

with multiple legumes, as, for example, *Cassia fistula*, and have recently examined flowers of *Ceratonia siliquastrum* with 8-24 legumes. Such examples may suffice to indicate that even mature legumes need not be terminal.

At the same time, the lateral positions of such multiple legumes lend no obligate support to the classical foliar interpretation of carpels, such as Dr. Newman appears to claim. For it will be evident that lateral position in itself is no more a proof of the foliar nature of a carpel than the lateral origin and position of a branch would be proof of its foliar origin. My views on free carpel formation are detailed in "Publications of the Hartley Botanical Laboratories", No. 12, in which grounds are advanced for the belief that free carpels are emergences of a spore-bearing axis, the apex of which is arrested, and which may or may not come to be involved in any mature carpel.

It will be found on examination of primordial stages of *Acacia* that the single legume is of multiple primordial origin, the primordial being united by toral growth as the apex of the cone is arrested. This simple fact would in itself be sufficient to counter the classical view of carpel origin with each carpel as a fertile leaf, and might be used, if necessary, in support of Saunders' polymorphic view.

It would seem, however, that the time has come to abandon discussions as to what is leaf and what is stem, and to turn attention to the problems of physiology which determine the arrest of floral apices and the subjacent formation of ovuliferous toral growths. It may be stated finally that a legume differs in no material respect from a follicle such as that of *Nigella*, *Aconitum*, *Delphinium* or *Caltha*, in each of which the follicles are of multiple primordial origin.

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Feb. 3.

¹ NATURE, 137, 70 (Jan. 11, 1936).

² Proc. Linn. Soc. New South Wales, 40, Pts. 5 and 6 (1935).

Helium Content of the Stratosphere and of the Air at the Earth's Surface

As Prof. F. A. Paneth and Mr. E. Glückauf¹ have mentioned our researches² upon the composition of the stratosphere, we think it useful to specify some points concerning the amounts of helium. Our conclusions deal only with the sum helium+neon, these two gases not being separated one from the other. In our researches we have tried to determine especially the content of oxygen, of nitrogen and of argon, and we obtained the contents of helium+neon only incidentally. In fact, as we have previously stated, we have not measured the helium+neon in all our samples, and as we also stated, we have mixed for that measurement samples from near altitudes. It was, therefore, only as an *indication* that we gave our figures.

As, however, our measurements of the air taken at the level of the earth were made under exactly the same conditions and at the same time as the measurements of the air of the stratosphere, we think in the stratosphere *there is a slight increase of the total helium+neon*, but cannot give very accurate proportions. Moreover, Tetens³ and Wigand⁴ had already pointed out an increase of the proportions of the 'light gases' in the higher layers of the troposphere.

In considering the question, a new fact occurred to us as probable. We found that the proportion of helium+neon (multiplied by 10³), in eight experiments on the air at the ground-level, is successively: 2.8, 2.9, 2.7, 2.4, 2.4, 2.9, 2.45, 2.45, 2.6; for the stratosphere, our figures are: 3.2, 3.5, 3.3, 2.8, 4.6, 2.7, 3.0. When we consider that the air at the earth's surface has been taken in quite different places: Paris, Mont Blanc, Madagascar, Greenland, etc. (parts of investigations not yet published), and that we have made the measurements with exactly the same apparatus, it appears that *the amount of helium+neon is more constant at the level of the earth than in the stratosphere*. The same conclusion seems to follow from the three determinations made by Prof. Paneth and Mr. Glückauf.

Concerning the variation with altitude we think, with Prof. Paneth and Mr. Glückauf, that many more determinations are needed before any certain conclusion is positively established. At present we have no longer the possibility of clearing up these two questions, namely: (1) whether the proportion of 'light gases' of the stratosphere is actually variable; (2) whether this variation depends upon altitude. We hope Prof. Paneth will be able to get many air samples from the stratosphere and determine the helium content by the very ingenious and accurate method he has worked out.

If the increase of helium of the stratosphere be confirmed, we think it may come from extra-terrestrial sources, perhaps from the sun.

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¹ NATURE, 136, 717 (1935).

² C.R., 200, 1340, 1371, 2108 (1935).

³ Erg. Obs. Lindenberg, 6, 219 (1911).

⁴ Phys. Z., 17, 396 (1916); *idem*, 25, 684 (1924).

Electric Moments of Solute Molecules

THE well-known method of computing the electric moments of solute molecules due to Debye makes use of the Clausius-Mosotti formula for the dielectric constant of a mixture. Whereas the analogous Lorenz-Lorentz formula for the refractive index of a mixture is probably very accurate¹, the Clausius-Mosotti formula is at the best a rough approximation because it ignores the force on a polar molecule due to the surrounding molecules being polarised by the molecule considered.

When it is desired to determine the electric moment of a molecule by measurements on solutions of the substance, it is advisable and customary to use high dilutions and non-polar solvents. But it is precisely under these conditions that it is possible to avoid the use of the Clausius-Mosotti formula by taking as model of the solute molecule a sphere and as model of the solvent a continuous medium. This model is completely analogous to that used with such conspicuous success by Debye and Hückel in their treatment of interionic energy in solutions of electrolytes.

Using this model, I obtain the very simple formula

$$(\epsilon - \epsilon_0 - n^2 + n_0^2)/\epsilon_0 C = 4\pi\mu^2/3kT \quad \dots (1)$$

where ϵ is the dielectric constant of the solution, ϵ_0 that of the pure solvent, n is the refractive index of the solution, n_0 that of the pure solvent, C is the number of solute molecules in each cubic centimetre of solution, k is Boltzmann's constant, T is the