

PHYSICS

Balloons Carrying Radios Tell Stratosphere Secrets

“Wobble” in Signal Frequency Indicates Altitude; Interruptions Tell of Temperature and Cosmic Rays

SMALL stratosphere balloons without pilots and using tiny radio transmitters to send back upper air information to earth-bound scientists will make possible a whole new program of cosmic ray studies, Dr. Arthur H. Compton of the University of Chicago reported in a statement to Science Service.

The small balloons—quite Lilliputian in size compared with the great 3,000,000 cubic foot bag of the recent National Geographic Society and U. S. Army Air Corps flight—weigh only 16 pounds when sent aloft by a bag whose largest extended diameter is but 15 feet.

The radio “voice” sending back the information to earth is a single tube oscillator transmitting a signal on twenty meters wavelength. A barometer, a thermometer and a cosmic ray meter affect the radio signal in such a way that accurate records of these conditions can be learned. A similar short wave oscillator is kept in continuous operation.

Changing conditions in a special barometer vary the frequency (or what is the same thing, the wavelength) of the transmitted wave. Air pressure, and hence altitude, is thus determined by recording the “wobble” in the incoming radio signal.

Interruptions Show Temperature

Temperature is recorded by vibrations of a balance wheel somewhat like that of a watch. Its period, or time of oscillation, is affected by the temperature. This mechanical oscillator interrupts the carrier wave at each vibration. Thus the radio signal comes on and goes off at intervals. The difference in length of the time intervals indicates temperature.

Cosmic ray intensities are determined by the current in the cosmic ray meter produced by ionization. The instrument is charged up to a known value. As the cosmic rays make the surrounding air electrically conducting, the charge of the instrument leaks away. How rapidly the leakage occurs depends on the intensity of the cosmic rays. Each complete discharge of the cosmic ray meter is noted

by interruptions in the carrier radio wave.

All that is necessary in the ground laboratory, then, are instruments to make a record of the wavelength of the radio signal, telling the air pressure and hence the elevation; and to detect interruptions in the radio signal telling temperature and cosmic ray intensity.

Studies of the upper atmosphere, Dr. Compton stated, have been made before by the system of sending up automatic recording instruments on two small balloons of different sizes. Together the twin bags carry the apparatus aloft until finally the smaller one bursts.

The remaining balloon is insufficient in size to keep up the ascent, so that the apparatus descends gently to the

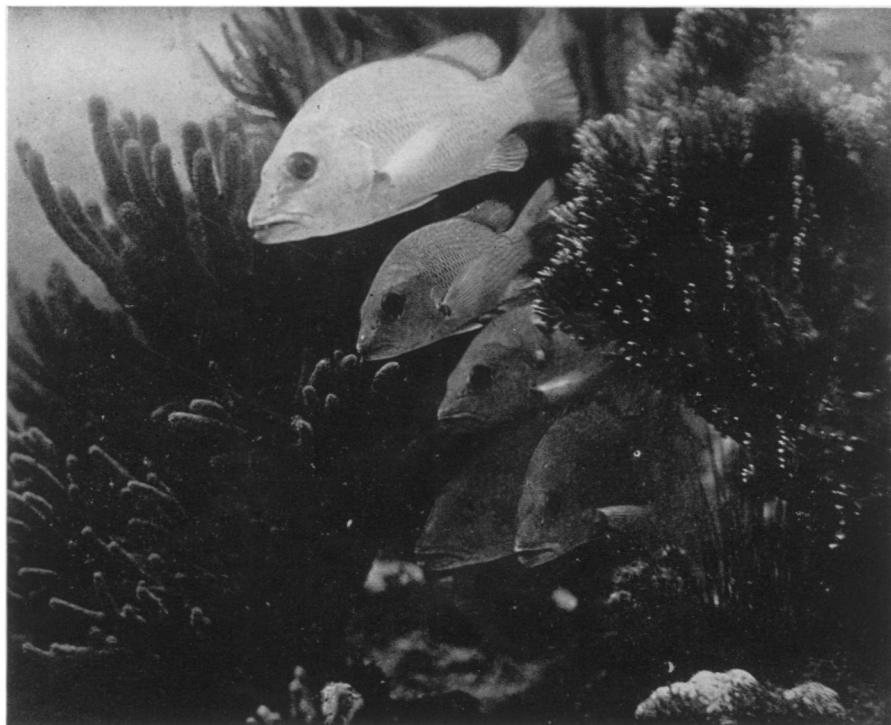
ground. Reward notices are attached to the whole unit payable on the return of the apparatus. Good results have been obtained with this method, said Dr. Compton, by the German scientists Hess and Kolhorster and by Prof. R. A. Millikan in the United States.

While valuable, the method has one defect. It can be used only in regions of the world having a fairly dense population, where there is some assurance that the balloon and its instruments will be found and returned. Europe, the United States and southern Canada comprise the regions of usefulness of the method.

Expect Loss

Radio balloon apparatus, however, is sent up with little hope—and no need—of its recovery. The cost of \$100 for each flight is only a few times that of an airplane flight and only a small fraction of the cost of a manned balloon ascension.

“We do not expect,” concluded Dr. Compton, “that this radio transmission method of obtaining cosmic ray data from the stratosphere will replace measurements made in large balloons of the stratosphere type, because some



THROUGH THE GROVES OF THE SEA

The fisher on the glassy waters over coral groves must always be prepared for the strange and beautiful forms of life that may swim into his ken out of the next clump of animate bushes on the bottom. This little “herd” of marine game, photographed by Dr. W. H. Longley of the Carnegie Institution’s marine biological station at Tortugas, is good to eat as well as pleasant to look upon. They are gray snappers, rated high among Florida food fishes.