SCIENCE NEWS

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EXPEDITIONS OF THE NAVAL OBSERVATORY

WHILE one of its offices is making last-minute calculations of the path of total eclipse of the sun visible in California on April 28, other astronomers at the U. S. Naval Observatory are preparing for an expedition to a remote island in the South Pacific to observe another total eclipse on October 21.

Niuafou Island, a tiny bit of land in the Tonga group, not far from Samoa, is the only accessible location from which the October eclipse can be seen. It is not much frequented by travelers, for the ordinary contact with the outside world for its few hundred inhabitants is a tin can full of mail thrown overboard by the monthly inter-island steamer. A native swims out and gets the can, which has given Niuafou the local name of "Tin Can Island."

Captain C. S. Freeman, superintendent of the observatory, stated to *Science Service* that, despite its inaccessibility, the Naval Observatory has decided to sponsor an expedition there to observe the eclipse. This will not be strictly a Naval Observatory expedition, however, for astronomers from various American observatories will participate. Dr. S. A. Mitchell, director of the Leander McCormick Observatory of the University of Virginia, and veteran of seven previous eclipses, will head the party.

The remainder of the personnel is yet to be selected, but Captain Freeman especially desires some astronomer who can make photometric observations of the brightness of the eclipse. If some one can be found who is willing and able to make such observations, he will be given a place.

Starting in the summer from San Francisco, the party will proceed to Pago Pago in American Samoa by naval transport, whence a smaller naval vessel will transport the party to Niuafou, several hundred miles distant.

April 28 will bring the year's first total eclipse, and this is also occupying the attention of the Nautical Almanac Office at the Naval Observatory. This eclipse crosses California, Nevada and Idaho, but is of very short duration, and not nearly as favorable astronomically as the one in October. It will only last about a second and a half at most, and the path over which it will be total, where the dark disc of the moon hides the sun, will only be about half a mile wide, as compared to a width of perhaps a hundred miles for a really good eclipse.

Eclipse predictions are always a bit uncertain, owing to incomplete knowledge of the moon's motion, and the skill of the astronomers will be taxed in locating the exact path in advance. Calculations now being made are taking into consideration observations of the moon made as recently as last month, and it is hoped that no astronomer who is guided by their predictions will find himself outside the path of totality.

FOSSIL SPECIES OF THE GRAND CANYON

FOSSIL remains of plants found in the walls of the Grand Canyon show that many millions of years ago stunted vegetation of very singular aspect grew in a great red sandy floodplain under a semi-arid climate in northern Arizona. This great red land has been found by David White, who has been studying the deposits and their remains of extinct plants for the Carnegie Institution, to have continued a long time before the region sank beneath the sea and was covered with the sea shell-bearing limestones hundreds of feet in thickness which form the upper part of the walls of the Canyon. These limestones pave the high plateau through which the canyon was and is still being cut, and they underlie the foundations of the hotels and camps on both sides of the great abyss.

Most of the newly discovered relics of this ancient growth represent seed-ferns. These were fernlike plants that bore real seeds instead of spores. The rocks that contain them, known geologically as the Hermit shale, were laid down as fine-grained river silts long before the Grand Canyon was even a crease on the surface of the desert plateau. They date from the Permian, the period immediately following the Coal Age.

Some of the plants are found in beds of the same geological epoch in eastern North America and in Europe as far east as the Ural Mountains. One unique group of forms is most closely connected with a flora that covered the region of tremendous glaciers in ancient times which spread over portions of India, Australia, South Africa and South America. Remnants of this flora should be found among the specimens of fossil plants which Professor Gould, of the Byrd Antarctic Expedition, may have found in the Queen Maud Range which he explored in Antarctica.

The thick layers of ripple-marked silt indicate that the rivers of the region at that time carried considerable volumes of water, at least part of the time. Some of them are marked with deep "suncracks" telling of the exposure of the mud to intense heat and rapid evaporation. The molds of salt crystals testify to seasons of intense drought, while, in addition to the impressions of raindrops, the deep pits and pockmarks on the surfaces of some of the shales bear record of hailstorms. All this argues a fairly dry though not necessarily arid region, visited by occasional though short-lived periods of rainfall, followed by "fair and warmer." The droughtiness of the ancient climate is also argued from the character of the leaves. Though most of these are fernlike, they are severely simple in outline, lacking the fine feathery subdivisions that mark such leaves when they grow in a moist climate. Many of them are fuzzy and their stems are covered with scales or fine spines, suggestive of desert growth. Some of them have thickened blades, and at least one species appears to have had the habit of curling into quills when it dried. All these characters earmark the plants of dry-air habitats.

Besides the fernlike plants, there are several curious forms of branches with twigs of stunted coniferous trees. All the different kinds found in the deposits became extinct many millions of years ago. Some of the genera and species have never been found in any other region.

With the remains of plants are associated wings of insects, trails of worms and large numbers of remarkably distinct footprints of different primitive amphibia, suggestive of the living "mud-puppy" and of reptiles. Some of the footprints are of rather large size; others are very small and delicate.

In naming his new species and genera, Dr. White has given recognition to local place-names and to persons associated with the Grand Canyon. The principal new genus is a seed-fern which he has called *Supaia,* from Supai, an old Indian name which has been applied to one of the rock formations in the Canyon wall. One species of this new genus has been named *Supaia merriami* in honor of Dr. John C. Merriam, president of the Carnegie Institution of Washington, and another has been called *Supaia sturdevantii,* in memory of a former park naturalist who was drowned in the river while on an exploring trip through the Canyon.

Two other new genera have been named *Yakia,* from an Indian place-name, and *Eltovaria,* in memory of a Spanish explorer of the Southwest. An animal genus of uncertain connection Dr. White has named *Scoyenia,* after Aven Scoyen, formerly chief of the ranger force in Grand Canyon National Park.

NATURE OF THE ZODIACAL LIGHT

STREAMING out from the earth on the side away from the sun there may be a sort of comet-like tail, which we sometimes see as a faint patch of light called the "Gegenschein" or "counter-glow." This is the suggestion just made by Dr. E. O. Hulburt, of the Naval Research Laboratory, in a report to the American Physical Society, on the nature of the zodiacal light.

This light can usually be seen on a dark, clear night after twilight has gone. It appears as a faint beam of light extending upward from the western horizon along the ecliptic, the path of the planets. In the spring, when the ecliptic is almost vertical in the evening, it can best be observed. Near the horizon it is brighter than the Milky Way. In the early morning, before dawn, it can also be seen, extending upwards in the eastern sky. The generally accepted theory of its origin, in recent years, has been that it is caused by sunlight reflected from a mass of tiny bodies, each moving in its own orbit around the sun. The "Gegenschein," seen in a dark night sky as a faint patch of light directly opposite the sun, was supposed to be due to a concentration of these small particles about a million miles from the earth on a line with the sun and the earth, as a result of the gravitational attraction of these two bodies.

Dr. Hulburt, however, revives an old theory, that the particles originate in the earth's own atmosphere. He points out that outbursts on the sun, which give rise to magnetic storms and displays of the northern lights, also affect the zodiacal light. On this account, he suggests, it seems as if the zodiacal light is not mere reflected sunlight, but that the particles themselves first absorb the light, and then re-emit it. Physically, this is quite a different process from reflection. According to Dr. Hulburt, collisions of atoms and molecules high in the earth's atmosphere cause some to be ejected from the influence of the earth with a speed of about seven miles a second. They reach levels of some 40,000 miles above the surface of the earth where they are partly broken into ions by the action of the sun's ultra-violet light. Here they are acted upon by three forces: the gravitational attraction of the earth, the magnetic attraction of the earth and the pressure of light from the sun. This arranges them into a ring, oblong in cross-section, surrounding the earth. It is this ring that gives off the zodiacal light, suggests the physicist.

The ring is perhaps 50,000 kilometers (31,000 miles) distant on the daylight side of the earth. On the night side the ring stretches out to great distances of 100,000 or 1,000,000 kilometers (62,000 or 620,000 miles). At its far end ions continually stream away in the direction of the sun's rays, so that the ring merges into a sort of comet's tail which may be the Gegenschein.

At the rate at which the atoms would escape from the earth, Dr. Hulburt estimates that about a millionth of the atmosphere would be ejected in a million years. He points out that one point which his theory does not explain is that about 15 per cent. of the zodiacal light is polarized, that is, the light vibrations are only in certain particular directions, instead of being indiscriminately in all directions, as in ordinary sunlight.

ARCHEOLOGICAL SURVEYS BY AIRPLANE

AN elaborate system of canals built by Indian engineers somewhere about 1200 A. D., and now almost entirely lost to view, has been successfully mapped by the penetrating eye of the airplane camera. The mosaic map of what might be called invisible ruins was made from a U. S. Army plane and by an army photographer. Neil M. Judd, archeologist of the U. S. National Museum, supervised the aerial survey over the Gila and Salt River Valleys, in Arizona.

Preliminary reports from the army officers reassure Mr. Judd that the photographs achieved their purpose, though the work of developing and arranging the negatives is not complete. The pictures were taken from an altitude of about two miles.

The magic ability of airplane photography to bring back into existence the plans of vanished buildings surprised the people of England when Major O. G. S. Crawford showed that his air pictures could record the plans of Roman towns and fortresses long since plowed over. Now, Mr. Judd has shown that the same magic works for America's prehistory.

Only forty years ago, the lines of 400 miles of the prehistoric canals and laterals could be seen in central Arizona. Now, not more than 40 miles of this remarkable engineering work can be observed from the ground. The land which the Pueblo Indians irrigated so that they could raise their corn, beans and squashes is now green with alfalfa, citrus and date groves, fields of lettuce and cotton. The Coolidge Dam stores water for much of this farming.

The plan to study the Indians' system of irrigating this region was proposed by Senator Carl Hayden, of

Arizona. Last summer Senator Hayden noticed that where Indian reservation land was being prepared for irrigation the workmen were pulling up cactus, mesquite and other growth at the rate of twenty acres a day and filling in the ancient canals. He felt that some record of the old American engineering should be quickly made.

In many cases an airplane observer 2,000 feet up can see with his own eyes the course of the old canals. Describing these observations and his study on the ground, Mr. Judd stated that the engineering of the Indians was sound. Their ideas were so sound indeed that many of the modern canals of the region, dug with steam shovels, have followed the same contours and approximately the same gradient. The Indians had to dig their canals with nothing better than stone tools and sticks. The loosened material was carried off in baskets. They had no metal, no beasts of burden.

Both the Pueblos and modern engineers have followed the same course of constructing canals and later abandoning them in favor of new ones, Mr. Judd explained. From the air it was possible to find points where one of the early Indian canals was cut across by a later one.

White settlers who first went into the Southwest made good use of the Indian engineering plans. One Mormon group which settled near the town of Mesa in the eighteen-seventies dug a canal in one of the courses set by Indians many centuries before, and a part of that canal is in use to-day.

ITEMS

THE almost inaccessible natural bridge high up on the side of Bridge Mountain in Zion National Park may soon be within reach of the hardy hiker as a result of a successful climb to the top of the bridge by three men, Superintendent E. T. Scoyen, of the park; Chief Ranger D. J. Jolley, and Ranger A. G. Schiefer. The main purpose of the trip was to study the practicability of building a foot trail to the bridge site. It was found that such a trail can be constructed, but even under the best of conditions the trip will always remain one to be undertaken only by the more venturesome and hardy.

THE largest fish hatchery in the world is now under construction near Lonoke, Arkansas, according to the Arkansas Game and Fish Commission. The hatchery, a state project, is being built under the supervision of Del Brown, in charge of the U. S. Bureau of Fisheries station at Mammoth Springs, Arkansas, who has been lent to the state for the undertaking. This record-breaking hatchery will include 244 acres of ponds and will be devoted to the propagation of the warm-water nest-building fishes such as bass and bream.

YEAST that has had its chance to absorb the ultra-violet rays of sunlight has proved effective in keeping young chicks free from the disabling and often fatal disease of leg weakness, in experiments performed at the University of Wisconsin by Dr. Harry Steenbock, Dr. J. G. Halpin and Dr. G. E. Holmes. This disease, which is really a form of rickets, has been combated in the past by giving the chicks doses of cod-liver oil, but it is pointed out that irradiated yeast is cheaper, easier to mix with the ration, and less likely to leave undesirable flavors in the flesh of the young fowls.

JUST as crushed rock is mixed into concrete, so small pieces of limestone are added to molten bearing metal to form a conglomerate which is in successful use on tramcars in Germany. The theory of this revolutionary procedure is that the limestone acts as a sponge and absorbs the oil.

A NEW fossil species of ape, quite unlike any now in existence, has been turned up out of the marly soil of southern France, at Sénèze, in the department of Haut-Loire. The animal is represented by a skull in fairly good condition, with the lower jawbone and almost all of the teeth still intact. Professor Charles Depéret, of the University of Lyons, who has made a study of the skull, states that the animal was an old female. The skull has a length of seven and a quarter inches over all, and the width over the cheek arches, one of which is now broken, was about four and one half inches. The skull is remarkable for the great protrusion of the face, which almost parallels that of the modern baboons. Professor Depéret does not contend that the creature was an ancestor of the baboons, but cites the development of face and jaw as a case of "convergent evolution." In other respects the skull offers some suggestions of the snouted monkeys of Asia. Professor Depéret has named the new species *Dolichopithecus arvernensis.*

SUNSHINE and cloud, rain and snow, heat and cold, or humidity will not interfere with the work of the president of the United States and his staff upon the completion of the remodeling of the presidential offices in the White House's west wing, ravaged by fire on Christmas eve. Air-conditioning apparatus will refrigerate the air in summer, heat it in winter and keep its relative humidity at 50 per cent., most comfortable at all seasons. The outside air will be filtered and washed and admitted to the building through one inlet with all windows kept closed at all seasons. Ideal lighting is being designed for all offices and special attention will be given to President Hoover's own office and the Cabinet room, in which the lighting has not heretofore been considered adequate.

TURKEY-LIKE birds once nested in the region now occupied by the city of Los Angeles, California. This fact has been brought to light in the course of a review of the Ice Age birds of Rancho La Brea tar pits in the collections of the Los Angeles Museum. The review was undertaken by Dr. Hildegarde Howard, of the museum, for the purpose of establishing a census of the birds of the region. It was found that of about 500 individuals of the extinct, turkey-like bird, *Parapavo,* represented in these collections, more than 150 were young birds, many of them only chicks.