

National Academy Meeting Draws Science Leaders

Below are reported some of the important papers presented at the annual meeting of the National Academy of Sciences, which took place in Washington, April 25-27.

"Athens of Southwest"

Pueblo Bonito, four-story apartment house settlement in New Mexico, was the Athens of the Southwest 1,000 years ago. The artistry and skill of the Indians who made this masterpiece of primitive civil engineering were described before the National Academy of Sciences by Neil M. Judd, curator of American archæology at the U. S. National Museum, who has directed excavations at Pueblo Bonito during the past six years.

The excavations, which have been conducted under the auspices of the National Geographic Society, have revealed that this unique Indian city went through four major periods of building activity, and two distinct groups of similar yet unrelated Indians were responsible for the prodigious construction projects, Mr. Judd said.

"Those of the first group," he said, "dwelt for several generations in their moon-shaped pueblo before the second group arrived, presumably by invitation, and introduced superior architectural and cultural practices that quickly won for Pueblo Bonito preeminence among all contemporaneous villages north of Mexico. All archæological evidence shows these two Indian peoples to have been entirely distinct and independent from each other. And yet they dwelt side by side and lived the same sort of life in the same terraced town."

The first residents of the community were conservatives and built small low-ceiled rooms with rough sandstone slabs, adding on rooms as their families increased without any plan for regularity or design. The second group which came into the community set to work to build orderly dwellings, with the skill of master craftsmen, though they had no metal tools, no beasts of burden.

The newcomers first erected dwellings of hand-dressed stone, Mr. Judd explained, and filled the spaces between the stones with small chips or spalls. Later, however, they evolved a more artistic masonry by laying the large dressed blocks in horizontal bands. And, finally, they found that laminate sandstone with uniform, natural cleavage required much less reshaping, and yet made

more secure, equally attractive walls than did the softer, irregular blocks, which must be squared with stone hammers before placement.

While the late comers developed three outstanding types of masonry the old original settlers continued to build in the crude and more hazardous fashion of piling up stones, bequeathed to them by their ancestors.

Pueblo Bonito had nearly 800 rooms and sheltered between 1,200 and 1,500 individuals, Mr. Judd states. Archæological evidence points to its abandonment approximately 1000 years ago.

The past season's work at the prehistoric pueblo centered chiefly on the architecture of the structure. Mr. Judd expects to return to Pueblo Bonito within a few weeks, in order to complete his reports of the project.

Moon Lacks Common Rock

What the moon is made of, favorite mystery ever since the days when it was supposed to be made of green cheese, is more nearly being answered than ever before. The studies of Dr. F. E. Wright, of the Geophysical Laboratory of the Carnegie Institution of Washington, which he described at the meeting indicate that the surface of the moon consists of such rock as pumice and granite, with no basalt.

Dr. Wright is a member of a joint committee of astronomers, geologists, and geophysicists of the Carnegie Institution of Washington, that is investigating the moon. His study was made by the use of polarized light. Ordinary light waves vibrate up and down and left and right and in all possible combinations of these directions, but when passed through a special prism, or reflected at certain angles, are reduced to vibrations in a single plane. This is called polarized light.

Unlike direct sunlight, the light from the moon is partly polarized by reflection on the moon's surface, and by determining the degree of polarization, it is possible to learn something of the nature of the reflecting surface.

At different phases of the moon, the light is reflected to the earth at different angles, and by comparing with it the polarization of light reflected from earthly rock surfaces, Dr. Wright has found that rocks containing large amounts of silica,

such as pumice, granite, quartz-porphry, as well as sulphur and powders of transparent substances, polarize light reflected from their surfaces much in the same way as the moon does. But basalt, a rock due to volcanic causes, affects the light quite differently.

At best, however, says Dr. Wright, the amount of polarized light reflected from the moon is very slight, and at new moon and full moon is practically absent.

Grand Canyon Yields Fossils

The fossil-bearing rocks of the Grand Canyon, which have recently aroused much interest because of the discovery in them of footprints of long-extinct animals, are now yielding remains of the leaves and stems of plants among which these animals roamed and fed, many millions of years ago. Dr. David White, of the U. S. Geological Survey, told of his examination and identification of many specimens from this region.

The plants that grew on the ancient floodplain of red sand through which the great gash of the Grand Canyon has since been cut were very little like the ones that grow in the forests of today. Their nearest relatives still living are the ferns and the tropical cycads and similar plants.

The plant remains were all preserved by being deposited at the bottoms of streams or ponds, but there is evidence, says Dr. White, that these bodies of water were not permanent, but appeared during rainy seasons and dried up when the rains ceased, just as most of the streams and ponds in the arid Southwest do to this day. Pressed between thin layers of water-deposited sand that gradually hardened into strata of sandstone, the leaf and stem fragments were preserved like botanical specimens in a huge book, and even after their own substance had gradually decayed and almost wholly vanished, their imprints were left on the stone just as the print of a pressed flower is sometimes left between the pages of an old volume, shelved many years ago and never opened.

The knowledge gained by scientists about the ancient animals of the Grand Canyon region was summarized and brought down to date by Dr. Charles W. Gilmore of the

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U. S. National Museum. Footprints of extinct reptiles and amphibians have been found in three distinct formations, he told his fellow-scientists. These are known respectively as the Coconino, Hermit and Supai formations. Thirty-three species were represented by tracks in these three levels, 22 species in the Coconino, 8 in the Hermit formation, which also yielded all the plant fossils studied by Dr. White, and 3 species of animals in the Supai. Remains of insects were found for the first time in the Hermit formation. More than two tons of stone slabs bearing fossil footprints are now in the U. S. National Museum.

"Death Whisper's" Tricks

"Death whisper" waves of sound of such high frequency that they can not be heard, though they are capable of killing small animals and of breaking down the corpuscles of blood, have been put through some strange new antics by Prof. R. W. Wood of the Johns Hopkins University and A. L. Loomis, of Tuxedo Park, N. Y., at the latter's private laboratory. The newest experiments of the two investigators were reported by Prof. Wood, before the annual meeting of the National Academy of Sciences.

These rays of inaudible sound waves are produced from slices of quartz crystal, driven by oscillating electric currents of frequencies of around 500,000 a second. They travel through any liquid or solid object and heat it as they go, but do not come out into the air. Blood corpuscles in a physiological salt solution are broken down, tingeing the whole body of the fluid a clear red; but if a tiny particle of gelatin—half a per cent or less—is added it somehow protects the corpuscles and they are not broken.

If a block of artificially frozen ice is subjected to their action, the waves have no apparent effect on it until it is placed under pressure, when it at once breaks into a mass of tiny crystals. But a piece of pond ice, frozen under different conditions, resisted the waves and did not crumble. Prof. Wood has no explanation to offer, as yet, for this difference in behavior. Finely powdered solids, stirred up in water to make a suspension, are driven together by the waves, until they form a closely packed round mass just under the surface.

Things that can not ordinarily be mixed with water, like oil, paraffin and mercury, are forced by the vibrations to become exceedingly fine suspensions or emulsions. A paraffin candle was floated on water and the current turned on. The wax melted from the surface and came down into the liquid in the form of a cloud of microscopic white drops, forming a veritable paraffin milk that could not be distinguished in appearance from real milk. In another experiment, a little mercury was poured on the bottom of the beaker full of water. The waves broke it up into drops so small that they could just be seen with the highest power of the microscope, scattered evenly through the water in a dense cloud. This mercury-water emulsion was as black as ink. Prof. Wood believes that a possible future application of this newly discovered power of the "death whisper" may be to create emulsions out of combinations of liquids that can not be forced to mix in any other way.

Weight Lost in Breath

The loss in weight that we all undergo every day, mostly water given off through the skin and lungs, has been the object of research by Dr. Francis G. Benedict and Cornelia Gollay Benedict of the Carnegie Institution of Washington, who reported at the meeting. Two sensitive balances were used in the work. Both were strong enough to sustain the weight of a man, but sensitive enough to register small changes in weight. One of the balances would indicate a change of one-third of an ounce, and was so constructed that the volunteer for the experiment could sleep all night on its platform. The other was a hundred times as sensitive, but could be occupied for only an hour or so at a stretch.

The total moisture losses of this class from a woman of average weight were found to average around 30 grams, or one ounce, per hour; for a man the figure was about one-third higher. An auxiliary device permitted the separate measurement of losses from the lungs and skin, and while these varied among individuals and from time to time in the same individual, they averaged 50 per cent. from each source of water loss. Other ingenious mechanisms measured the carbon dioxide given off, the percentage of water in the outgoing breath, and also its temperature.

Measures Tiny Temperature

Using an electrical heat-measuring device so incredibly delicate that it is sensitive to two trillionths of an ampere of current and will measure temperature changes of as little as one ten-millionth of a degree Centigrade, Dr. A. V. Hill of the Cornell University has measured the temperature changes in nerve fibers during their activity. In describing his experiments before the academy he stated that his object had been to learn more about the nature of nervous action. Older theories have held that nervous impulses were not like other physiological processes, but were physical waves like light or radio waves. These ideas were based on the absence of any detectable heat given off by nerves as a result of stimulation. But with the extremely sensitive instrument devised by Dr. Hill it is possible to measure the almost vanishingly minute temperature rise that occurs in a single nerve fiber when it is caused to react. The moment of activity of a nerve is followed by a prolonged period of recovery, during which nine times the initial amount of heat is given off.

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It is said that certain kinds of bacteria convert fertile soils into alkali wastes.

Motor bus routes in the United States now cover a greater mileage than railroads.

The hottest stars probably reach a temperature as high as 40,000 degrees Fahrenheit.

Ruins of the buried city of Pompeii were discovered in 1748 by peasants digging in a field.

An exhibition of cooking gas was given at the Centennial Exposition in Philadelphia in 1876.

The warlike Amazon ants make raids on brown ant colonies and capture slaves to wait on them.

Census figures show that in 1925 almost 24,000,000 radio tubes were manufactured, as compared with about 4,600,000 in 1923.

Ancient astronomers named the stars and constellations, but the clouds were first named and classified by an Englishman in 1803.