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November 17, 1933

A Science Service Feature

? WHY THE WEATHER ? Mailed November 10, 1933

UPPER AIR COMPOSITION

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One of the effects of the winds in the lower atmosphere is to keep the atmospheric gases thoroughly mixed, so that their proportions remain substantially uniform all over the world, except with respect to the percentage of water vapor, which varies conspicuously as a result of evaporation and condensation. Ignoring this constituent, the lower air consists of about 78 per cent. nitrogen, 21 per cent. oxygen, and 1 per cent. argon, besides containing a little carbon dioxide and traces of several other gases.

As recently as ten years ago the composition of the air above the lower levels of the stratosphere was supposed to vary with altitude. The higher atmosphere was believed to be so tranquil that its gases tended to a state of diffusive equilibrium. Thus the light gases hydrogen and helium, which form only minute fractions of the lower air, were thought to be relatively abundant at high levels, and it seemed probable that above a height of 70 or 80 miles the atmosphere might consist entirely of one of these light substances.

Evidence furnished by the aurora has negated this idea. The spectrum of the aurora reveals the presence of nitrogen at all levels up to a few hundred miles, and also of another gas, the identity of which remained enigmatical until the year 1925. In that year the famous "green line" of the auroral spectrum was shown by the experiments of Prof. McLennan and his associates, at the University of Toronto, to be due to oxygen. The oxygen at high levels, or part of it, differs from the oxygen we breathe in being monatomic instead of diatomic.

Other gases, though not registered in the auroral spectrum, may be present in small proportions, but it now appears that the air as far up as it can be observed is mainly a mixture of nitrogen and oxygen, just as it is at sea level.

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