SCIENCE NEWS

Science Service, Washington, D. C.

ECLIPSE EXPEDITIONS

WITH the sailing from here of Dr. Harlan T. Stetson, of Harvard University, to the Malay Peninsula, where he will observe the eclipse of the sun on May 9, the third American expedition is under way. Also crossing the Pacific for a similar purpose is Dr. R. L. Waterfield, an English astronomer, who prepared for the eclipse in Baltimore. He is bound for the Philippines.

The Harvard expedition, in addition to Professor Stetson, consists of Mr. and Mrs. Weld Arnold, of the American Geographical Society, New York, and Josef Johnson, of the California Institute of Technology, at Pasadena. They will disembark at Penang and proceed by rail to Alor Star, capital of the Province of Kedah.

The purpose of this group will be to make measurements of the brightness of the sky during the eclipse, and of the corona, the outermost layer of the sun that can be observed only at an eclipse. A number of photographs will be taken with different sized cameras to record the outermost parts of the corona. One novel research will be concerned with the brightness of the Zodiacal Light. This is a glow that appears sometimes in the sky after sunset or before sunrise, stretching upwards along the ecliptic or path of the sun. It is due to a flattened cloud of fine particles, very much scattered, that surrounds the sun, and reflects sunlight to the earth. Before sunrise or after sunset, its ends are visible. It can not be seen with the naked eye during an eclipse, but Dr. Stetson hopes to make measurements of its brightness with his photometers, and to determine whether there is any relation between it and the corona itself.

Another instrument that he will use is a camera equipped with a lens made of quartz and silvered, so that only the rapidly vibrating and invisible ultraviolet light can pass through to the sensitive plate. With this he will make photographs of the corona in ultraviolet light for the use of Dr. Edison Pettit, of the Mt. Wilson Observatory.

Dr. Waterfield's expedition which includes, besides himself, Wyndham E. B. Lloyd, of the University of Cambridge, England, will make observations in the Philippines at Iloilo, near the site of the party from the U. S. Naval Observatory in Washington. The chief instrument will be a camera 11½ feet long with a lens 7 inches in diameter. One picture will be made with this, on a very sensitive photographic plate, and with a rotating shutter. This will permit the faint outer reaches of the corona to be photographed without overexposing the much more brilliant inner part. The shutter consists of four aluminum vanes, which will revolve immediately in front of the plate. The outer part of the corona will be exposed for about 200 seconds, nearly the whole duration of the eclipse at Iloilo, while the inner and brighter part will only be exposed for a half second.

With smaller cameras, they will make photographs of the corona with infra-red light, consisting of waves too long to be visible. As the light of the sky is weak in infra-red, it is hoped that in this way the farthest expansions of the corona may be recorded. But before sailing Dr. Waterfield pointed out that this may not be successful, for the corona itself, like the sky, may turn out to be poor in infra-red also. With a five inch diameter lens in a camera six feet long ordinary photographs of the corona will be made with various exposures, and also photographs in color may be tried. This will be done with a new English method of photography in natural colors.

With a large grating which, like a prism, breaks light up into its constituent colors, photographs of the spectrum of the eclipse will be taken. These will be made of the flash, when the last glimpse of the outermost visible layer of the sun appears just before the opaque moon covers the inner parts, and of the corona itself, in the long wave, infra-red part of the spectrum. Previously few successful photographs have been made of the eclipse spectrum in the long wave, infra-red light, so Dr. Waterfield hopes to reveal some new lines in the spectrum that reveals so much to the astronomer.

The coming eclipse is a very remarkable one because of its length. In Sumatra and on the Malay Peninsula, it will last about five minutes, and nearly three minutes in the Philippines. An expedition from Swarthmore College, Pennsylvania, will take observations in Sumatra, besides the Naval Observatory party at Iloilo and Dr. Stetson's at Alor Star. Two other English expeditions, one from the Royal Observatory at Greenwich and one from Cambridge University, have gone to the Malay Peninsula. Another group, from the Hamburg Observatory in Germany, has also settled in the Philippines.

SUBMARINE GRAVITY DETERMINATIONS

OBSERVATIONS of swinging pendulums in a submerged submarine may help scientists to locate sources of potential earthquake danger under the ocean, Dr. Frederick E. Wright told members of the Franklin Institute on April 12. Dr. Wright is connected with the Geophysical Laboratory of the Carnegie Institution of Washington, and he was the institution's representative on a cruise made last autumn in a U. S. Naval submarine, the *S-21*, for the measurement of the intensity of gravity under the ocean.

"The earth's surface is irregular," said Dr. Wright. "Great mountain masses, such as the Himalayas, rise to heights exceeding 29,000 feet above sea-level; great ocean deeps extend to 32,000 feet below sea-level and cause the geologist to wonder why these immense structures fail to collapse from a yielding of the rocks under the shearing stresses thereby developed. Gravity measurements have shown, however, that a mountain mass

is not actually an extra, uncompensated load on the earth's surface. It is not carried, like a load on a bridge, by a strong non-yielding structure. Mountain masses are elevated because the column of which they represent the top consists of rocks of less density than the rocks underlying depressed land surfaces. This condition of equilibrium is called isostasy.''

If the soil carried by rivers, or other methods of transfer of material from one part of the earth to another, causes a shift of load, there are corresponding adjustments of the earth as a whole to restore the state of equilibrium to maintain the balance. These readjustments may be slow, or sudden, in the form of earthquakes.

''Gravity measurements over the land areas of the earth prove that the earth's crust is everywhere in a state of approaching equilibrium,'' he continued. ''Wherever large departures do occur, they indicate excess or deficiency of load, and these in turn produce stresses in the earth's crust. It is an axiom in geology, as in other matters, that extremes are temporary in character; high mountain masses are not eternal but are soon worn down and effaced. If they are actually extra loads on the earth's crust they give rise to abnormally high gravity values.''

Until recently, all such gravity observations were made on land, yet the ocean covers 72 per cent. of the earth's area, so that scientific knowledge was limited. By means of the special form of gravity pendulum, invented by Dr. F. A. Vening Meinesz, of the Dutch Geodetic Commission, ocean measurements can be made from a submerged submarine, which is more stable than a surface ship, as it is beyond the influence of the surface waves and swells. After several trips on Dutch submarines, Dr. Vening Meinesz came to the United States last fall and spent two months cruising the Caribbean and Gulf of Mexico in the *S-21*.

THE TORNADO RECORD

THE tornado record for the first quarter of 1929 as shown by information gathered by the U. S. Weather Bureau promises another unusual year for these disastrous storms.

Last year more tornadoes occurred in the United States than during any previous year for which the government meteorologists had gathered data. The record for 1928 nearly doubled the usual number of 90 to 100 a year. But the loss of life due to tornadoes in 1928 was exceedingly small and the property loss was far below that of the worst years.

In the first two months of this year 10 tornadoes caused 32 deaths, compared with only four tornadoes and no deaths, in January and February of 1928. March kept up the unfavorable condition with some half dozen whirlers and a dozen or so of deaths. And the Arkansas tornado toll gives April the beginnings of a bad showing.

As May and June are the months that usually show the largest damage from tornadoes, meteorologists feel that more storms and suffering must be expected.

The southern states experience their tornado storms most frequently in the later winter and early spring. Then the whirler season invades the northern states. Contrary to popular opinion there is no ''tornado belt.'' Statistics show that over half of the extremely destructive tornadoes have occurred east of the Mississippi.

The tornado is born of currents of air above the ground that differ in direction and come in contact. A condition of warm, moist air near the ground overladen with cold air sets up violent heat transfer and overturning of the atmosphere. A great whirl or vortex results, releasing the pent-up energy of the air. Not always does the funnel-shaped cloud reach the ground, but when it does the low pressure of its center explodes houses and the wind about the vortex prostrates all that it encounters. Usually a tornado moves east or northeastward at the rate of 25 to 50 miles per hour. If you see one coming at you, run as hard as possible toward the northwest as, due to the small path, a few feet may mean the difference between danger and safety.

THE CONTROL OF INDIVIDUAL DEVELOPMENT

WHEN Frederick the Great wanted his regiment of oversize grenadiers, he had to send out his recruiting sergeants to coax or kidnap six-footers all over Europe. But future Fredericks will be able to get their giants merely by feeding infants properly adjusted doses of glandular extracts. And ''internal six-footness''—intellectual super-development—may possibly be brought about in the same way.

All this, if the prophecies uttered here before the American Philosophical Society by Oscar Riddle, of the Carnegie Institution of Washington, reach fulfilment. It will not be a case of ''environment'' overcoming ''heredity,'' but rather a man-controlled readjustment of the interplay of these two forces, which has hitherto been left to chance. Recent researches on the effects of special conditions applied to the early stages of organisms have shown the feasibility of controlling development. While these have so far been applied mainly to sub-human forms of life, their application to our own race is merely a matter of time and the gathering of further data and skill in manipulation.

''To produce these changes in an individual and in a race it will of course be necessary to bring about changes in specific conditions during various stages of life and development,'' he continued. ''Some of these special conditions will doubtless have to be applied during intrauterine—or even in preuterine—life, some in childhood, some in adolescence and some in later life. This will mean indeed a sort of super-medicine, a super-education, and a continuous and very personal application of a great body of knowledge. It will be a recurrent work, necessary in every generation, as is the work of education and of medicine.

''The development of a generation of giants, for example, would mean no transmission of inheritance of gigantism, since no change is made in the combination of genes carried by these giants. If each next generation wants its giants it must make them, just as it must now make its educated men. But here we get a closer

view of how this powerful creative work on the part of man may affect the thought and purpose of the man of to-morrow."

THE ASCENT OF SAP

"HEARTS" in plants, propelling the sap upward by rhythmic beats, are denied any real existence by several American and European plant physiologists, whose repetitions of the widely heralded experiments of Sir Jagadis Chunder Bose have not given the results claimed by him. The "pulsations" shown on his records, they state, are due simply to the tremors of imperfectly adjusted instruments, and when these sources of error are eliminated the apparent pulsations vanish immediately. Without these precautions, a round lampwick soaked in cabbage juice shows "pulsations" of exactly the same kind detected in the living stem of a plant.

The newest attack on the Bose theories is by Dr. G. A. Persson, of Mt. Clemens, Michigan, in an article which will appear in the forthcoming issue of *The Scientific American*. Dr. Persson, a physician interested in the physiological effects of poisons, was attracted to the Bose experiments by the reported effects of strychnine and other drugs on the "heart-action" of plants. He and his assistant built duplicates of two of Dr. Bose's pieces of apparatus, the electric probe and the sphygmograph.

Both of these instruments are supposed to register minute increases and decreases in the diameter of plant stems, making them readable to the naked eye by deflections on the scale of a sensitive galvanometer. Dr. Persson did get wiggly-line tracings that resembled those of Dr. Bose; but he states that when he carefully insulated his apparatus against vibration and electrical disturbance, and refrained from walking near his plant or causing any air currents in its neighborhood, the apparent pulsations stopped completely.

These negative results agree with those of Professor H. H. Dixon, of the University of Dublin. Professor Dixon built an electric probe some time ago and also a third instrument used by Dr. Bose, called a quadrant electrometer. He was not able to detect any heart-like pulsings in plants with either of these pieces of apparatus.

Professor Dixon, following some preliminary work done by other experimenters on the continent of Europe, was able some years ago to demonstrate that a continuous column of water in a sealed vessel has a strength like a woven rope, resisting a breaking strain of several hundreds of pounds per square inch. This tensile strength of water is sufficient to pull sap up to the tops of the tallest trees as though each microscopic water tube in the sapwood had a slender steel wire strung through it. The evaporation at the leaf-surfaces furnishes the pull, according to Professor Dixon's theory, and the water-columns themselves act as cords to lift themselves.

Almost all plant physiologists have now accepted Professor Dixon's hypothesis of the ascent of sap. Among the most notable of his American supporters is Dr. D. T. MacDougal, of the Carnegie Institution of Washington, who has tested the theory on a large scale at the Coastal Laboratory at Carmel, California, of which he is director. The results of these experiments, Dr. MacDougal states, are a confirmation of Professor Dixon's ideas and a refutation of those of Dr. Bose.

ITEMS

THE heron, threatened with extinction, seems to have found a natural sanctuary in Florida, where it can hold its own and even thrive. J. V. Kelsey, U. S. game protector, recently made a trip through the Lake Okeechobee section, and reported that he witnessed a rare and beautiful sight, and one which indicated an encouraging survival of birds thought nearly extinct. At a point approximately ten miles east and north of Belle Glade, Palm Beach County, and as far as Pahokee, in all a distance of about 25 miles, there were thousands of American egrets and snowy herons, stretching away into the overflowed country as far as the eye could see.

SUGAR-CANE mosaic, the worst known disease of sugar-cane, has become established in Peru, according to two American specialists in sugar-cane troubles, E. V. Abbott and G. N. Wolcott, who are at present working at the Peruvian Government agricultural experiment station at Lima, Peru. Their results were discussed in the issue of SCIENCE for April 5. Cane is grown on the valley haciendas, many of which have been visited by the American investigators. So far the disease has been discovered in only one valley, near Lima. The corn aphis, an insect responsible for its spread, has been found widely distributed in all the afflicted fields. It is present in other parts of Peru as well, so that if the disease once gets out of hand it can easily assume epidemic proportions.

INVESTIGATORS at the Mayo Clinic and elsewhere have found that the liver has great powers of regeneration. From 65 to 70 per cent. can be removed and the remaining portions will begin to grow larger, and in six to eight weeks will almost replace the lost parts. The practical application of these findings is in disease of the liver in man. Certain diseases destroy liver tissue, but with this power of regeneration the patient with an injured liver can continue to live and in many cases to work along quite happily. It is hoped that as a result of further work it will be possible to protect the injured liver from further injury and thus to save life. Some of these life-saving measures already are in use.

AUSTRALIA'S paper requirements may eventually be met by the product of native paper mills, although at present all paper used in the commonwealth is imported. Eucalyptus fiber has been successfully made into paper on an experimental scale. Hitherto attempts at utilizing hardwoods like eucalyptus have not been successful, because the mechanical methods of producing pulp will not work with hardwoods, and the standard alkali processes for producing chemical pulp have resulted in paper that is too bulky, soft and "short" when tried with eucalyptus. However, a modification of one of the alkali processes has been worked out which gives a paper of satisfactory finish and strength.