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JUPITER'S MOONS

At least three of the moons of Jupiter, like the moon of the earth, rotate once on their axis in the same time that it takes them to make one revolution around their parent planet, according to Dr. Joel Stebbins, professor of astronomy at the University of Wisconsin, now working at the Lick Observatory.

Dr. Stebbins is making use of the 12-inch refracting telescope of the observatory, and a photoelectric photometer, by means of which the light from a star, planet or moon is focussed on a film of metallic potassium. This results in a minute electric current which can be measured with a delicate galvanometer, and so the brightness of the object can be accurately determined.

The chief difficulty is in keeping the brilliant light from Jupiter itself off the cell, but Dr. Stebbins has overcome this by the use of a small diaphragm with a hole through which the light from a satellite can shine, but not the planet. However, satellite I, the nearest to Jupiter, is too close to be measured even by this method.

Measurements have been made of II, III and IV. All these satellites were discovered by Galileo in 1610, and can be seen with a small telescope. In addition there are five others which require a large instrument to make them visible.

Moons, II, III and IV take 3 days, 13 hours; 7 days, 4 hours and 16 days, 18 hours, respectively, to revolve around Jupiter and Dr. Stebbins finds that the variation of the light of the first two at least also follows these periods. This, he explains, is probably due to their being bodies like our moon, and unequally bright over their surface, so that as a greater or less area of the bright surface is exposed to the earth their light is greater or less, because this is largely reflected sunlight.

In order to check the photoelectric cell, Dr. Stebbins compares the light of the satellites with near-by stars whose light is constant, and he suggests that this may be used as a possible check on the variation of sunlight. Direct measurements of sunlight vary greatly because of variations in atmospheric conditions, but since these would affect alike the brilliancy of the satellites and of the comparison stars, a variation in the difference between satellites and stars would indicate an actual variation of sunlight.

TEMPERATURE OF THE UPPER AIR

An adventurous human being who plans to travel 30 miles away from the earth will do well to include an asbestos overcoat in his equipment, for some weather experts believe that the upper air may sizzle at a temperature above the normal boiling of water, or 200 degrees Fahrenheit. New evidence which has set meteorologists to speculating on this weather problem has been obtained by a series of experimental explosions set off by scientists in France.

Thirty tons of melanite were used in setting off four explosions at La Courtine, a point about half way between Paris and the Pyrenees. Observers at Bordeaux and other places radiating from La Courtine were notified when the explosions were to take place, and recorded the time at which the sound reached them. The experiments have attracted considerable interest, because few tests of the audibility of sound waves have been made in which a number of observers were waiting to make exact notes of their reception of the sound waves.

Several hundred observations were made during each experiment, and by studying these notes in connection with wind and temperature conditions at the time of the explosions scientists are making some deductions as to the state of the upper air.

Professor Charles Maurain, director of the Institute de Physique du Globe at Paris, who has just reported the result of the tests, has assumed that the upper atmosphere is uniform in temperature up to over 30 miles. J. F. Whipple, British meteorologist, studying the experiments, however, finds reason to believe that the temperature begins to rise at about 20 miles and that at 30 miles the heat may reach 220 degrees Fahrenheit.

This theory, that the upper air may be hot, instead of about 75 degrees below zero, is also held by Professor F. A. Lindemann, of the University of Oxford. The hot upper air theory has been recently questioned, however, by Dr. C. M. Sparrow, professor of physics at the University of Virginia, who holds that the atmosphere does not become any warmer with the increase of height.

RHENIUM AND MASURIUM

Search for two missing chemical elements, lately reported discovered in Germany, may have to be continued. For from Russia comes word that a careful check-up on the elements, rhenium and masurium, fails to substantiate recent investigations.

In June, 1925, Professor Walter Noddack, of the University of Berlin, assisted by Ida Tacke and Otto Berg, reported that he found the characteristic X-ray spectra of the missing elements, numbered 75 and 43 in the periodic tables, in platinum ores from the Ural Mountains.

Dr. O. Zvjaginstsev, of the Platinum Institute of the Russian Academy of Sciences, has repeated the experiments of Professor Noddack, using rare metals from the same source and has failed to find the element No. 75 at all and considers the presence of the still rarer element No. 43 "extremely unlikely."

"The platinum was treated chemically and the X-ray spectrum photographs of the final products were carefully measured." Dr. Zvjaginstsev has announced through the scientific journal, *Nature*, "No. 75 would have been easily detected if it were present in the native platinum in quantities pointed out by Professor Nod-

dack, or even 10 to 100 times less than that. As a matter of fact, the spectrum photographs obtained prove with certainty the absence of the element in native platinum in a quantity exceeding .0003 per cent."

The discovery of this element, which is a close relative of the well-known metal, manganese, has also been claimed by Dr. J. Heyrovsky and Dr. Doleysek, both of Prague, who reported that they had found it associated with manganese.

GUINEA PIGS' BLOOD

DR. ROSCOE R. HYDE, of the department of immunology of the School of Hygiene and Public Health, Johns Hopkins University, in experimenting with a race of guinea pigs whose blood is of a type known as "complement deficient," has discovered that a serum which kills a normal guinea pig in a few minutes has no apparent effect when injected into the complement-deficient guinea pig.

This race of guinea pigs is unique, being the only one of the kind recorded. It was developed at the Vermont Agricultural Station, and probably arose from a "mutant" or such an accidental difference as occurs again and again in the evolution of both plants and animals, giving rise to different new varieties.

It was found that this type of blood is an inherited characteristic in accordance with the Mendelian law, and the breeding of this pure complement-deficient type has made it possible to demonstrate that the quality of blood called "complement" is capable of division into three component parts.

The first two components are known to be destroyed by heating to 133 degrees Fahrenheit. The third component, which these guinea pigs lack, is not destroyed by this temperature, as is shown by the fact that even very small quantities of normal guinea pig blood or human blood which has been subjected to this temperature for thirty minutes will activate the blood of the complement-deficient guinea pig. That is, it temporarily brings its blood up to the same condition as that of the normal guinea pig.

Because of the close similarity existing between human blood and the blood of the guinea pig, it is quite possible that individual men and women may be found whose blood is deficient in this respect.

THE NEBRASKAN PLAINS

GREAT forests once grew on what are now the treeless plains and sand drifts of western Nebraska and abundant vegetation once flourished where irrigation is now necessary to sustain plant life. These conclusions are indicated in a study by Professor E. W. Berry, of the Johns Hopkins University, of a collection of fossil nuts published by the American Museum of Natural History.

These fossils were discovered in Sioux County, Nebraska, together with fossil remains of prehistoric animals somewhat related to the rhinoceros, from which fact the deposits are called the Titanotherium beds. Specimens of these nuts were first reported in 1895, by Professor E. H. Barbour, who called them hickory nuts.

Professor Berry, however, has compared his specimens with all existing species of hickory and walnut and finds that they are walnuts and most closely related to the common black walnut so plentiful throughout the eastern part of the United States and the Mississippi Valley.

These deposits are attributed to the Oligocene or early Tertiary period of the earth's history and indicate that climatic conditions in that region were more humid and rainfall much greater than at present. The black walnut requires a rich, deep, well-watered soil, and in such soil there would naturally be an abundance and variety of vegetable life. It is possible that these walnuts may have been confined to narrow areas along river banks, but the abundance and character of the associated animal life, says Professor Berry, indicate that there were considerable areas of forested country in that region.

WHITE COLONIZATION OF THE TROPICS

THE world's rapidly growing white population, with its demand for more food and space, is making colonization and acclimatization of the tropics a constantly more important problem, but despite the advances of science, conquest of the wet tropics is deferred by many handicaps.

True acclimatization, according to Professor Glen T. Trewartha, of the University of Wisconsin, who has reported his study to the American Geographical Society, involves two requirements: first, that large numbers of whites may live in the wet tropics on a plane of civilization similar to that of their homes, retain their original physical health and vitality and their mental and moral vigor, and perpetuate their kind; second, that future generations begotten by tropical immigrants maintain a civilization at least equal to that in their homeland and possess the equivalent in length of life, moral character, physical stamina and mental alertness possessed by their intermediate-zone ancestors.

Summarizing recent publications on the question Professor Trewartha finds that both the dry and wet tropical climates have advantages and disadvantages. In the drier, lack of water places a limitation on agricultural development. It is the constantly wet tropics which seem to hold greater possibilities for the increased food production growing world population is demanding, yet which hold the most serious handicaps for white colonization.

Despite the advance of tropical medicine, which has bettered economic conditions in saving life and increasing production, complete eradication of tropical diseases in low latitudes can not be expected in the early future. Physiological effects of the heat and other conditions of tropical climate will also remain. It is known that the colored races suffer physiologically from the tropics in lesser degree than the white, but Professor Trewartha concludes that while the acquisition of the Negro's

greater immunity to tropic heat, humidity and disease would be desirable, it would be of doubtful value if it were to be gained at the expense of sacrificing those qualities which are the white man's chief claim to distinction.

THE GOATS OF GUADALUPE ISLAND

OUT in the Pacific on a nearly barren island, goats are learning to climb trees and swim in the ocean for food. Necessity is the teacher of this population of Guadalupe Island, a volcanic bit of dry land sticking up out of the sea 240 miles southwest of San Diego, according to Laurence M. Huey, curator of birds and mammals in the natural history museum at San Diego.

Guadalupe Island, which has become famous during recent years as the only known habitat of the elephant seal, formerly was used as a penal colony by the Mexican government. To-day the only inhabitants are a guard of Mexican soldiers to protect the elephant seals, which have become almost extinct, and myriads of goats.

These goats climb to the highest pinnacle, and thread their dangerous way up the face of the cliffs overhanging the sea in search of a blade of grass or a bit of herbage. During the dry season food is so scarce that the goats have resorted to eating the bark from the cypress trees which crown the island, and desiring the luscious looking foliage they learned to climb the trees. But by constant gnawing away of the bark the trees are dying, and the goats have had to turn to the sea for their provender. They eat the bits of seaweed that are cast upon the beach and even venture into the water for more pretentious forays.

By destroying the cypress forests the goats are destroying their only source of fresh water supply, and unless they learn to subsist upon the hitherto unpalatable salt water, they will die of both thirst and hunger.

The goats, which were first introduced in the penal colony days to supply food and milk for the colonists, have proved the nemesis of other forms of life on the island. Of the ten forms of bird life and mammals that are endemic to Guadalupe, they are responsible for the extinction of three. The towhee and wren were exterminated by the complete destruction of the underbrush, while the carcaras preyed upon the new-born kids and were destroyed by men who had been granted the concession of exploiting the goats for their hides and tallow.

Several carcasses of goats have been seen floating in the water beneath the precipitous cliffs, an evidence that the animals had fallen from the bluffs overhanging the sea. But, as a rule, they cling to the face of the precipices almost as tenaciously as a fly ascending a window-pane.

ITEMS

A WAR gas made by Professor Gabriel Bertrand, of the Pasteur Institute, has found a peace time use in the silk industry. The silk cocoons are gassed by small quantities of chloropicrin which has proved exceedingly practical and easy to handle. The gas has been tried out in various silk raising centers and has been found to possess marked advantages over killing the cocoons by baking or steaming. Under the prevalent methods of silk culture the cocoons have to be all sold within a period of two or three weeks, but the use of chloropicrin promises a practical way, it is said, for the growers to turn the cocoons into non-perishable merchandise which can be sold when the market is best.

AS part of a comprehensive plan by which all the important airways of the country will be accurately chartered from airplanes, the Navy Department has ordered that all topographical markings in the Norfolk area be recorded for the guidance of pilots. It has been found in the past that aviators frequently experience a great deal of difficulty because of the fact that outstanding details as viewed from the ground may not coincide at all with the view beheld by an aviator. Repeated flights will be made over the same terrain, in order to carefully fix these details. After a careful digest of all data obtained, it will be incorporated in new charts to be prepared on the pantograver, a new machine recently perfected by the Navy.

INSIGHT into the real mechanism of scurvy, beri-beri and all the diseases caused by a lack of vitamins is the goal of a group of workers in the Hygienic Laboratory of the U. S. Public Health Service. In the division of pharmacology, M. I. Smith, W. T. McClosky and E. G. Hendrick have been dosing devitaminized rats with various toxic drugs to see how the reaction of the avitaminous organism varies from the normal. They found that the ability of the tissues of vitamin-deficient animals to resist poisons is considerably reduced. The susceptibility of animals that have been deprived of vitamin A, which is necessary for health and growth, and the anti-neuritic vitamin B, to several nerve poisons indicates a general impairment of the nervous system. The markedly decreased resistance of vitamin A deficient rats to morphine suggests, according to the authors, that the respiratory center is weakened by a lack of this essential food element. "Sluggish circulation and weakened respiratory center," say the authors, "would account satisfactorily for the frequent occurrence of pulmonary congestion and lung disease in rats on vitamin-deficient diet."

PROTECTION against typhoid by swallowing vaccine instead of having it injected under the skin is being tried out experimentally at the bacteriological laboratories at the State College of Washington. This method has the advantage of making the victims less sick than the customary shot in the arm, but the degree of immunity it confers compared to the older way is not yet absolutely determined, according to Professor Victor Burke and La Verne Barnes, of the department of bacteriology, in a forthcoming issue of *The Journal of Infectious Diseases*. The rate at which the immunity is developed is also unknown for the present, but it is hoped that further research will clear up these points and indicate the practical value of mouth vaccination.