SCIENCE NEWS

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ARCTIC FLIGHT OF THE "GRAF ZEPPELIN"

SOUNDINGS of the water below and of the air above, with automatic radio-equipped balloons, will be part of the program of scientific observations to be made by the *Graf Zeppelin* when it flies over the North Polar regions next spring. The flight is to be made under the auspices of the International Society for Arctic Research by Aircraft, generally known as Aeroarctic.

Dr. Walter Bleistein, treasurer of Aeroarctic and secretary of its technical commission, has left Washington, D. C., to return to Germany. While in the United States he organized American cooperation. Dr. J. A. Fleming, acting director of the Department of Terrestrial Magnetism of the Carnegie Institution of Washington, is secretary of the American section of the society.

The first ocean soundings from a dirigible will be made as the *Graf* sails over open lanes in the ice, Dr. Bleistein told *Science Service*. This will be done with the sonic depth finder, which measures the time taken for a sound to reach the bottom of the ocean and be reflected back to a microphone that is part of the apparatus. The airship will not alight, but will lower the instruments on the end of a cable to the water surface. Electrical connections between the float carrying them and the airship will reveal the water depth at any point. While the soundings are being made the *Zeppelin* will be navigated to follow the lane.

Aerial study will be made by sending up small balloons, equipped with instruments for measuring atmospheric pressure, temperature and humidity. When such balloons are sent up from places in populated regions, the instruments are made to record the data. Usually they are found and returned to their source. As the Eskimos can not be depended on to return the balloons, this method can not be used, so the balloons will be equipped with small radio transmitters. They will automatically radio their observations back to the airship.

According to present plans, the expedition will start on April 1, from Tromsö, Norway, the European base, and is expected to take six weeks. After a preliminary flight to Spitsbergen, to acquaint the scientific staff with life on an airship, the first long flight will be made, skirting Spitsbergen on the southwest, across the Arctic Ocean between Greenland and the Pole to Beaufort Sea, thence across Alaska to Fairbanks, where a mooring mast and full equipment for handling an airship will be ready. A mooring mast is also provided at Tromsö.

The next flight will be over the great unexplored area between Alaska and the Pole; from Fairbanks northwest, across Wrangell Island, then north to within 200 miles of the Pole and back to Alaska, paralleling part of the first flight. The third flight will be to return to Tromsö by way of Northern Land and Franz Josef Land. As Northern Land represents a large unexplored area, the ship will cruise around over it. If feasible, a party will be landed, with sledges and equipment, and left to return to civilization over the ice.

In addition to the upper air observations and the oceanographic research, investigations will be made on the electricity of the atmosphere, on the magnetism of the earth and in meteorology.

Dr. Fridtjof Nansen, veteran Arctic explorer, will be the head of the expedition, while Dr. Harald U. Sverdrup will be second. Captain E. A. Lehmann, who took the *Graf Zeppelin* back to Germany after its last visit to America, will command the ship. The scientific staff will number twelve, while a crew of thirty-five will be carried. As in former trips, the engines of the ship will burn gas, a supply of which is being provided at Tromsö and Fairbanks. This gas consists largely of ethane and propane, two compounds of hydrogen and carbon.

The expedition is really a reconnaissance one, Dr. Bleistein emphasized. It will determine the feasibility of exploration by airship, and of landing parties on the ice. Should it prove successful, it will doubtless be the forerunner of future Arctic flights, on still larger airships, thus exploring thoroughly all the Arctic regions in a far more complete manner than is possible on the ground.

THE FATE OF PLANETS

THE rings of Saturn, now unique in the heavens, as far as astronomers know, may be rivalled by a similar system around the earth in the dimly remote future, Dr. Harlow Shapley, director of the Harvard College Observatory, said in a recent lecture. He spoke on "Planets and their Fate," as the third in a series of lectures at the College of the City of New York, on "Flights from Chaos."

"For some years we have been familiar with the fact that the earth's rotation is slowing down, that the day is lengthening, and that the moon is receding," said Dr. Shapley. "We have learned that after an interval of some fifty thousand million years the month and the day will be the same length again, as they were at the time the earth-moon system was formed. This equality of month and day in the future will be forty-seven of our days in length; at the time of the origin of the moon from the earth it was less than five of our present hours in length.

"According to calculation, the moon will ultimately return to the earth, and in the dimly remote future its fate will be disruption by the tidal forces of the earth and transformation into a ring system of myriads of moons such as that now observed around Saturn. This process may fail of completion if in the meanwhile the sun's stores of energy have become exhausted and our oceans have become frozen, stilling the tides which are involved in the machinery of the evolution of days and months. The irregularities are probably due to pulsations of unknown origin in the earth's crust. Though so close to us, compared with the stars, and though such a vast number of observations have been made of them, the planets and moons associated with the earth in the sun's family present some of the most baffling astronom-

ical mysteries. No theory of the origin of the planets is wholly satisfactory, though the current tidal evolution hypothesis, which has developed from the planetesimal hypothesis, accounts for the major features of the system.''

What is the origin of the asteroids, the tiny planets that swarm between the orbits of Jupiter and Mars? Whence came the several thousand comets that are members of the solar system? What caused the moons of Mars? How are astronomers to account for the observed speeds of rotation and revolution of the planets and the sun? These are some of the problems that Dr. Shapley pointed out, and of them, he said, the last one is ''perhaps most disturbing of all.''

''To account,'' he continued, ''for the observed rotation of the sun, Dr. Jeffreys, of England, has recently proposed the theory that the planets were formed not through the tidal disruption of the sun by the near approach of another star, but by the actual glancing collision of our sun with another star. The shearing forces of such a collision could account for the rapid rotation.

''The near approach of two stars is an exceedingly rare phenomenon. It is calculated to occur in our galactic system not oftener than once in a thousand million years. The actual collision of two stars would be a much more uncommon occurrence. Even so, since the astronomer measures time in terms of ten millions of millions of years, it is probable that many planetary systems exist throughout our galaxy and the innumerable other galaxies that are strewn throughout space.''

TELESCOPE FOR SOUTH AFRICA

WHAT will be the largest telescope south of the equator is now under final test at Pittsburgh, preparatory to dismantling it for shipment to its final home in South Africa. The new instrument, a reflecting telescope with a mirror five feet in diameter, has been built for the southern station of the Harvard College Observatory, at Bloemfontein, by J. W. Fecker. Harvard astronomers are now using it to make photographs of the stars. So far, it seems to be entirely satisfactory and free from measurable error.

The mounting of the telescope was designed by Mr. Fecker and built in his shops. The huge mirror, exceeded in size by only three others now in use, previously belonged to the Harvard Observatory, but was not satisfactory. It has been refigured in the Fecker works, and provided with a special mounting to prevent it from bending, as it was formerly thought too thin to be of use.

When erected in South Africa, the Harvard Station at Bloemfontein will have several large instruments adapted for photography of the southern skies. In addition to the big reflector, a refracting telescope, with a photographic lens 24 inches in diameter, is already in use, as well as a number of smaller telescopes.

The mirror for the world's third largest telescope is also undergoing completion here. This is the 69-inch disc made last year at the Bureau of Standards in Washington, and intended for the Perkins Observatory at Ohio Wesleyan University, Delaware, Ohio. The instrument was completed with the intention of using a 60-inch mirror. As the Bureau of Standards scientists succeeded in making a bigger disc than anticipated, Mr. Fecker has also built a new tube for the telescope, to use the mirror to its full advantage.

Mr. Fecker is the successor of John A. Brashear, one of the most famous makers of large telescopes and lenses.

PHENOMENALLY SLOW BREATHING

A PHYSIOLOGICAL celebrity, a young woman physiologist who breathes only three to five times a minute, has been the object of great scientific interest and public curiosity during the Carnegie Institution of Washington's annual exhibition of scientific work.

The average adult breathes fifteen to eighteen times a minute, and the extremely slow normal breathing of the young woman, now an assistant in physiology in Goucher College, Baltimore, is considered by Dr. Francis G. Benedict, of the Carnegie Institution's Nutrition Laboratory at Boston, to be absolutely unique.

Not even ill patients in hospitals who exhale and inhale ten times a minute approach the usual rate of respiration of this physiologist who, while willing to aid science by studying the cause of her unique ability and demonstrating it to the public, desires to remain anonymous in printed reports.

Her unique rate of respiration was discovered about five years ago when as a student of physiology at Mt. Holyoke she noted that she did not breathe as fast as her fellow students. The phenomenon came to the attention of Dr. Benedict, a leading research worker in the field of human physiology. In lecturing to some 70,000 physicians in some 20 cities of Europe he tried to find a similar case. A thorough search of the scientific literature was also made. No other instance of such slow breathing has been found.

The depth of the breathing is greater than normal. She inhales three pints of air at a time whereas ordinary people take in and let out only one pint. Her lung capacity, however, is normal and not larger than that of the average person. The air passing through her lungs is normal in amount and the amount of oxygen she extracts from it is also normal.

If she were a singer, she would be able to hold her notes a phenomenally long time. Dr. Benedict has urged her to attempt singing as an experiment, but her interests lie in the field of scientific research rather than in music. If she were a sprinter, which she is not, she would probably be able to run 200 yards on a single breath whereas the ordinary runner completes a hundred-yard-dash in one intake of air.

In the demonstration, the young physiologist wears a special form of respiration mask, like an inverted bucket which fits over the head. A rubber collar closes the open end, while a celluloid window permits her to see what is going on about her. Air enters through a tube at the top, and is sucked out through a tube at the side by means of a small electric blower. The exhaust air is drawn through chemicals to absorb the carbon dioxide breathed out of the lungs. After being thus purified, the air goes back to the mask and is breathed over again. A collapsible cylinder, like a city gas tank, goes up and

down as the subject breathes out and in, while a pen attached to it writes a permanent record of the breathing volume on a revolving paper cylinder.

As the substance of the body burns to produce heat, oxygen is changed into carbon dioxide, and so the volume of air in the apparatus is gradually reduced. For every liter of oxygen that is used, about five calories, or heat units, are produced. Therefore, by measuring the rate at which oxygen is used up, the heat produced by the subject can be measured.

HOSPITALS FOR PATIENTS OF MODERATE MEANS

A DEFINITE trend toward increasing accommodations and lowering costs in hospitals, designed for the benefit of patients of moderate means, was observed in a study of hospital service just completed by Dr. Niles Carpenter, of the Committee on the Cost of Medical Care.

Whether or not the patient of moderate means will be able to pay for his hospital care if all hospitals adopt these new policies can not yet be stated. A satisfactory answer to this question will be forthcoming after a few more years' experience with the new policies.

The study was based on conditions in 270 hospitals. Sharp distinctions between the classes of hospital patients are being broken down, much as are the distinctions between classes of passengers on transatlantic liners, the study revealed.

"Passengers in the 'steerage' (that is, the ward) are beginning to receive some of the privileges heretofore associated only with the 'first cabin' (that is, the private room), and a new 'cabin class' of accommodations (the semi-private room and the small ward), intermediate in physical equipment and in accompanying privileges between these two extremes, has made its appearance."

In 1908 almost one third of the beds in the hospitals studied were in large wards. In 1928 less than one tenth were in such wards. The proportion of beds in semi-private rooms increased over the same twenty-year period from one tenth of the total number to almost one quarter of the total.

Special provisions for patients of moderate means are now included in the future building plans of many of the hospitals studied. Twenty-one institutions plan new buildings primarily for the use of such patients. The Massachusetts General Hospital of Boston plans a new "Hospital for People of Moderate Means" of 300 beds with rates varying from $6.50 per day for single rooms to $4.00 a day for cubicles.

Prices most frequently charged for beds in semi-private rooms range from $5.00 to $6.99 per day and for beds in small wards from $3.00 to $4.99. Only one fifth of the beds in single rooms can be secured for less than $5.00 a day, while about three fourths of the beds in semi-private rooms and almost all of those in small wards are priced at less than $5.00.

In the matter of extra service charges, such as for laboratory, X-ray, special nursing, operating room and anesthesia, the hospitals are working out various plans for lightening the burden these often place on patients of moderate means. Some hospitals are graduating these charges, some are eliminating them and some are placing them on a flat rate basis. Hospitals are also trying to make financial adjustments by which the total charges are reduced or placed on a deferred or installment basis of payment for patients of moderate means. These arrangements are made after careful, tactful investigation of the patient's resources and financial status.

Finally, in some hospitals a fixed limit is placed on the fee which the physician charges his patients of moderate circumstances. In other hospitals an informal understanding exists between physician and hospital to much the same effect.

ITEMS

PORTRAITS of the giant cats that once roamed North America were a feature of the annual exhibition of the work of the Carnegie Institution of Washington. Fossil finds at various places, but especially at the famous La Brea tar pits in California, have made possible the collection of an unusually complete series of skulls, representing all stages from kittenhood to old age. There are two definite types shown in the big-cat group of Ice Age time in America. One is the famous saber-tooth tiger, which used its exaggerated upper eye teeth for killing its prey and fighting its enemies. The other is a more orthodox cat, a great lion, which has a skull and tooth arrangement more like those of the present-day lions and tigers, which are primarily biting animals.

FOSSIL leaves, split out from between layers of rocks, tell of a great change in the climate of eastern Oregon since the days when it was a region of major volcanic activity several millions of years ago. The region is now one of considerable aridity, with only about fifteen inches of rainfall a year. But these rocks, now on display at the annual exhibition of the Carnegie Institution of Washington, contain leaves of sequoia, alder, tan-oak and bay, indicating the type of forest found now on the northern coast of California, which receives 45 inches of rain each year. The leaves and other plant parts were caught in falls of volcanic ash, which preserved their imprints while they were compressed and hardened into stone.

MARMOTS, better known as "woodchucks" and "groundhogs," are disappearing in California's Sierra Nevada, according to Dr. H. C. Bryant, of the University of California, writing in *Yosemite Nature Notes*. These animals ten years ago were exceedingly common near timber line throughout the central Sierra Nevada. According to Dr. Bryant, cycles of scarcity and abundance are known for almost all rodents. The gray squirrel suffered diminution as the result of a severe disease several years ago, until not one was to be found on the floor of Yosemite Valley. At present it is coming back to its former habitat, at least six different squirrels having been counted there last summer. Now it is the marmot that is scarce throughout the whole Yosemite National Park region, but no one knows the real reason for the scarcity.