

tion by primary radiation, the influence of the quantum number l is of more importance than the energy differences between the three L -levels.

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Photochemistry of Vitamins A, B, C, D

PROBABLY because our letter in NATURE of May 14, p. 720, on this subject was too compressed, some misunderstanding seems to have arisen as to the method which we have described. After reading the remarks of Prof. Heilbron and Dr. Morton in NATURE of June 11, p. 866, we think it may save further difficulties if we reaffirm the purpose of our original communication. We wished to show the possibility and to describe some applications of selective *monochromatic irradiation* as an instrument of research in biological problems.

Before this, filters have been used in order to separate different spectral regions, chiefly because monochromators have not been constructed to give a sufficiently high intensity in the ultra-violet to bring about photochemical changes in a reasonable time. (In 1929 Marshall and Knudson, however, applied monochromatic radiation to ergosterol.) With our instrument, we are able to secure accurately monochromatic light of very high intensity. The use of broad bands of ultra-violet radiation, even though selected with a knowledge of absorption spectra, may often conceal the essential molecular changes which occur in a photochemical reaction. Thus, unless the parent substance is irradiated with strictly monochromatic light, the possibilities are left open (*a*) that the parent molecule may be destroyed in two or more ways simultaneously, and/or (*b*) that the daughter molecule may be destroyed by absorption of wavelengths other than that causing its production from the parent. These possibilities cannot be definitely excluded by the use of filters, but only by the use of monochromatic radiation.

The method and its applications (which naturally vary from molecule to molecule) will be described in full in a subsequent publication. Until this complete statement is available, we feel that it will economise in time and space to postpone discussion of the detailed points raised by Heilbron and Morton. We should, however, like to say, in reference to vitamin A, that up to the present we have only recorded the fact that on irradiating carotene we have obtained a band near 3280 Å.; at a later date, however, we hope to be able to announce the results of experiments on the nutritive value of samples in which the whole of the carotene has been destroyed. We are also trying to devise physical tests more detailed than those in present use, to apply to our irradiated product and to vitamin A itself.

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Hexuronic Acid as the Antiscorbutic Factor

At the request of Prof. A. Szent-Györgyi, crystalline hexuronic acid from adrenal glands, kindly supplied by him, was tested by us for antiscorbutic activity. Six guinea-pigs, weighing 260 gm., 275 gm., 300 gm., 280 gm., 295 gm., and 310 gm., were employed in the test. Each animal received 1 mgm. of the preparation daily, the first dose being administered when the animals had been six days on the scorbutic diet.

Fifty-five days after the commencement of the experiment the guinea-pigs were chloroformed, owing

to the exhaustion of the supply of hexuronic acid, and were found to be free from macroscopic signs of scurvy at autopsy. The weight of the animals at the time of death was 430 gm., 465 gm., 355 gm., 392 gm., 370 gm., and 442 gm. respectively. All the guinea-pigs showed uninterrupted growth during approximately the first forty days, after which time their weights declined slightly. The post-mortem examination did not, however, suggest that this decline was due to scurvy.

The results are, therefore, very similar to those obtained by Svirbely and Szent-Györgyi,¹ but, as I pointed out later,² although this proves the presence of the antiscorbutic factor in Szent-Györgyi's preparation, it does not, in my opinion, afford sufficient evidence of the identity of hexuronic acid with the antiscorbutic factor.

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¹ NATURE, April 16, p. 576.

² NATURE, May 7, p. 690.

VITAMIN C is the name given to a substance the lack of which causes scurvy. Svirbely and Szent-Györgyi have shown (NATURE, April 16 and May 7) that the hexuronic acid which was discovered by one of them, and is present in orange and lemon juice, is capable of preventing scurvy. Furthermore, they have shown that lemon juice has approximately the same antiscorbutic activity as the hexuronic acid present in it. In my opinion, no clearer demonstration could have been given of the identity of hexuronic acid and the vitamin. No circumstantial evidence can have much value against such a direct demonstration. The only possibility of doubt was with regard to the correctness of the experiment. However carefully an experiment is done, there is always the chance of an error, especially in such a subtle question as a deficiency disease. For this reason I asked Dr. S. S. Zilva to repeat our experiments, and supplied the necessary crystalline hexuronic acid. Dr. Zilva was kind enough to accept and undertake the work. As he reports above, his experiments were entirely confirmatory, so that no doubt is left whatever regarding the antiscorbutic activity and thus the vitamin nature of the hexuronic acid.

It needs very big assumptions to explain these results in any way other than by supposing that hexuronic acid is in fact the vitamin. An adequate explanation will be given in our detailed report in the *Biochemical Journal* of the observations which led Dr. Zilva several years ago to the opinion that the vitamin could not be part of the 'Reducing Factor', and thus could not be identical with hexuronic acid.

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Central and Peripheral Vision

It is generally stated that the fact, long known to astronomers, that faint stars are seen most distinctly when viewed eccentrically is a phenomenon of dark adaptation, but this is not the case, as exactly the same condition is found with the light-adapted eye, as a simple experiment will show.

If two discs of white paper, each of a diameter of a sixteenth of an inch, be pasted on black cardboard an inch apart and viewed from a distance of twelve to eighteen inches, it will be found that the one that is directly looked at (with one eye) appears much darker than the other. This is observed in broad daylight.

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Board of Trade, S.W.1,
June 4.