

PHYSICS

# New Electric Roof of World Found by American Physicists

## Discovery Delayed by Shielding of Lower Electrified Layer Marconi Expects to Locate Roof Higher Than Any Known

**F**URTHER light has been thrown on the "electric roof of the world"—the electrically charged layers of the upper atmosphere which reflect wireless waves and render possible long distance radio transmission—by the researches of J. P. Schafer and W. M. Goodall of the Bell Telephone Laboratories, Deal, New Jersey.

Two reflecting layers are known, one at a height of 100 to 120 kilometers, and another somewhere between 190 to 300 kilometers. In the course of recent experiments, the New Jersey physicists have found an intermediate layer at an average height of 150 kilometers, from which wireless waves are reflected. (A kilometer is about six-tenths of a mile.)

They state, in a communication to *Nature*, that the reason why this intermediate electric "roof" had not been detected before is because it is shielded by the lower layer and only occasionally does its electrical or ionic density become greater than that of the lower layer, so as to enable its detection. Even then, it is necessary that the frequency of the radio waves be just great enough to permit penetration of the lower region and yet small enough to give reflection from the new layer.

### Not One But Several

Another important fact discovered by Messrs. Schafer and Goodall is that the upper reflecting layer really consists of several layers though its exact structure varies at different times.

It is understood that Marconi is contemplating the discovery of a still higher reflecting "roof." He is led to believe that such a layer must exist, by his experiments with very short radio waves of 40 to 60 centimeters wavelength. With these ultra-short wavelengths, contrary to what might have been expected, Marconi has already been able to communicate over distances up to 170 kilometers. These ultra-short waves pass through all the electric layers in the upper atmosphere, so far known, and their long distance range may be due

to reflection from a higher and more highly ionized layer.

The practical importance of ultra-short radio waves is very great, because they are not interfered with by atmospheric conditions. Knowledge of the conditions which would render them available for long-distance telephony is therefore extremely valuable.

The existence of the new layer has been confirmed at two places in England. Prof. E. V. Appleton of King's College, London, and J. A. Ratcliffe and E. L. C. White of the Cavendish Laboratory, Cambridge, writing independently to *Nature*, state that they have also detected an intermediate electrical layer that reflects radio waves.

The electrical strength (ionization) of this layer is, however, smaller at

noon than in the early morning, and in this respect it differs from the American electric "roof." Prof. Appleton further agrees that the upper layer, which bears his name, is probably composite. He considers that from the latest data one may deduce the existence of four reflecting layers in the ionosphere. The Kennelly-Heaviside layer, 100 to 120 kilometers, is the lowest; next at about 150 kilometers height, comes the newly discovered layer of Schafer and Goodall and then between 190 and 300 kilometers the Appleton region consisting of at least two layers. Senator Marconi, then, is searching for a fifth radio roof of the world beyond the Appleton region.

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PALEONTOLOGY

## Dinosaur is Restored Internally and Externally

**B**EAKED like a tortoise, horned like a rhinoceros, its muscles and skin skillfully restored by anatomists, a twenty-foot dinosaur has just been placed on exhibition in the Peabody Museum of Natural History at Yale University. The monster is of the genus known to paleontologists as *Monoclonius*, and it



INSIDE AND OUT