simply because at the depth at which the water, as such, would have left light preponderatingly blue, the gross particles would have reduced the illumination to less than that at which plants could survive. The presence of a selectively absorbing tint and of finer particles also reduces the blue light.

Evidence as to the relatively great turbidity of fresh-water lakes is afforded by measurements with the Secchi disc. Southern and Gardiner found that in Lake Atorick, which is supplied by drainage from bogs, the maximum depth for visibility was 3 m., for Lake Derg, 10 miles from the entry of the River Shannon, 4·8 m., for a very clear lake, Loughrea, 10·3 m. Values for certain lowland European lakes range from 0·2 to 7·25 m., according to Thomasson. In the sea, however, off Plymouth, Russell has found 13 m. in April to more than 20 m. in June, and values up to 50 m. are not uncommon in the open sea. Moreover, most of the fresh waters are subjected to periodical floods, with increase in turbidity. Only rarely, therefore, would the possession of a red pigment be of any service to fresh-water plants.

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The Caryophyllene Alcohols and their Occurrence in Nature.

IT is a well-known fact that most hydrocarbons of the terpene and higher terpene classes are associated in Nature with corresponding alcohols from which the hydrocarbons themselves can be derived by removal of the elements of water. It is very probable, indeed, that these unsaturated hydrocarbons are actually produced in the plant by this method. Now, with the exception of cadinene, caryophyllene is probably the most widely distributed sesquiterpene in Nature, and it has therefore long been a matter of surprise that caryophyllene alcohol (which may readily be prepared from caryophyllene by Wallach's hydration method) does not occur naturally. The author knows of no recorded discovery of this alcohol in essential oils.

A study of the chemistry of caryophyllene, however, and in particular some work carried out recently in this laboratory (Henderson and Robertson, *Jour. Chem. Soc.*, 1926, 62-70), throws considerable light on this problem. Briefly, it has been established that Wallach's hydration method effects ring closure in the caryophyllene molecule with the production of a tricyclic structure. The reaction is not reversible, and the dicyclic caryophyllene structure cannot again be derived from the alcohol and its derivatives. The alcohol and its esters, therefore, possess a different configuration from that of caryophyllene, and hence could not be expected to occur as parent compounds of this hydrocarbon.

This may be said to explain the non-occurrence of caryophyllene alcohol in Nature. Another interesting result of this work, however, has recently been brought to my notice. In the paper referred to above, a new caryophyllene alcohol, called caryophyllol, was synthesised directly from the hydrocarbon, and was shown to retain the dicyclic caryophyllene structure. Caryophyllol, therefore, and not Wallach's hydrate, we would expect to find occurring in plants as the natural parent of caryophyllene, and this surmise appears to be justified by some work of Semmler on an oil drawn from clove stems (*Ber.*, 1912, 45, 1392). In the higher boiling fractions he discovered a bicyclic sesquiterpene alcohol the properties of which are practically identical with those of the synthetic caryophyllol, as the following figures show:

	b.p.	$d_4^{17-20°}$	$n_D^{17-20°}$	$[R_L]_D$
Semmler's alcohol from clove stems	138-148° at 8 mm.	0·9681	1·5010	68·18
Synthetic caryophyllol	142-150° at 10 mm.	0·9632	1·5015	68·03

The agreement is the more striking in that the boiling-point and density of these compounds are both lower than is usual with alcohols of this class, and are therefore the more characteristic.

It is hoped that further work will establish the chemical identity of these two alcohols, although the experiments may be complicated owing to the theoretical possibility of four closely related isomers. In the meantime it may with some safety be predicted that caryophyllol will be found to occur in the higher boiling portions of other essential oils which contain caryophyllene.

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The Reversal of the Hydrogen Series in the Extreme Ultra-Violet.

IN the course of the presentation of a paper on the spectrum of neon at the spring meeting of the American Physical Society a year ago, I mentioned that I had been able to obtain the first three members of the hydrogen series in the extreme ultra-violet reversed. Recently I have repeated the experiment with the purpose of improving the technique and confirming the results.

In the first place, it is necessary to produce a continuous spectrum in the region in question; I have already described briefly how this may be accomplished (*Astrophysical Journal*, vol. 60, July 1924, p. 2). The procedure consists in charging a condenser of about 0·5 micro-farad capacity with a direct current and then discharging it through a vacuum tube of the internal capillary type arranged in series with a half-centimetre spark gap. The best results are obtained with a discharge tube of common glass. It is important that the capillary be not too large: I have found a diameter of about a millimetre satisfactory. The material of the electrodes is not important: I have employed tungsten.

The continuous spectrum seems to owe its existence to the disintegration products of the glass set free by the erosive action of the discharge; its strength depends scarcely at all on the nature of the gas in the discharge tube. The experiment is not without mechanical difficulties, for the slit of the spectroscope frequently becomes plugged up by glass dust, the removal of which involves a troublesome process.

Once the conditions for producing the continuous background have been secured, the best results were obtained by admitting hydrogen into the discharge tube at a pressure of about one millimetre. Upon applying the explosive condenser discharge, the first four members of the series—1215·6, 1025·8, 972·5, and 949·7—appear on the photographic plate sharply reversed. It is not necessary to employ pure hydrogen, however; the first two members of the series have been obtained with helium containing a trace of hydrogen. The nature of the apparatus is such (*Astrophysical Journal*, vol. 60, p. 8, 1924) that a distance of about one centimetre separates the end of the capillary from the slit of the spectroscope, while the gas which fills the discharge tube is removed from the light path by a pump the inlet of which lies two