If in equation (4) we insert that value for N which results from a combination of equations (1) and (3), that is

$$(6)\quad N = e^4/(f^2 m_p^2 m^2)$$

we find

$$(7)\quad M = e^3/(f^{3/2} m_p m).$$

By inserting on the right-hand side of (7) the well-known values for the constants, we obtain

$$(8)\quad M = 4 \times 10^{33} \text{ grams}$$

or about twice the mass of the sun. This result is in good agreement with astronomical observations, since the fixed stars were found to have masses varying between about 0.2 and 50 times the mass of the sun, the average mass being a modest multiple of that of the sun.

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AN APPROACH TO THE SYNTHESIS OF FICHTELITE

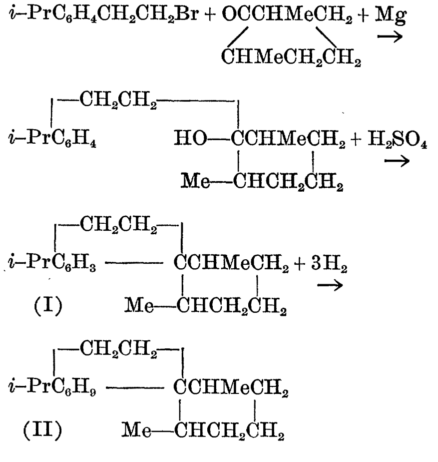
One of the most interesting of the retene derivatives is the fichtelite which occurs, usually associated with retene itself, in partially fossilized pine trunks found in various European peat and lignite beds. Its source is evidently the resin acids originally present in the coniferous woods in which it lies buried. It has been known for just about a century. For many years it was believed to be perhydroretene, $C_{18}H_{32}$, until Ipatiew's synthesis of the latter proved that the two were not identical. Based upon some new experimental work, Ruzicka and Waldmann recently[1] proposed for fichtelite the structure of 12-methyl-perhydroretene, or perhydroabietane, $C_{19}H_{34}$ (II).

In the January, 1938, issue of the *Journal* of the American Chemical Society, Fieser and Campbell (p. 167) have described a tetrahydroabietic acid (m.p. 163–164.5°), decarboxylation of which should yield 12-methyl-perhydroretene.

Since in these laboratories we have for some time been attacking, from the synthetic side, this problem of the constitution of fichtelite, it seems to us desirable to report here briefly the progress to date.

Steps followed in this synthesis have been the following, using *m*-bromocumene as the initial material:

$$m\text{-}i\text{-PrC}_6\text{H}_4\text{Br} \xrightarrow[+\,\text{Mg}]{+\,(\text{CH}_2)_2\text{O}} i\text{-PrC}_6\text{H}_4\text{CH}_2\text{CH}_2\text{OH} \xrightarrow{+\,\text{PBr}_3}$$



The octahydro derivative (I) gave retene when fused with selenium. Catalytically hydrogenated at 225° and 150 atmospheres pressure, for four hours, in the presence of Raney nickel, in methylcyclohexane solution, it absorbed 3 moles of hydrogen per mole of hydrocarbon, with formation of a $C_{19}H_{34}$ hydrocarbon, as an odorless, colorless, transparent, viscous oil, b.p. 179–181° at 12 mm., n_{25}^{D} 1.5025, which congealed to a glassy solid when cooled well below laboratory temperature. With cold alkaline permanganate or with a carbon tetrachloride solution of bromine, it behaved as a saturated compound and also was inert to concentrated sulfuric acid.

As fichtelite is a white crystalline solid, m.p. 46°, our synthetic product obviously is not identical therewith. It may be that the difference between the two is a stereochemical one[2] or that our product requires further purification.

A critical comparison of the synthetic with the natural product has been delayed by the difficulty we have encountered in securing an adequate supply of fichtelite.

The research is being continued, in the endeavor to clear up these points.

To Professor Homer Adkins, of the University of Wisconsin, we are particularly indebted for his assistance in the catalytic hydrogenation of the octahydro derivative (I).

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SCIENTIFIC APPARATUS AND LABORATORY METHODS

A BATH FOR SMOOTH MUSCLE

It is difficult when recording smooth muscle contractions *in vitro* to change the fluid surrounding the muscle without exposure of the preparation to the atmosphere. This may be accomplished rapidly and easily with the smooth muscle bath shown in the ac-

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[1] *Helv. Chim. Acta,* 18: 611, 1935.

[2] *Cf.* Ruzicka, Balaš and Schinz; *Helv. Chim. Acta,* 6: 695, 1923.