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SUN SPOTS AND ANIMAL LIFE

PERIODIC increases in the numbers of certain animals are blamed on the sun and its spots by C. S. Elton, of the department of zoology and comparative anatomy of the University of Oxford. Extraordinary as this conclusion may seem, Mr. Elton offers scientific data to show that animal populations are influenced by the well known sun spot cycle.

By methods of mathematical analysis it is possible to recognize definite climatic cycles, he says, even in a country with a variable climate. In seeking the causes of these variations it is reasonable to look to the sun, the source of practically all our energy. For over one hundred and fifty years records have been kept of the number of sun spots. These increase to a maximum about every eleven years. Increase in the number of sun spots is accompanied by an increased output of energy by the sun, and, strange to say, by a low temperature on the earth. Further, the average annual temperature of the whole earth, the atmospheric pressures and rainfalls of various parts of the earth, the tracks of storms in North America and the rate of growth of the redwood tree, have all been found to show marked eleven-year fluctuations which correspond to those of sun spot numbers. There are natural records in the case of the redwood dating back in many cases three or four thousand years.

Turning now to variations in the numbers of animals, if the return of rabbit skins taken by the Hudson Bay Company be consulted, the interesting fact is established that the numbers increase to a maximum every eleven years, and that each maximum corresponds to a sun spot minimum. The fur returns of this company, which have been kept since 1845, give a good index of the total rabbit population, hence the conclusion is reached that variation in the number of sun spots in some way affects the rate of reproduction of rabbits.

Biologists can not yet explain this extraordinary relationship but it seems likely that the explanation will be found in the effect of sunlight on animals, both directly and indirectly, through their food. It is common knowledge now that the antirachitic vitamin is intimately related to sunshine.

The lynx and the fox feed on the rabbit, so it is not surprising that the numbers of these animals, too, vary in well marked eleven-year periods.

Another interesting little animal in this connection is the lemming, which lives in the Arctic regions. Periodically it attains vast numbers and it migrates usually from the mountains to the lowlands, often even into the sea. Such migrations occur contemporaneously throughout Norway, Sweden and northern Canada and probably throughout the whole Arctic regions.

"The spectacle of processions of lemmings ecstatically throwing themselves over the ends of railway bridges, and falling to an apparently useless death beneath; the sea strewn with dead lemmings like leaves on the ground after a storm; lemmings making a beeline across crowded traffic oblivious to danger; all these things are bound to make people talk," Mr. Elton says. "The lemming-years are such conspicuous phenomena that it is safe to assume that all which have occurred since about 1860 have been recorded. Lemming-years in Norway have the status of great floods."

By studying their records it is found that their frequency is about three and one-half years, not eleven years as in the case of rabbits. Close examination of meteorological data shows that climate too fluctuates in three and one-half year periods, particularly in Arctic regions. The cause of this short period fluctuation is not known.

In the same way as the fox and lynx benefit by years of large rabbit numbers, so in lemming-years large numbers of short-eared owls collect to feed on them, and peregrine falcons, which in normal years do not visit Norway, collect in large numbers to feed on the owls. In Greenland Arctic foxes tire of ptarmigan in lemming-years and so allow it to breed and attain large numbers in the year following the lemming-year. Then the Arctic fox decides that he likes ptarmigan after all and down go the ptarmigan numbers.

NAVY ASTRONOMERS TO OBSERVE ECLIPSE IN SUMATRA

IT is gratifying to American astronomers and others interested in the progress of science to know that the United States Naval Observatory will carry on in the observation of total eclipses of the sun by sending an expedition to Sumatra to observe the total eclipse of January 14, 1926.

Through the unique opportunities that it possesses as a government institution under the control of the Navy Department it is possible for the United States Naval Observatory to advance the cause of astronomical science in some ways that are not within the reach of private institutions. This was evidenced in the sending forth of special time signals for the convenience of eclipse observers on the occasion of the last eclipse and in the pioneer work in the observation of the eclipse from the Navy dirigible, *Los Angeles*, by a group of scientists from the observatory under the head of Captain Edwin T. Pollock, superintendent of the Naval Observatory.

The interest shown by the present superintendent in promoting eclipse observations speaks well for the success of the eclipse expedition that will be sent forth from our national observatory before the year is over, the sixth to be equipped by this observatory since the year 1900. It is also in keeping with the traditions of the Navy. Many astronomers of to-day recall the enthusiastic interest in the cause of astronomical research evidenced by Rear-Admiral Colby M. Chester, superin-

tendent of the Naval Observatory in 1905, who headed an expedition sent out by this observatory to Africa and Spain to observe the eclipse of August 30, 1905, when a special line squadron of three vessels was detailed by the Navy Department for the observation of the eclipse and a special appropriation of $5,000 was granted by Congress.

An interesting report of the results of the observation of this eclipse and of the eclipse of June 8, 1918, as well as notes of aviators on the eclipse of September 10, 1923, are contained in the Publications of the U. S. Naval Observatory, Second Series, Vol. X, Part II—Appendix, which has just recently come from the press. There are some remarkably fine plates in this volume, photographs of corona and prominences, and drawings from negatives, in addition to the scientific discussion of the observations of these eclipses. The frontispiece is a reproduction in color of the painting of the corona of the eclipse of June 8, 1918, by the artist, Howard Russell Butler, who was a member of the Naval Observatory eclipse expedition to Baker, Oregon. There is also a reproduction in color of a painting by the same artist of the approach of the moon's shadow and of details in the structure of the prominences.

An earlier volume of the Publications of the U. S. Naval Observatory, published in 1905, dealt with the results of the observations of the eclipses of May 28, 1900 and May 17, 1901, the former in North Carolina and Georgia and the latter in Sumatra. Both volumes are valuable contributions to the published records of eclipse observations. They will be followed by another volume dealing with the results of the observations of the eclipse of January 24, 1925 and January 14, 1926.

The eclipse of next January will be a fine one of four minutes duration in the Indian Ocean and over three minutes duration in Sumatra, where it will occur in the afternoon. This eclipse will also be visible later in the afternoon and with shorter duration in Borneo and the island of Mindanao in the Philippines. It will occur on the east African coast near the equator shortly after sunrise. If present plans are carried out there will be at least one other eclipse expedition sent out from the United States to observe this eclipse, the Sproul Observatory expedition from Swarthmore College. This institution, whose department of astronomy is under the direction of Dr. John A. Miller, has been particularly active in observing recent eclipses. English, French and German observatories also are now planning to send expeditions.—*Isabel M. Lewis.*

NEWLY DISCOVERED PREHISTORIC FOOTPRINTS

MYSTERIOUS tracks of strange fossil animals discovered in primitive rocks 950 feet below the top of the Grand Canyon of the Colorado, have been brought to Washington for identification by Dr. C. W. Gilmore, paleontologist of the U. S. National Museum. These creatures left their footprints in the sands millions of years before the huge reptilian dinosaurs began to splash through the swamps then in that region.

The tracks were discovered crossing the mule path of the Hermit trail that takes venturesome tourists from the rim to the bottom of the canyon. From the Permian geological strata in which they were found, Dr. Gilmore estimates that the animals which made them lived at least twenty-five million years ago. Intensive study will be made of the faint claw and foot prints in an effort to determine just what sort of animals they were. Many tracks are included in the tons of stone just delivered here. A preliminary survey of these imprints indicates that they were left by animals ranging from a few inches up to five feet in length, probably including amphibians and crustaceans and other water-loving animals of a more primitive order that the dinosaurs and similar reptiles.

The only clue to the identity of these varied animal tracks is contained in one track which shows the mark of a rounded flat toe such as a primitive reptile called Diadectes is known to have had. Added mystery is given these marks in the stone by the fact that the formation in which they were discovered was evidently once a wet, sandy slope and all the tracks showed that the animals were climbing up the slope.

A section of the rock showing these tracks has been exposed and left in place to serve as an outdoor exhibit for tourists passing over the trail. As soon as Dr. Gilmore is able to study out and identify the tracks, the spot will be fittingly marked as a convincing illustration of the upward climb of life on earth. Dr. Gilmore said: "When even the most skeptical see these marks in the layer of stone 950 feet below the present rim of the canyon, they begin to realize the vast period of time which must have elapsed since these primitive animals lived."

SUBSTITUTES FOR MOTOR FUEL IN SWEDEN

GASOLINE costs are sky-high in Sweden, and Swedish inventors are busy on devices to make motor operation possible without it. One that has been patented makes use of gas generated from charcoal, and two others use crude oil.

The charcoal-gas generator is an interesting device. A chamber lined with fireclay is filled with charcoal, which is heated to incandescence by its own combustion. Steam is then drawn through the glowing coals, resulting in the formation of a mixture of carbon monoxide and hydrogen, both of which have high fuel value. After being filtered and purified, they are fed into the engine. The inventor claims that no change is needed in the carburetor, and that the engine can use gasoline or charcoal gas alternately without trouble. He states that the weight of charcoal fuel necessary for operation is greater than that of the gasoline formerly carried, but that its cost is only one fourth as great.

A similar reduction in the cost of operating an automobile is claimed by the Swedish inventor, Nils Anderson, for his device which permits the combustion of crude oil in an ordinary gasoline motor. The basic difficulty

which Anderson had to overcome was the fact that crude oil can not be completely vaporized by ordinary heating, but leaves a residue which will clog the engine unless disposed of. He solves the problem by playing a current of superheated air upon the oil as it leaves the nozzle. This shatters the ingredients that can not be turned into gas and turns them into a combustible fluid, which is consumed during the explosion in the cylinder. When using crude oil, however, the motor must be started with gasoline.

Another time-saver in the operation of crude oil motors is a special igniter devised by C. A. Rudstrom. The ordinary method of starting a crude oil engine involves the heating of the hot-bulb with a blow torch, a process which takes several minutes. But Rudstrom requires only twenty seconds to start combustion in a cold engine. His igniter is brought to a glow by means of an electric current from a battery which is charged by a generator connected with the engine.

NEW EXPEDITION TO DARIEN

AN expedition to further explore the area inhabited by the white Indians of Panama is about to penetrate into the interior of this country, hitherto practically unknown to all except the white and brown Indians.

Dr. and Mrs. Reginald G. Harris have joined Richard O. Marsh, who took three white Indian children and five brown Indians to the United States last summer, in this attempt to learn for science more details about the origin and cause of the unusual presence of many white-skinned Indians among the brown San Blas and mountain tribes. With Marsh also is Major Harry B. Johnson, naturalist, who accompanied him last year on his trip of exploration in this part of Darien.

Dr. Harris is director of the laboratory of the Long Island Biological Association at Cold Spring Harbor, N. Y., and he has already studied many of the white Indians along the coast with a view to solving the biological puzzle of their origin. Mrs. Harris is a daughter of Dr. C. B. Davenport, director of the department of genetics of the Carnegie Institution of Washington.

Marsh left the United States January 2 and brought back to their native land all but one of the Indians which he took north last summer. The smaller white Indian boy, a youngster of eleven, named Chepu, has been adopted by the Marsh family at Brockport, N. Y.

Reports reaching the coast indicate that there is much unrest among the mountain tribes who threaten an uprising against the negro rubber hunters who are penetrating the country and raiding the Indian plantations. All of the Indians are very friendly to the Marsh party, however. Among the brown San Blas Indians taken to the United States by Marsh was Iqua Negappi, "crown prince" of the San Blas, who will one day rule the whole coast.

PARATHYROID EXTRACTS AND TETANY

SUCCESSFUL treatment of parathyroid tetany, a deficiency disease caused by defects in the parathyroid gland, is announced as the result of researches by Dr. J. B. Collip, of the University of Alberta.

The parathyroid gland is an obscure body associated with the thyroid gland in the throat, in the region of the "Adam's apple." It is one of the ductless glands, whose secretions pass directly into the blood and are therefore very hard to isolate and study. Persons with parathyroid deficiency and animals from which these glands have been removed surgically, develop a condition known as "tetany," marked by extreme nervousness, spasms and stiffening of the muscles and other distressing symptoms.

Hitherto there has been no effective treatment for this condition but Dr. Collip has succeeded in obtaining an extract from animal parathyroids, which he calls "parathyrin," and which seems to be the long-sought remedy. After a number of successful preliminary experiments with dogs, whose parathyroids had been operated upon, he tried the extract on a baby in a hospital, whose condition had become desperate. The child's life was saved and at last reports she was well on the road to recovery.

The operation of parathyrin in normal persons and animals seems to be connected with the quantity of lime in the blood. Tetany is accompanied with disturbances of the calcium concentration and when the extract is administered, normal conditions are restored.

ITEMS

FIREPROOF insulation for telephone switchboard wires is made possible by a new use recently discovered here of selenium, an element whose chief use hitherto has been in apparatus involving the control of electric current by light. The flameproofing of switchboard wires is highly important, for even a small fire can undo many hours of work and throw a whole exchange out of commission. Fireproofing substances now in use are only partially successful. The peculiar thing about the use of selenium for this purpose is that the element itself can be burned. Only when it is used on the cotton covering of the wires does it take on fireproof qualities. But then the wire resists all ordinary flames, and even when ignited by the intense heat of a blow-torch goes out immediately when the outside flame is removed.

A DEVICE which sends out distress signals from ships automatically has been invented by M. Passaquin, a young engineer. The instrument consists of wheels with projections around the edges corresponding to the signal, SOS, certain numbers which will give the latitude and longitude of the vessel, and the radio call of the ship. An ordinary electric motor operates the machine which is mounted on a table. Each wheel is set at the proper angle and the motor started. The signal flashes three times and then stops. After a short pause the signal is flashed again and again until the motor is forced to stop running. Ships or lifeboats equipped with this new invention do not have to have radio operators in order to send out messages of distress. A special dial on the transmitter may be set every day with the exact location of the ship and the motor turned on to operate the set whenever an emergency arises.