Letters to the Editor.

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The Absorption Spectrum of Vitamin A.

THE study of the oil-soluble vitamins has supplied overwhelming proof that both provitamin D and the antirachitic vitamin itself exhibit photochemical properties. As regards the action of light on vitamin A, the balance of opinion has, we believe, hitherto been in favour of an indirect oxidation process rather than a purely photochemical mechanism. Although the evidence for the former has been somewhat ill-founded, its adoption has led to the neglect of the latter view, which we are now able definitely to prove is the correct one.

As photochemical changes imply absorption, and presumably selective absorption, of light, we adopted some time ago the following working hypotheses:

(a) that provitamin D should exhibit selective absorption in the ultra-violet, and

(b) that vitamin A should exhibit selective absorption in the visible or near ultra-violet, since it has been demonstrated by many workers (for example, Peacock, *Lancet*, ii., 328; 1926) that this vitamin is destroyed either by sunlight or the light from an incandescent lamp.

The first hypothesis was confirmed by a spectrographic study of cholesterol from cod-liver oil, when three absorption bands at 293.5 μ , 281.5 μ , and 270 μ were observed and shown to be criteria of provitamin D. This discovery paved the way to the recognition of ergosterol as the photochemical precursor of vitamin D.

As regards the second hypothesis, work on this has in the past been hindered by the difficulty of obtaining really rich sources of vitamin A. Since cod-liver oil is the best known source of this vitamin, it is clear that we should start from this material. The absorption spectrum of cod-liver oil had previously been examined by Schlutz and Morse (*Amer. J. Dis. Child.*, 30, 199; 1925) and Schlutz and Ziegler (*J. Biol. Chem.*, 69, 415; 1926), who found two absorption bands at about 328 μ and 279 μ in thin films of the oil. Heilbron, Kamm, and Morton (*Biochem. J.*, 21, 78, 1279; 1927) also observed marked inflections in the regions 320 μ and 270-290 μ , whilst Woodrow (*Phil. Mag.*, 943; 1928) has recently recorded both the band in the neighbourhood of 320 μ and the fine structure associated with ergosterol. From these observations it is clearly reasonable to test the hypothesis that the 328 μ band is connected with vitamin A, since no other constituent of cod-liver oil is known to show a band in this region of the spectrum.

A large and varied assortment of fish liver oils and vitamin A concentrates has now been collected and a detailed spectrographic examination made of the samples. The outstanding result of this work has been the recording of a prominent absorption band at 328.5 μ , the intensity of which, moreover, runs closely parallel with the vitamin A potencies of the various oils as measured by the well-known antimony trichloride colour test. Irradiation results in the disappearance of the chromogenic substance. Biological experiments have proved that aeration or oxidation also causes the destruction of the vitamin, and we have now found that the spectrographic tests indicate the same result.

In order to define the active wave-lengths more closely, a rich vitamin A containing oil was irradiated for forty-eight hours in a small silvered quartz test-tube. The advantage of the silvering lies in the fact that the thin film of metal transmits only a narrow band of the spectrum, the absorption of the oil being almost exactly the same as the transmission of the filter. Not only was the vitamin potency as determined by the colour test reduced to very small dimensions, but the selective absorption almost wholly disappeared.

It seems likely, from evidence which will be communicated in full elsewhere, that the first decomposition products of vitamin A include a substance possessing an absorption band in the region 275-285 μ .

Examination of 'non-saponifiable' extracts prepared in Prof. Drummond's laboratories indicates, as shown in the following table, that not only is the 328 μ band present, but also that the dilution used is in good agreement with the high concentration of the vitamin present.

Material.	Prof. Drummond's Estimates (SbCl ₃ Test).	Values from the 328 μ Band.
Cod liver 1 . . .	1	1
Cod liver 2 . . .	2	1.6
Cod liver 3 . . .	3	3.2
Cod-liver oil extract *	500	200-300
Sheep-liver fat extract *	775	800-1000

* Non-saponifiable material from which all sterols have been removed by crystallisation and precipitation with digitonin.

The adoption of the 328 μ band as a criterion of vitamin A will, we hope, assist in the elucidation of the chemical nature of the substance. Whilst the test may not always be as delicate as the antimony trichloride reaction, it is less empirical and in all probability more trustworthy.

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Earthquake Warnings.

IN continuation of my letters to NATURE on earthquake warnings in 1923 (vol. 112, p. 538) and 1927 (vol. 120, p. 619), I should like to direct attention to an important paper by Prof. Ishimoto (*Bull. Earthquake Research Inst.*, vol. 4, pp. 203-222). Most of it is in the Japanese language and character, but there is a brief abstract in French on pp. 203-206, and the figures, plates, and tables are easily understood. These show the tilting of the ground preceding earthquakes in the Tango (Tahano) peninsula on the north coast of Japan, indicated by the 'tiltometer' (or 'klinograph') set up at Miyadu (Miyasu), 35° 27' N. and 135° 13' E.). The observations were carried out immediately after the great Tango earthquake of Mar. 7, 1927, and graphs are given showing the tilting during two periods from Mar. 15 to April 1, and from April 22 to Sept. 10 in the same year.

During this time there were nine earthquakes which were recorded either at Miyadu, or at Toyooka, 32 km. to the west, and had an intensity not below that indicated by II. on the Japanese scale (IV. on the Mercalli scale). All except two were immediately preceded by a marked tilting of the instrument, superposed on the minor diurnal tilts, due mainly to variations of temperature. The amount of the tilts preceding earthquakes varied from 6.5 to 19.8, and 26.2 seconds of arc, but the last took place in three stages