

take place also in agar cultures if the access of air to the nodules and roots is facilitated by allowing the agar to shrink. Consequently, the excretion is a natural process which is closely dependent on the air-content of the medium.

Recently we have found² that pea and clover nodule bacteria effect a butyric fermentation of glucose, whereby hydrogen is also produced. This finding will probably help us to gain a clearer conception of the mechanism of nitrogen fixation. All attempts to effect a fixation of nitrogen by free-living nodule bacteria have so far led to negative results. This is probably due to the fact that ordinary sugar compounds are very poorly utilised by these bacteria. It seems, therefore, natural to assume that the nodule bacteria receive from their host plant some particularly suitable sugar compound which is readily utilised, and provides the energy required for nitrogen fixation. Theoretically it would thus be possible to effect a fixation of nitrogen by free-living nodule bacteria as soon as the chemical nature of the specific carbohydrate is ascertained.

Further details will be published in the *Journal of Agricultural Science*.

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¹ Virtanen, A. I., v. Hausen, S., and Karström, H., *Biochem. Z.*, **253**, 106; 1933. *NATURE*, **131**, 534, April 15, 1933.

² Virtanen, A. I., Norlund, M., and Hollo, E., *Biochem. J.*, **28**, 796; 1934.

Synthetic Compound with Vitamin B₂ Activity

ACCORDING to a note¹ in *NATURE* on a lecture recently given by me, synthetic 6,7-dimethyl-9-1-araboflavin, C₁₇H₂₀N₄O₆, possesses similar growth-promoting activity to that of lactoflavine (vitamin B₂). The statement, that a catalytically active compound results by combination with the colloidal carrier of the 'yellow enzyme' of O. Warburg and W. Christian is incorrect, both for the natural and synthetic pigment, in so far as experiments *in vitro* are concerned. According to the *in vitro* experiments described by H. Theorell², phosphoric acid plays an important rôle in the combination. *In vivo*, on the other hand, a combination of both pigments with phosphoric acid and protein to form yellow enzymes apparently takes place. *In this sense only*³ does the synthesis of a compound with vitamin B₂ activity represent also the first synthesis of the active group of an enzyme.

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¹ *NATURE*, **134**, 966; 1934.

² *Biochem. Z.*, **275**, 37, 344; 1934.

³ For the original German text, see *Ber.*, **67**, 2084; 1934. **68**, 166; 1935.

Formulae and Equations in Nuclear Chemistry

THE question which Prof. Lowry raises on p. 36 of *NATURE* of January 5 is one which has perforce exercised my mind in the last few days, since I am at present revising the final page-proofs of the report of the International Conference on Physics. He refers to the different positions in which the numerals indicating the mass and atomic number of a nucleus are placed by different writers. Thus, we have

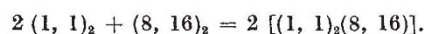
⁴He, ³He⁺ and He₂⁴. He points out that if the last form is used, there is a difficulty in showing the number of atoms in a molecule in the customary English fashion (for example, Cl₂) whilst both the second and third forms introduce a difficulty for the French chemist, who is in the habit of writing Cl² for a molecule of chlorine.

As a matter of fact, the ideal symbolism would leave space not only for this numerical indication, but also for a sign to denote the state of ionisation. The two requirements together completely rule out both the second and third forms above, leaving only the first as suitable for general adoption.

From a logical point of view, if the symbol refers to a nucleus and not to a complete atom, the lower numeral is unnecessary. If a nucleus has subscript 2, it is helium, and conversely. Thus, the simplest method would be to write ⁴He, ⁶Li or ⁷Li. The only objection is the ugliness of the juxtaposed large and small figures in such an equation as 2¹H₂ + ¹⁶O₂ = 2¹H₂¹⁶O.

If we were bold enough, we should adopt a logical scheme, and save the printer much trouble, by giving up the letter instead of the subscript. An atom would be represented by a number or numbers in a bracket: (1, 1) and (1, 2) for ordinary and heavy hydrogen, (2, 4) for helium, (3) to mean either isotope of lithium, and so on.

The above reaction would then be written



It is easy with this notation to show states of ionisation: (17, 35)⁻ + (19, 39)⁺ = [(19, 39)(17, 35)] or (17)⁻ + (19)⁺ = [(17)(19)] would replace the familiar Cl⁻ + K⁺ = KCl.

If it is decided to retain the use of letters, I would plead for the use of ¹H to signify all the isotopes of hydrogen. When H is restricted to mean ¹H, we have the additional symbols ²D and ³T (with perhaps ⁴Q to follow) to remember, and there is no symbol available to mean hydrogen in general. One is certainly needed for this purpose, and the need is illustrated on p. 23 of the issue of *NATURE* to which I have already referred.

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Absorption Spectrum of Sulphur Monoxide

IN a recent investigation¹, we attempted to detect sulphur monoxide in the photochemical decomposition of sulphur dioxide by examining the absorption spectrum of the latter before and after its irradiation. An absorption spectrum of the monoxide was reported to have been found by P. W. Schenk and H. Cordes² in the spectral region between 3300 Å. and 2500 Å., and although sulphur dioxide has very strong absorption bands in this region, they found evidence of the spectrum of sulphur monoxide, even when its concentration was 10⁴ times smaller than that of the dioxide³. This spectrum, however, could not be detected in the photochemical decomposition of sulphur dioxide, and it has been assumed¹ that the act of photo-dissociation provides sulphur monoxide with a surplus amount of energy which makes it react instantaneously. But since this surplus amount of energy is only 13 cal. for 1950 Å., this conclusion did not seem quite satisfactory. It seemed advisable,