

## ASTRONOMY

# Atmosphere Big and Hot

Research shows that the earth's atmosphere extends some 10,000 to 15,000 miles out, and the temperature beyond the first 400 miles is around 4,000 degrees F.

► **THE EARTH'S** atmosphere is bigger—and hotter—than has previously been estimated.

Scientists of a non-profit organization doing research for government agencies, the Rand Corporation, have put together all the scientific information about the earth's atmosphere.

Here are some of the startling facts their research has indicated:

The earth's atmosphere extends to a distance of 10,000 to 15,000 miles out from the surface of the earth.

From 400 miles out on to the outer reaches of the atmosphere, there is a uniform temperature of some 4,000 degrees Fahrenheit. This, despite the fact that at some 50 miles from the earth the temperature is about 50 degrees below zero Fahrenheit.

Ten thousand miles above the earth, the atmosphere has a pressure 1,000,000,000,000,000,000 (a billion billion) times smaller than it is at sea level. Best man-made vacuum pumps do not approach this low pressure.

Just beyond the atmosphere, outer space is filled with highly rarefied hydrogen gas at a temperature of 18,000 degrees Fahrenheit.

Gases in the atmosphere are pretty much the same at 200 miles as they are on the surface, largely nitrogen and oxygen. Above 200 miles, the nitrogen increases until an altitude of 2,000 to 3,000 miles is reached. Here the atmosphere is mainly nitrogen. Above 4,000 miles altitude, however, the

nitrogen decreases rapidly and hydrogen and some helium are found in the rest of the atmosphere.

Some of these hydrogen and helium atoms are believed to escape into interplanetary space, but helium is continually released at the surface of the earth by chemical processes. Hydrogen atoms may be fed into the upper atmosphere from interplanetary space.

At some 10,000 miles above the earth, where the pressure is many times less than that in any vacuum pump, there are about a million atoms in air per cubic foot. This means that the atoms are about an eighth of an inch apart. But because the atoms are so small, they probably travel 10,000 miles before colliding with other atoms.

Because the atmosphere is so rarefied at this altitude, the scientists explain that the high temperature probably does not affect such things as meteorites. They estimate that the heating of a meteorite in the atmosphere does not take place until it reaches altitudes as low as about 60 miles.

Best knowledge of what the atmosphere is like at great distances above the earth has come from studies with radio waves which are reflected by the ionosphere. This region of the atmosphere is where negatively charged particles have been stripped from atoms and molecules of the atmospheric gas. These particles, called electrons, form a gaseous layer which plays an important role in some types of radio communication.

The Rand study, thus far, has been car-

ried out only for the reaches of the atmosphere above the equator and the middle latitudes but not over the polar regions.

Science News Letter, June 25, 1949

## ● RADIO

Saturday, July 2, 3:15 p.m., EDST

"Adventures in Science" with Watson Davis, director of Science Service, over Columbia Broadcasting System.

Dr. H. L. Johnston, director of Cryogenic Laboratory, Ohio State University, will talk about "The Ultimate Fuel."

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