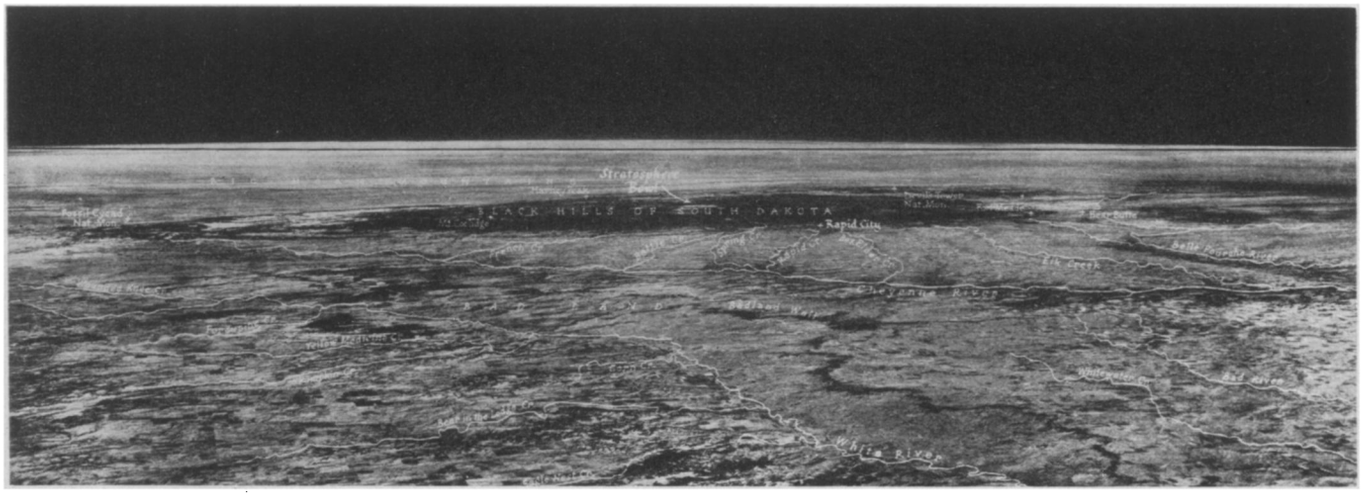

FROM ABOVE

The stratosphere voyager looks at a sky that is black and an earth that is unmistakably curving. This view of the Black Hills and surrounding landscape was taken high above the ground from the stratosphere balloon Explorer II, and is reproduced by special permission from the National Geographic Magazine.

PHYSICS

Scientists Describe Results Obtained in Stratosphere

Electrical Conductivity of Air Above 60,000 Feet Does Not Increase With Altitude; Gases Measured

THE UNTOLD story behind the record-breaking stratosphere flight of the balloon Explorer II last year was revealed at the meeting of the Philosophical Society of Washington when the scientists who built instruments for the experiments and tested the strength of the craft before it left the ground told of their work.

Among the apparatus carried aloft in the 72,395 feet ascent of Capt. Orvil Anderson and Capt. Albert W. Stevens in the National Geographic Society-U. S. Army Air Corps balloon was the equipment of O. H. Gish for measuring air conductivity. This was from the Department of Terrestrial Magnetism of the Carnegie Institution of Washington.

The ease with which the air conducts electrical current, said Mr. Gish, rises steadily from ground level to 60,000 feet, where it is 60 times as great as at the surface of the earth. From 60,000 feet upward, however, the conductivity is surprisingly low.

The conductivity not only fails to increase but even decreases slightly. This finding may have importance for cosmic ray studies, since above 20,000 feet altitude cosmic radiation is the main contributing cause of air ionization, and hence of air conductivity.

Between 20,000 and 60,000 feet, Mr. Gish indicated, cosmic rays can now be said to explain satisfactorily the conductivity recorded in the new observations.

Three possible causes may account for the unexpected air conductivity found above 60,000 feet:

(1) The cosmic ray intensity may decrease between 60,000 and the 72,395 foot peak elevation.

(2) Above 55,000 feet the path of the balloon appears to have entered an entirely different air mass from that in which it started. Under 55,000 feet the Explorer II was in a mass of air which was of polar origin; above this point it entered air which had come from the tropics. Polar and tropical air, said Mr. Gish, have differences of conductivity.

(3) Above 60,000 feet the balloon entered a region where the ozone content is greater. Ozone is known to affect the mobility of the air ions on which conductivity measurements are based and thus might account for the lack of conductivity increase above 60,000 feet.

The composition of the stratosphere air was described by G. M. Shepherd of the National Bureau of Standards. The helium content of the stratosphere air is very much too high, he indicated, to be accounted for by the separation of gases which gravity would bring about. Helium was found in a concentration of 300 parts per million of gas. Contamination of the helium samples from the helium of the balloon was anticipated and is suspected in the measurements.

The ratio of the amount of oxygen to nitrogen obtained in the stratosphere air samples is slightly different from that expected, Mr. Shepherd said. The possible origin of these differences is still under study. If the difference turns out to be real, it would indicate that a separation of the two gases due to gravity is occurring at the altitudes reached.

W. G. Brombacher, also from the National Bureau of Standards, revealed that the automatic instruments carried aloft brought back a complete "life history" of the epochal flight in terms of barometric pressure and time.

There is a difference of some 175 feet, he said, in these barometric altitude records and the official height reached by the Explorer II. This difference arises because the official figures are measured from the center of the inflated balloon, while the barometric pressure was read 175 feet below.

The use of the vertical camera to measure altitude, Mr. Brombacher declared, yielded results in good accord with the pressure records.

The strength and performance of the stratosphere balloon was described by Dr. L. B. Tuckerman of the National Bureau of Standards.

Significant in the performance of the balloon, Dr. Tuckerman indicated, was the use of the ballast chart from which Capt. Anderson could determine what amount of ballast would be required for a safe landing.

Science News Letter, May 9, 1936