square mile at 72,000 tons. No allowance was made for runoff and evaporation, so the above figure may be too high for the rainfall deficiency, but too low for the total deficiency of water, because the weight of the missing ground water could not be figured and included in the total, as it should be theoretically. To this figure of over thirty-eight billion tons must be added the much larger figure which would result from an estimate of the area affected by the drought in New York state and eastern Canada. Surely the addition of this area would triple the above calculation.

It may be objected that during other periods of low water and low barometric pressure we have had no quakes, but it must be remembered that a quake can not take place unless the strain is ripe enough for it, whatever the rainfall and barometric pressure may be. The shock would come without these aids eventually. The rainfall and low barometric pressure are looked upon merely as the finger that pulls the trigger. In a sinking area heavy rainfall and high barometric pressure would bring on the final shock, but here in New England, which is for the most part a rising area, it is reasonable to suppose that a low rainfall and low barometric pressure would be the deciding factors. In other words, rainfall and air pressure do not bring about the same results in the same way.

In 1912 Professor Noah Fields Drake,[2] then of Leland Stanford University, from a study of the remarkable earthquake records of China for the last 4,000 years, decided that it was plain that earthquakes vary with rainfall, there being more quakes with more rainfall. In 1913 the writer[3] found that, taking the earth as a whole, there seemed to be more quakes during rainy periods than during dry ones. In 1914 Dr. Stephen Taber[4] showed conclusively that in the region around Charleston, S. C., earthquakes and rainfall are related. In the area studied by Dr. Taber there has been an earthquake, on the average, every other month since the big Charleston earthquake of 1886. The results in the Charleston and Summerville area were so conclusive that it does not seem improbable that the great weight in rainfall, ground water and air pressure taken off of New England, New York and Quebec has played its part in the shocks of January 7 and February 28, notwithstanding the fact that a drought is concerned rather

[2] Drake, Noah Fields, "Destructive earthquakes in China," Bull. Seis. Soc. Amer., Vol. 2, No. 1, pp. 40–91, 1912.

[3] Sayles, R. W., "Earthquakes and rainfall," Bull. Seis. Amer., Vol. 3, No. 2, pp. 51–56, 1913.

[4] Taber, Stephen, "Seismic activity in the Atlantic coastal plain near Charleston, S. C.," Vol. 4, No. 3, pp. 108–160, 1914.

than high water. Visher[5] has recently given instances of the concurrence of tropical cyclones and earthquakes. The large number of cases of this kind makes it impossible to ignore low barometric pressures in the study of earthquakes. It is the rainfall factor which should receive more consideration.

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NOTE: Since writing the above observations, the Montana earthquake of June 27 has occurred. It is noteworthy that Montana has been suffering for some time from a deficiency of precipitation.

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ALLAN RIVERSTON McCULLOCH

THE news of the death in Honolulu of Mr. Allan Riverston McCulloch, curator of fishes in the Australian Museum and chief fishery expert of Australia, has lately reached his American friends and scientific associates. Mr. McCulloch was born in Sydney on June 20, 1855. For forty years he has been known as one of the leading naturalists in Australia, having particular charge of the fishes in the Australian Museum at Sydney. He is the author of numerous papers, the most important being "Deep Sea Explorations, of *The Woy Woy* (1907) and *The Endeavour* (1914, 1916, 1917)," and a descriptive record of the fishes of New South Wales (1914). With these were various papers descriptive of new forms in the Records of the Australian Museum. His work is throughout accurate, methodical and broad-minded, his interest extending beyond taxonomy to the general relations of fisheries. He kept for years a carefully arranged card catalogue of the fishes of the Pacific, and had planned a general descriptive work on the Australian species as well as a general list of the fishes of the Pacific.

Mr. McCulloch took part in several important exploring expeditions, having been with Sir Ernest Shackleton in some explorations, later with Frank Hurley in New Guinea, and still later on the great coral-bound Lord Howe Island. While in Lord Howe he had a severe illness and was granted by the museum a year's leave of absence for "recovering from mental breakdown." He came to Honolulu in July to attend a Fisheries Conference of the Pan-Pacific Union in September. The agenda for this conference he carefully prepared, and it has been accepted by his colleagues.

It is reported that while in Hawaii he had periods of exaltation followed by others of extreme depression, which seemed to indicate incipient loss of mind. Mr. Alexander Hume Ford, secretary of the Pan-Pacific Union, writes: "While a charming companion, he has been under a constant mental strain." While in this condition he shot himself, on September 6, at the age of seventy. He left behind a note saying "Something has gone wrong in my brain. I am afraid of madness. Therefore I am determined to end things." He explains the purchase of a revolver in order that no fault should be attributed to any associate.

McCulloch was a man of charming personality, with a good position, many friends and a record of worthy achievement. His further prospects were alluring. The only reason for his deed was a premonition of a wretched mental future, the beginning of which he had already felt.

DAVID STARR JORDAN

[5] Visher, Stephen, "Tropical cyclones and earthquakes," Bull. Seis. Soc. Amer., Vol. 14, No. 3, pp. 181–184, 1924.

SCIENTIFIC EVENTS

THE LONDON CELEBRATION OF THE BICENTENARY OF THE RUSSIAN ACADEMY OF SCIENCES

THE London *Times* states that the Society for Cultural Relations between the Peoples of the British Commonwealth and the Union of Socialist Soviet Republics held a meeting "on the initiative of the science section," in London on September 10 for the celebration of the bicentenary of the Russian Academy of Sciences.

Sir Richard Gregory, who presided, said they were assembled to carry out a suggestion made to the science section of the society that while there was being celebrated in Leningrad and Moscow the bicentenary of the Russian Academy of Sciences, those who were familiar with the scientific work and workers in Russia should assemble there in sympathy and congratulation on the attainment of the bicentenary. For two centuries the Academy of Sciences in Russia had kept alight the torch of learning, and although at times that torch might seem to have been flickering, it had never been extinguished. Speaking as an astronomer, so long as thirty years ago they in the astronomical world were astonished by some remarkable telescopic work carried out by the great Russian astronomer, Belopolsky. It might be news to some of those present to know that in continuation of that astronomical work there was being manufactured in this country at the present moment what would be the lens of the largest refracting telescope in the world to go to Russia. The largest at present was in the Yerkes Observatory in Chicago, which was 40 inches in diameter. The telescope now being constructed at the works of Sir Charles Parsons, in Newcastle, was