SCIENCE NEWS

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GRANITE FROM SANDSTONE AND SHALE

ROCKS that were originally sandstones, limestones and slates have been found mysteriously changed by nature into granite. This is a most surprising phenomenon, since geologists heretofore have classed granite as a type of igneous rock that developed from a molten mass of material formed at considerable distances below the earth's surface.

Dr. G. H. Anderson, research geologist of the California Institute of Technology, made this discovery in the Inyo Mountains of California, during a study of the rock material composing the core of the range.

Batholiths, essentially masses of igneous rock, are common to almost every mountain range and invariably are composed of granitic rock. Rising from the depths of the earth, the molten batholithic material engulfs and melts rocks in its path, but solidifies before reaching the surface. Other dynamic forces produce shears or faulting in the crust and eventually uplift a tremendous rock mass, forming the mountain with the batholith as its core.

In the Inyo Mountains, during pre-Cambrian time, over 500,000,000 years ago, sedimentary rocks were being deposited in a sea that occupied the present position of the range. Since the recession of the sea and the present development of the mountains, certain chemical substances in solution, emanating from a batholith in the earth's interior, caused alterations and replacements in the sediments, making them virtually indistinguishable from a true granite.

Some of the striking features upon which Dr. Anderson based his conclusions are the preservation of the apparent bedding of the original sediments, the sedimentary relics found in the transposed granite, and the gradation of remnant sedimentary material into the granite. Numerous chemical analyses of different samples of the granite combined with petrographic studies substantiated Dr. Anderson's discovery.

GOVERNMENT SURVEY AS PART OF THE EMPLOYMENT PROGRAM

THE tall steel towers now conspicuous on the landscape in many parts of the United States are units in a great network of such towers that will eventually cover the whole United States so closely that no point will be more than twelve and a half miles from such a station.

They are being used by the U. S. Coast and Geodetic Survey in making control surveys of the land. The primary purpose of the present plan is to give work to unemployed men, but the more ultimate aim is an exact knowledge of the lay of the land that will determine boundaries of private properties and political units with more certainty, preventing much costly litigation.

The towers are temporary structures. Although they may be 100 feet or more high, they are put up in only about three hours, and may be dismantled with equal speed and facility to move on to the next point where a triangulation station is needed.

Each is a double structure, the outer portion, supporting the observer's platform and a light, being without any contact with the inner tower on which the surveying instrument is placed. Thus the precise instrument is kept from any jarring with the movements of the observer.

The triangulation method of surveying is based upon the scientific principle that if one side of a triangle and its angles are known, the remaining sides can be computed mathematically. The tall towers are erected to enable the surveyors to make observations from one corner of a triangle to another, possibly 25 miles away. Where mountains or hilltops are available, these are used to cut down the height necessary for the tower, but in flat wooded land it is sometimes necessary to build them as much as 120 feet tall.

Each tower is equipped at its top with a light which is observed at other towers. The angles of the triangle marked off by the lights are measured precisely with a scientific instrument, the theodolite.

By this system, it is possible to measure the distance between two points so accurately that the error will probably be less than five feet in a distance of one hundred miles.

ALTITUDE FLYING AND IMPROVED WEATHER FORECASTING

CLIMBING to altitudes of over three miles, Army, Navy and commercial pilots for the U. S. Weather Bureau will now carry instruments aloft with them each day from twenty different airports, on vertical hops to record conditions in the higher air and give weather experts increased data on which to base their forecasts.

For the past two or three years commercial pilots have been making observations daily above the clouds, but up until the beginning of July, mass analyses of the upper air have not been conducted on a large scale.

Each observation pilot has attached to the wing of his plane a meteorograph, an instrument which automatically records humidity, temperature and pressure. These are the three R's in the science of predicting the waves, eddies and cross currents of that turbulent sea, the atmosphere. In addition, the pilot notes the altitudes of the top and bottom of cloud banks, the positions and altitudes of rainstorms which pelt down into dry strata of air and never reach the ground, and local disturbances such as thunderstorms or dust clouds. Pilot balloons sent up from the ground and watched through precise telescopic instruments furnish a method of finding accurately the direction and speed of different layers of air as the small, gas-filled spheres rise through them.

The use of airplanes furnishes a striking contrast to the methods of thirty years ago; the principle, however, is the same. In the days when flying was still a matter for conjecture as to its possibility, large box kites were used. These were about eight feet long and rose to altitudes of 10,000 to 18,000 feet, carrying instruments with them. They were primitive from the viewpoint of scien-

tific precision, and dangerous when they broke loose and trailed their piano-wire kite strings along the ground.

Of the many services, regional and national, which the U. S. Weather Bureau accomplishes, Dr. C. C. Clark, acting chief, considers that the use of extensive airplane observations at high altitudes will be most important to commercial and military air travel. Pilots will know more definitely what lies ahead; they will know whether they can climb to a desired altitude without encountering a snow squall or head wind, or whether danger lies before them.

A SIDEROSTAT TELESCOPE

WHEN Gustavus Wynne Cook, banker, manufacturer and amateur astronomer of Philadelphia, wishes to observe the stars next winter from his private observatory at Wynnewood, he will not have to do it from a cold observatory, where the temperature inside and out must be the same.

From a steam-heated room he will use a telescope projecting horizontally in through one wall, and by means of remote electrical controls he will operate a 25-inch diameter mirror outside which will reflect the star light into the 15-inch lens of the telescope. A series of dials, electrically connected to the mirror, will enable him to tell where it points, and to set it accurately to any astronomical body within reach. An accurately adjusted electric motor, operating in a manner similar to the electric clocks that one attaches to the lighting circuit, will keep the mirror moving steadily. Thus it will compensate for the earth's turning, and will remain pointed to the star.

This is called a siderostat telescope, and it is believed to be the first of its kind in the United States. It is now reaching completion in the telescope works of J. W. Fecker, in Pittsburgh, and it will be installed within the next few weeks. Already Mr. Cook has several other instruments, including two special telescopes for the study of the sun and a 28½-inch reflecting telescope. This instrument is now in regular use in cooperation with the Sproul Observatory of Swarthmore College. It is being used with a spectroscope in a research program measuring the speeds at which the stars are moving towards or away from the solar system.

FAST-SWIMMING SEA ANIMALS

IF marine engineers really wanted to increase the speed of great ocean liners they would put the ship's propeller in the bow and make it act as a "puller" instead of a "pusher" as now used. This is the verdict of Dr. Heinz Judis, after a study of the methods of movement in fast-swimming sea animals like the penguins, dolphins, seals and sharks.

All these animals, which gain remarkable speed in spite of comparatively small effort, have two sets of "propellers" which are the fins in front and rear. But in fast swimming only the forward fins are employed for straight-ahead motion. The tail fin serves mainly for steering.

A ship produces a bow wave, a resonance wave, and a system of stern waves. At high speeds these complicated wave systems constitute the major part of the total resistance. Every propeller, and so also a penguin's wings, according to Dr. Judis, produces a system of waves. But when a penguin is swimming fast, the waves produced by the wings cancel the bow waves so that the animal saves nearly the whole of this resistance.

Towing tests on a dead penguin made at the Berlin Institute of Shipbuilding Research showed that the resistance decreased the moment that the water began to flow over the shoulders of the animal, and the bow wave then almost disappeared.

Dr. Judis equipped a boat with fins and a mechanism by which the combined flapping and feathering motion of a penguin's wings could be simulated. The wooden fins were of necessity stiff, whereas they should have been flexible. But despite this defect the results exceeded expectations. The boat propelled by two men made 2.8 to 3.7 miles per hour.

For comparison, the boat was also equipped with paddles, and was driven in each case at 6.2 miles per hour. Photographs showed that with the paddles strong bow waves were developed, but with the fins they were almost entirely absent.

ACID SEEPAGE FROM COAL MINES

LIKE plugging rat-holes to prevent disease contagion, it has been found necessary to stop up the entrance to over 1,200 abandoned West Virginia coal mines to prevent the formation of dangerous amounts of sulphuric acid in seepage water far underground.

A recent report to the editors of *The Engineering News Record* states that the concentration of sulphuric acid in the small streams and rivers of that region has been found sufficiently great to menace the public health. The task of plugging over 4,200 mine openings with heavy walls of stone and concrete has been undertaken as a CWA project under the direction of the U. S. Public Health Service.

Engineers of the U. S. Bureau of Mines estimate that from one to three years will be required to bring river water back to normal conditions, although favorable results have been observed from more than 1,200 mine entrances already closed.

Chemically the reaction that forms sulphuric acid in the depths of the earth is quite simple. In most coal regions iron sulphide, commonly known as pyrites, is present in small quantities. This reacts with the oxygen in the air to form sulphuric acid in the seepage water. By hermetically sealing up all possible entrances the reaction is lessened.

Engineers investigated the presence of this powerful acid in river water when a high mortality of fishes in the locality was first noticed. Later it was found that the acid was in some cases sufficiently concentrated to corrode iron boats and metal parts of canal locks near the source of seepage.

DISTEMPER AND INFLUENZA

POSSIBILITY that the virus causing dog distemper may provide man with a new weapon against influenza appears in a report of Drs. Adolph Eichhorn and Norman J. Pyle, veterinarians of Pearl River, New York, to the American Medical Association.

Drs. Eichhorn and Pyle found that the virus of human influenza apparently makes ferrets immune to attacks of dog distemper. Their investigations suggest that the two diseases, influenza in man and distemper in dogs, are related somewhat as smallpox in man is related to the bovine disease, cowpox.

Vaccination of human beings against smallpox depends on this relation. Smallpox vaccine is made from the virus of cowpox. If distemper and influenza prove actually to be related, scientists may be able to develop from the distemper virus a vaccine that will protect against influenza. So far no successful vaccine against influenza has been developed. Drs. Eichhorn and Pyle are now working on experiments to determine the possibilities of producing such a vaccine from the dog distemper virus.

Their work so far has been confined to ferrets and their discovery that influenza protects these animals against distemper was made accidentally. They had been using ferrets for routine tests of canine distemper virus, when they decided to study an influenza virus obtained from human cases of the disease by the British investigators, Wilson Smith, C. H. Andrews and P. P. Laidlaw. The virus produced influenza in ferrets, just as the British investigators had reported. It was, however, a surprise to find that the ferrets after recovering from an attack of influenza were immune to the distemper virus given for the routine tests of the latter.

Claims have been made before now that influenza and distemper are related; but so far no definite proof has been presented of the identity or relationship of these viruses. Drs. Eichhorn and Pyle believe that their experiments strongly point to such a relationship.

THE CAUSE OF ALLERGIC DISORDERS

A NEW theory of the cause of hay fever and similar allergic disorders was presented to the recent meeting of the American Medical Association by Dr. Reuben L. Kahn, of the University of Michigan. As Dr. Kahn sees it, these diseases are not due to a special sensitiveness of certain persons to the pollens or other offending substances. Instead it is due to overactivity of the defensive forces of these persons' bodies which protect them against invading disease germs.

It may be that in some persons these defensive forces become over-zealous about guarding against foreign invaders of a protein nature. They may fail to distinguish between harmful invaders like the pneumonia germ and innocuous substances like plant pollens and horse dander.

The body tissues respond to invaders by a complicated process, the first step in which is an anchoring of the invader at the point of entry. The second step in the process is an attempt to kill the enemy on the spot; this is a process of inflammation which may be very uncomfortable for the individual being protected.

The sneezing, nose-running and eye-watering of the hay fever sufferer may be such an inflammatory process. The consequent discomfort may be a necessary evil in overcoming a cold or similar infection of nose or throat, but it is an unnecessary evil in the case of hay fever.

The fact that many persons inhale the same plant pollens without ill effect seems to show that in themselves they are not harmful and that the symptoms they sometimes cause result from a mistake by the tissue guardians of the body.

The mistake, Dr. Kahn suggests, is the result of modern living conditions. Enclosed homes and large group contacts in the office, factory, classroom and theater may lead to over-stimulation, particularly of the defensive forces in the nose and throat, by constant bombardment with disease germs.

ITEMS

BATHING rheumatic joints of hands, feet, wrists and ankles in hot paraffin is a valuable means of treating these conditions in arthritic patients, Dr. Bernard Langdon Wyatt, of Tucson, Arizona, has reported to the American Congress of Physical Therapy. The paraffin bath enables the physician to apply greater heat to the painful, crippled joints than is possible with solutions, packs, foments, oils or radiant heat, Dr. Wyatt explained. The reason seems to be because a tiny insulating space forms between the patient's skin and the inner layer of the paraffin coating which he gets over his hands or feet when the paraffin bath is used according to Dr. Wyatt's method. The insulating space helps the patient to endure very high temperatures. The high temperature causes an increased supply of blood to the affected part which relieves the pain and stiffness and enables the patient to move his joints more freely.

COD-LIVER oil, best known for its ability to prevent or cure rickets in children and to hasten their slow convalescence from infectious diseases, has found a new use as a dressing for wounds. This new use for the familiar oil was discovered by Professor Löhr as a result of three years of experimenting with thousands of cases at a hospital in Magdeburg. Combined with other fats to make a semi-solid ointment, cod-liver oil speeds up the healing of wounds, apparently giving just that fillip that makes all the difference between sluggish and quick recovery. Whether or not the speedier healing is a result of the high concentration of vitamins A and D in the oil Professor Löhr does not know, though he considers it a possibility. He says the new ointment is no panacea and should not be used indiscriminately. He uses it in selected cases, pasting on to wounds, sores and ulcers a layer so thick that the overlying dressings do not come into contact with the raw, tender surfaces of the wound, thus eliminating pain when the dressings are changed.

POSSIBLE existence of another hitherto unknown vitamin, with ability to prevent hemorrhage, is seen in experiments just reported by H. Dam of the Biochemical Institute of the University of Copenhagen. Chicks fed an experimental diet developed a disease very much like scurvy, the chief feature being extensive internal hemorrhages, Mr. Dam reported in a note to the British scientific journal, *Nature*. Large doses of anti-scurvy vitamin C in the form of lemon juice and ascorbic acid did not have any effect on the disease. But a diet consisting entirely of cereals or seeds plus salts prevented the occurrence of the hemorrhages. "The cause of the disease," concluded Mr. Dam, "must therefore be a deficiency in an antihemorrhagic factor different from vitamin C and occurring in cereals and seeds."