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BALLOONS AT HIGH ALTITUDES

PROFESSOR AUGUSTE PICCARD and Dr. Charles Kipfer, who have gone up to a height of over 50,000 feet, have been more fortunate as well as more successful than previous balloonists, many of whom have been martyrs to the conquest of the atmosphere.

The record balloon ascent in November, 1927, by Captain Hawthorne C. Gray, of the U. S. Army, ended fatally for him. After several previous narrow escapes, Captain Gray reached 43,000 feet but, accidentally cutting his oxygen tube, died from suffocation before reaching the ground at Sparta, Tennessee. On a previous ascent he lost consciousness only to find himself falling at about a thousand feet per minute. Throwing ballast overboard frantically he fortunately landed on some telegraph wires without harm. On another occasion he had to use a parachute to save his life.

The record for heavier-than-air machines is about the same figure. A height of 43,168 feet was reached by Lieutenant Apollo Soucek, of the U. S. Navy.

A new method for finding high altitudes and a record for two men was the outcome of a more recent and fortunate flight with an airplane, piloted by Captain St. Clair Street, of the Army Air Corps. Photographs of Dayton, Ohio, were taken from this machine by Captain Albert W. Stevens at a height of 40,000 feet.

Lightning, another hazard of high-flying balloons which depend on inflammable hydrogen instead of the helium such as used in the airship *Los Angeles*, caused the deaths of Dr. C. L. Meisinger, of the U. S. Weather Bureau, and Lieutenant J. T. Neeley, of the Army Air Service, in 1924, over central Illinois. In making a series of balloon flights to learn the behavior of storms at great heights, Dr. Meisinger and Lieutenant Neeley were finally the victims of a thunderstorm which set fire to their balloon, an accident they had feared but had luckily escaped in previous ascents. The height reached by the Piccard balloon is only half as high as the 20 miles reached by small pilot balloons carrying no persons.

There is some doubt as to whether anything of value will be added to our knowledge of cosmic rays as a result of his flight as has been claimed. In 1922 Dr. Robert A. Millikan and Dr. I. S. Bowen, of the California Institute of Technology, sent their cosmic ray electroscopes to a height of nearly ten miles, slightly higher than the reported Piccard record.

The Piccard ascension is the first balloon flight in which a sealed cabin has been used.

Experts believe that the stratosphere explored by the aluminum sphere offers the best hope for fast-flying airplanes as the resistance of the air at these heights is very small. Such a plane with an airtight cabin is actually under construction at the Junkerswerke, near Dessau, Germany. The plane is to be used for experimental work on the conditions prevailing above six miles high as far as they will affect flying.

THE AURORA IN THE LABORATORY

THE aurora borealis has been reproduced in the laboratory. Recent experiments of Dr. Joseph Kaplan, physicist of the University of California at Los Angeles, have shown that the same peculiar light emanations which glow in polar atmospheric heights can be made by electric discharge in a glass tube. This discharge is passed through extremely rarefied nitrogen. Heretofore a number of shades of light emanation, represented by specific lines of the red and green spectrum, have been observed only in the aurora. Their source has been unknown, although the influence of nitrogen has been suspected.

Dr. Kaplan exhausts a borosilicate glass tube until it retains only one millionth of its normal air content. At such a high degree of exhaustion an electric potential of 25,000 volts is barely able to force through a luminous discharge. Such evacuation of itself is not novel; but in the recent experiments the process of discharge was continued intermittently for weeks, during which much of the scanty gas content of nitrogen and oxygen disappeared and was replaced from the outside. Finally the residual gas, largely nitrogen, gave forth the ruddy aurora glow. The exhibition improves with each day of operation.

It is suspected in the Los Angeles laboratory that some chemical change, as yet unknown, has occurred on the inside walls of the tube. This change, strangely enough, makes the discharge act as though the tube were not there. This is exactly what Dr. Kaplan wishes, inasmuch as he suspects that it is the presence of the unnatural glass wall that has interfered with artificial aurora phenomena in past experiments. This would favor the present plausible theory that the aurora results from natural electric discharge at great altitudes, perhaps one hundred miles or more. At such elevations the atmospheric pressure is much like that in the experimental tube, but of course minus the glass walls.

Accepting this theory, one would credit the aurora borealis to the emanations of nitrogen molecules "excited" by electric discharge to a condition of abnormal energy. Common glass surfaces in ordinary apparatus destroy this excitation and prevent observation of the phenomena.

THE CAUSE OF THE MEXICAN BLINDNESS EPIDEMIC

A MYSTERIOUS epidemic of blindness which apparently began in the heart of Chiapas, spreading to Guatemala and parts of Oaxaca, has been traced by Mexican Government scientists under Dr. Rafael Silva, of the Department of Health, to a simulid fly which transmits filaria organisms to those it stings. Both whites and Indians are attacked, and the disease is spreading.

The fly, two species, *Simulium ochraceum* and *Simulium mooseri*, is known as the buffalo or turkey gnat in

the United States. The disease, onchocercosis, is characterized by tumors, generally on the head, and an irritation of the eyes which prevents the patient from looking into the light or the sun, and in serious cases ends in blindness. In some of the worst affected areas of Oaxaca nearly all the adult population is afflicted and, in the entire Mexican region where the disease occurs, it is estimated that many thousands are affected.

When an infected simulid bites, small filaria pass through its proboscis into the blood of the victim, looking for a place to develop, forming cysts, generally in the the head. Here they become mature, laying eggs which hatch immediately. The new filaria invade the entire body, and attracted by light, enter the eyes, irritating the cornea and causing lesions which in serious cases causes blindness.

A person with cysts or tumors is a dangerous carrier of the disease. In the stomach of the simulid fly that bites him the filaria pass through a transformation similar to that of the malaria parasite in the gut of the mosquito. The filaria reaches a latent state and passes into the proboscis of the fly waiting to enter the blood of a victim.

A similar African disease, produced by the filarium *Onchocerca volvulus,* but not accompanied by blindness, is believed to be the forerunner of the American disease and to have been brought to America by negroes. The cysts are identical. The American variation in its effects is not understood, but is believed due to some racial differences.

The Mexican Health Department is preparing five brigades to go into the affected areas of tropical Mexico in 1931 to fight the spread of the disease. No chemical has yet been found that will kill the filaria, but by removing the cysts the parasites appear to be eliminated from the body in the course of fifteen months.

ACID TREATMENT OF ROCKS

ROCKS that can not be told apart as they are dug out of the ground can be made to disclose their ages and geological kinships by dissolving away most of their substances with hydrochloric acid and examining what is left under a low-power microscope. This method of geological analysis by insoluble residues has been developed by H. S. McQueen, of the Missouri Bureau of Geology and Mines, working under the direction of Dr. H. A. Buehler, state geologist.

The development of the method was brought about by the presence of quantities of limestone rock from deep wells and other borings. All the samples looked pretty much alike, though it was known that they must be of very different natures and geologic ages. The masking similarity was due to the presence of the limestone matrix itself, in which there were none of the fossil casts that are the usual dating-tags which the geologist commonly uses in identifying his finds. Following hints given by earlier workers on the same problem, Mr. McQueen undertook to get rid of the featureless limy matrix by dissolving it in hydrochloric acid, so that he might concentrate his study on the bits of stuff buried in it that are not soluble in the acid.

The method has worked to perfection, he reports. Each type of limestone, indistinguishable to ordinary examination, yields an insoluble residue of particles that is absolutely characteristic for that particular type and unlike the residues of other types. One limestone will have fine sand particles in it, another will contain coarser sand particles of a different color, or perhaps bits of shale, chert, or tiny round pebbles known as oolites, or minute fossil shells or casts.

A peculiar type of particles, whose existence has never before been reported, was found in some of the dolomites. These are thin walls of silica that have been built up around dolomite crystals, and when the latter are dissolved out by the acid a spongy or lace-like mass which shows the cast of the dolomite remains. Since these casts have the characteristic shape of such crystals, Mr. McQueen has given them the name "dolocasts." Dolomites from different beds have yielded different types of dolocasts upon treatment with acid, and these helped in their identification.

Mr. McQueen has found his method of value in guiding various kinds of economic enterprises dependent on geological knowledge, such as mining, oil-seeking and deep drilling for water. He has also run cross-section lines in several directions through the state of Missouri, adding materially to the general geological knowledge of the region.

LIP READING BY THE PARTIALLY DEAF

THE person whose hearing begins to fail should learn lip reading without delay, as an economic policy. This was the practical advice given recently by Dr. Wendell C. Phillips, of New York City, speaking before the annual meeting of the American Federation of Organizations for the Hard of Hearing.

The thrifty ideas of the economist can be applied to the field of partial deafness, Dr. Phillips believes, and can help to cut down the waste of human happiness and human productiveness among the deafened. It is not sound economics for the physician to advise the hard of hearing person to delay learning lip reading until deafness becomes advanced.

Among the economic advantages of learning to read the lips while hearing is only partially impaired, Dr. Phillips cited the following: The person who learns to supplement his defective hearing by use of his eyes reduces the strain on his nerves and thus improves his general health; lip reading is good training in alertness and use of the eyes; beginning lip reading early, when hearing has only begun to fail, means easier learning and therefore a smaller expenditure for instruction, so far as adults are concerned; in school children, learning to read the lips as soon as a defect in hearing is recognized will reduce the cost of education. The hard of hearing child who does not learn lip reading is seriously handicapped in school, and frequently has to repeat grades.

Knowledge of lip reading enables the hard of hearing person to have happier and more satisfactory social contacts, and so leads to an improved mental outlook on life.

THE SEVENTEEN YEAR "LOCUST"

No alarm need be felt over the advent of the 17-year "locust" brood of 1931, scheduled to appear in vast hordes during the last week of May in the region centering about the eastern two thirds of Ohio and comprising portions of Pennsylvania, West Virginia, one or two points in Virginia and the northeastern corner of Kentucky.

Wrongly confused with the grasshopper plague of Egypt, the 17-year "locust" is really a cicada and an almost harmless relative of the harvest fly, though it appears formidable because of the noise it makes and the great numbers in which it sometimes appears. Indeed, the crop danger is confined almost entirely to very young plants, such as nursery trees, and the total damage done, even by a record brood, is slight.

For this reason attempts to exterminate the 17-year "locust" are uncalled for, in the opinion of J. A. Hyslop, entomologist in charge of Insect Pest Survey of the Bureau of Entomology. Living for 17 years underground and hatching almost to the day, year in and year out, whether the season is warm, cold, wet or dry, the 17-year "locust" is a biological curiosity which should be preserved for the interest of future generations.

Study of these strange insects has already held the interest of scientists for about a century and they are able to forecast with a high degree of certainty the size and distribution of the brood which is due to appear by the history of the "locust" crop of 17 years ago.

This year's 17-year "locust" crop is designated as brood five in the series of 17 annual hatchings which occur in rotation. Not as large as brood 10, the brood of 1931 is, nevertheless, very numerous and well defined in the regions where it occurs. Its advent has been heralded by the appearance of numerous small holes in the ground from which the locust emerges.

Always appearing in the last week of May, the 17-year "locust" persists through June and disappears by the fourth of July. During the four or five weeks of their life above ground, the insects feed very seldom or not at all, depending on the reserves accumulated during their long underground life. Damage may be caused, however, when the females deposit their eggs in furrows cut into the green bark of young twigs. This causes a temporary defoliation of many trees, but no permanent harm in the forests. It does at times cause damage, however, in orchards and nurseries.

AIRPLANES FOR HIGH ALTITUDES

AIRPLANES flying at heights of over six miles, which can reach much higher speeds than existing machines are being constructed at the famous Junkerswerke at Dessau. Already the first airplane to be used for research in this work has been constructed with the assistance of the German Institute for research in air communication and the scientific Notgemeinschaft.

The mysterious guns of the German Army, bombarding Paris at a distance of 75 miles, were the first practical application of the decidedly lower resistance of the "stratosphere," that tenuous layer of the atmosphere lying above a height of six miles. The chief aim of the new machine is to reach high altitudes and to find paths which can be used as regular airplane trade routes. It is not built for high speed or long flights, since it is regarded as an experimental laboratory for the study of the special conditions prevailing in the stratosphere. High speed can easily be attained at these heights. Recording rockets and balloons have been previously used to explore the stratosphere.

The airplane is a Junkers metal deep-deck, single-motored machine of wing breadth 60 feet and weight 9,000 pounds. A small compressor keeps the air pressure normal for the lungs within the cabin, which is double-walled and airtight. Control of the motor and steering is done by levers in the cabin working in airtight shafts. The motor itself is of a special type and has an airpump to supply enough air from the thin air at these heights.

On the basis of experiments with this machine a new airpump will be designed for altitudes up to ten miles. A large installation of scientific instruments forms the equipment of the machine.

ITEMS

THE epidemics of scarlet fever and measles which have visited the country have reached their peaks, it appears from reports of state health officers to the U. S. Public Health Service. For the week ended May 23, there were 20,080 cases of measles and 4,727 cases of scarlet fever. This is a drop of about a thousand cases for each disease over the previous week's totals. The measles epidemic has been general over the entire United States, while the scarlet fever outbreak appears to have occurred largely in the Atlantic and East North Central groups of states. The most cases of scarlet fever were reported from Massachusetts, New York, New Jersey, Pennsylvania, Illinois and Michigan.

A SAFETY fuel for automobiles and airplanes that is as incombustible as Diesel oil and yet as powerful and as productive of engine performance as good aviation gasoline was demonstrated at Langley Field before the sixth annual aircraft engineering research conference of the National Advisory Committee for Aeronautics. The new liquid is being tested at the Langley Memorial Aeronautical Laboratory in a special single-cylinder engine. This new fuel, produced by one of the leading oil companies, by means of the new process of hydrogenation, has such a low flash point that a lighted match can be tossed into it without starting a fire. To use the new kind of fuel it is necessary to replace the conventional carburetor with an injection pump, but the explosive mixture within the engine cylinder is fired by electrical ignition rather than by compression as in the Diesel engine.