for each plate. Fig. 2 illustrates the known displacements and intensities of $2p$–$4d$ and of $2p$–$4f$ in electric fields 0–100 kv./cm. Assuming (roughly) that the portion of the d line due to electric fields is as indicated by the crosses, the ratios in Fig. 2 make possible the calculation of the f line at corresponding fields as indicated. Even if one takes the entire d broadening as Stark effect, there is very little change in the calculated f line, owing to its very small relative intensity in low fields. If we consider, further, that we have here to deal with absorption wherein the maximum is about one half of the continuous background, a small increase of relative intensity is obtained for the f line, but this is of no vital importance to the present discussion. The 'residual' line at about λ4470·1 is seen to have considerable intensity.

In the above discussion, we have assumed that we have to deal with pure absorption. If appreciable emission is present to reduce the effective d absorption, it might be thought possible to retain the whole of λ4470 as a Stark line produced in absorption and not present in emission. When the whole of the recorded Stark effect is considered, however, such speculation leads to great difficulties. For example, the $p - p$ combinations and the lines $2p$–$5f$, $2P$–$5F$, should show a corresponding strength relative to the diffuse lines. Since these new lines actually show no intensity beyond our expectations based on pure absorption, it is certain that emission cannot be introduced to account for the whole of our 'residual' line as Stark effect.

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The Atmospheres of the Giant Planets

IN their article on the atmospheres of the giant planets[1] Drs. A. Adel and V. M. Slipher suggest that a predominantly hydrocarbon structure might not be at all unlikely for these planets; this conclusion is also indicated, in their opinion, by the fact that the mean densities of these celestial bodies are in a class with densities of most organic liquids.

In a recent paper[2] I tried to explain the low densities of the four outer planets by a modification of certain conceptions of H. Jeffreys, which now may be considered as well established and in accord with the leading ideas of geochemistry. The giant planets are supposed to consist of a core (density 5·5, similar in structure to the earth), a thick layer of ice (density 1·0 under very high pressure) and uppermost, a layer of condensed gases (highly compressed, density 0·35), mainly hydrogen. The mass ratio of the different layers (each supposed as homogeneous) is then fixed by the observed values of mean density and moment of inertia. The numerical evaluation proves a mass ratio of hydrogen to heavy elements which is of the same order of magnitude as in the sun. This result is consistent therefore with the current conceptions about the origin and evolution of the giant planets (formation from ejected solar matter, with no considerable loss of volatile constituents).

This scheme of the internal constitution of these bodies seems to be preferable to the hydrocarbon hypothesis, because it avoids special assumptions. Nevertheless, the remarkable abundance of the saturated hydrogen compounds ammonia and methane requires explanation with respect to their origin and stability. A recent letter from Dr. H. Jeffreys to me stated that "some astronomers here are still disinclined to believe that they [that is, Jupiter and Saturn] are not red-hot". I therefore take this opportunity to point out that the existence of ammonia and methane is quite incompatible with an atmospheric temperature of about 1000° abs., because these compounds are strongly dissociated in this range of temperature. I had omitted to emphasise this fact when I made the first tentative identification of ammonia and methane in the planetary atmospheres, and I may now add that probably these gases are also fairly stable under the influence of the ultra-violet solar radiation. The above quoted model involves the assumption that the atmospheres should contain no oxygen and, therefore, be transparent to solar radiation down to 2200 or 1800 A., the upper boundaries of continuous absorption of ammonia and methane, respectively. From the results of laboratory experiments one would expect that in the absence of appropriate acceptors for free hydrogen atoms, the photochemical decomposition of ammonia and methane would be followed by a nearly complete recombination.

With further knowledge about the photochemical processes in the Schumann ultra-violet and their secondary reactions, it will perhaps be possible to obtain indirect evidence or to exclude the existence in the planetary atmospheres of such compounds as give no absorption bands in the accessible region of the spectrum, but which would play an important rôle as partners in secondary reactions.

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[1] NATURE, 134, 148, July 28, 1934.
[2] *Göttinger Nachrichten*, 67, No. 5; 1934.

Origin of the Cosmic Corpuscles

THE investigations of A. H. Compton and his associates on the dependence of the intensity of cosmic radiation on latitude support the theory of Lemaître, in which cosmic rays are treated as corpuscular, while the experiments of Kunze and others have established the existence in association with the radiation of charged particles with energies as great as ten thousand million volts. It has been customary to assign the origin of these corpuscles to some process of atomic construction or destruction in outer space, and to consider the earth as an uncharged isolated body upon which the corpuscles are showered from all directions.

I should like, however, to point out that the observed effects are well explained on the hypothesis that the earth is an electrified sphere at a potential of some millions of volts, to which the charged corpuscles, originally of small energies and of interplanetary location, are drawn by electrostatic attraction.

A conductor of the dimensions of the earth, although charged to a potential of many millions of