

only the signs are given. We now calculate \bar{r} from equation I. Using $\bar{m}_y^{(2)}$ instead of $\bar{m}_y^{(1)}$ we get another value for \bar{r} . Similarly with $\bar{m}_x^{(2)}$ and $\bar{m}_y^{(1)}$ and $\bar{m}_y^{(2)}$ separately we get two more values of \bar{r} . We now take the highest and the lowest of these four values. Let \bar{r}_1 and \bar{r}_2 be these values. We will call the interval from \bar{r}_1 to \bar{r}_2 (including the end values) the P interval for \bar{r} . In a similar manner we can obtain an interval for \bar{r} on any other limit for random chance.

A General Test of Significance of \bar{r} .—Our test of significance may now be stated thus:

Using some limit for random chance we calculate the interval for \bar{r} as explained above. If this interval does not contain zero, \bar{r} is significant, and if zero be an end value

of this interval \bar{r} may be considered to be just significant.

It is easy to see that this test is quite general, that is, it is applicable to all samples irrespective of the frequency distributions in the populations, from which the samples were obtained. Details will be published elsewhere.

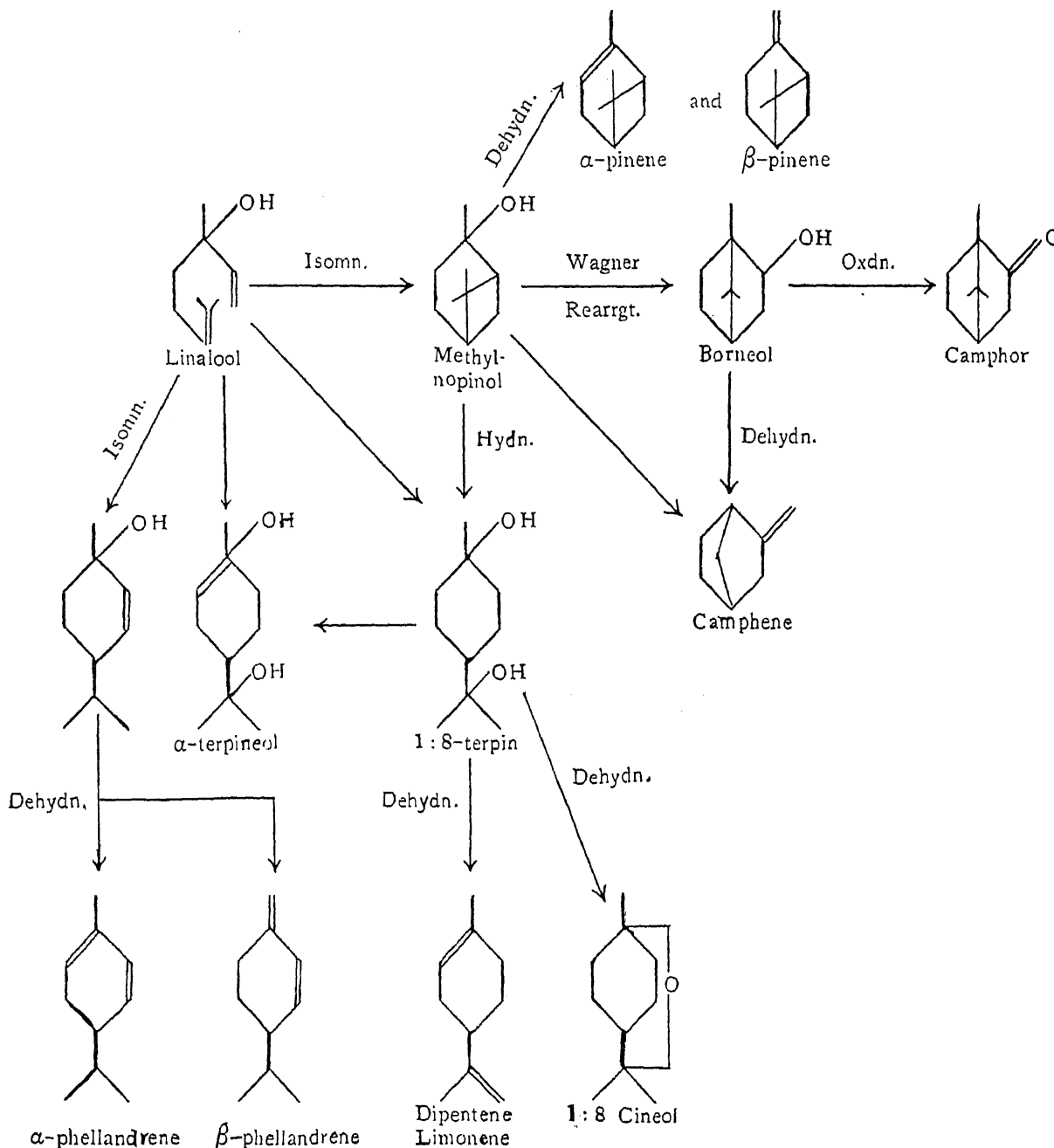
Poona 5,
July 8, 1937.

S. R. SAVUR.

¹ S. R. Savur, *Proc. Ind. Acad. Sci.*, 1937, 5, 564.

The Biogenesis of the Terpenes.

ADOPTING the view that, in general, the widely distributed terpenes are only indicative of the ease with which the biological



reactions in the plant proceed in the direction of their formation and not suggest that they are functioning as the progenitors of other terpenes, a study of the relative abundance of the terpenes should serve as a clue to understand the biogenetic tendencies in the plant regarding the synthesis of the terpenes. A census taken with this idea furnishes the following data: α -pinene occurring in 375 oils; cineol in 260; limonene or dipentene in 160; phellandrene (α or β) in 126; borneol in 110; camphene in 85; camphor in 70; α -terpineol in 165; β -pinene in 60 and the others are all occurring in smaller number of oils (the aliphatic terpenes being omitted).

From a knowledge of the general reactions of the various terpenes in our "test-tube experiments" and an analysis of their 'molecular architecture', it is suggested (after trying various possibilities) that linalool can satisfactorily be considered to be the precursor of all the abovementioned widely occurring terpenes. Very significant is the suggestion of Ruzicka¹ that the formation of small amounts of camphor and borneol observed by Winogradov² when linalool is heated with activated aluminium, takes place through the intermediate methylpinol, the formation of which from linalool by a double ring closure is now considered to be the trigger reaction in the production of the widely distributed bicyclic terpenes.

The scheme given above shows the probable "general direction of the processes" in the formation of the widely distributed terpenes in nature.

Regarding the formation of the widely distributed linalool (which is very closely related to geraniol, citral, citronellol and citronellal) it seems better to defer speculating till the exact (botanical) mechanism of the formation of the terpenes in the plant is understood.

The above scheme accommodates many facts, the detailed discussion of which as also the mechanism of formation of the other terpenes will shortly be published.

The author thanks Dr. P. C. Guha for valuable suggestions.

K. GANAPATHI.

Department of Organic Chemistry,
Indian Institute of Science,
Bangalore,
May 31, 1937.

¹ *Ann. Rev. of Biochem.*, 1932, 1, 583.

² *Ber.*, 1931, 64, 1991.

Physiology and Function of the Oesophageal Diverticulum in Blood-sucking Psychodidae.

It has been suggested by the previous workers on this line that the general function of the oesophageal diverticulum is that of a crop or a food reservoir, from which the food material is regurgitated back into the alimentary canal at intervals. The following experiment was done to determine as far as possible the exact function of the diverticulum. Sterile *Phlebotomus argentipes* Ann. and Brun. kept in different cages were allowed to suck the free-fluid from cotton-wool soaked in the following solutions, viz., 5% glucose in distilled water stained with methylene-blue, 5% glucose with a colloidal suspension of Indian ink and N.N.N. culture with flagellates. The midges were picked up after they were fully fed and dissected immediately. It was found in the case of flies fed on glucose-methylene-blue solution that the diverticulum was bloated up considerably with the fluid while in the case of those fed with the fluid with a suspension of Indian ink some of the finer particles reached the diverticulum along with glucose; the coarser particles, on the other hand, being diverted to the mid-gut. The experiment with the N.N.N. medium with flagellates showed the presence of flagellates both in the diverticulum and the mid-gut. Apparently, the mid-gut was reached after the diverticulum was already full. In the control experiment with flies fed on an animal it was found that flies bloated up with a blood-meal seldom showed any trace of blood in