behaviour of compounds in gas chromatography. The analysis was then carried out at intervals over the range 100°–200° C., and the retention volumes of the constituents determined.

At temperatures less than 125° C. the elution sequence was found to be 1 myrcene, 2 caryophyllene, 3 farnesene, 4 humulene; but above this temperature the sequence is 1 myrcene, 2 farnesene, 3 caryophyllene, 4 humulene. At 125° C. no separation of farnesene and caryophyllene is obtained. The change in retention volume relative to humulene for these two compounds is shown in Fig. 2. As can be seen, caryophyllene behaves normally in moving closer to humulene with increasing temperature, while farnesene moves farther away.

This effect must be due to a higher gradient on the vapour pressure/temperature curve for farnesene than on the equivalent curves for the two cyclic hydrocarbons. If this is the case, this type of behaviour may be of frequent occurrence in gas chromatography.

J. B. Roberts

Department of Hop Research,
Wye College (University of London),
Nr. Ashford, Kent.

[1] Howard, G. A., and Slater, C. A., *Chem. and Indust.*, 495 (1957).

Coding of Open-ended Carbon Chains

For any given open-ended carbon net the problem is to determine a number or code which is specific to this net and which permits its identification by a one-dimensional search in a sufficiently extensive catalogue of nets.

A method of coding nearly satisfying these requirements is suggested here.

Let the 'distance' between two carbon atoms of a net be one plus the number of intervening atoms when proceeding along the net from one atom to the other. Thus there will be a distance 1 between adjacent atoms, 2 between alternate atoms, etc. Let n_1 denote the number of pairs of adjacent atoms, n_2 the number of pairs of alternate atoms, and generally let n_i denote the number of pairs of atoms at a distance i.

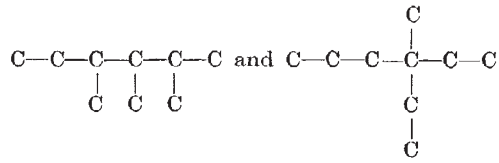
Consider now the number $(n_1, n_2, \ldots . n_s)$, $n_s \neq 0$, $n_t = 0$ when $t > s$, and examine its suitability as a code for an open-ended carbon atom net with n atoms. It will be noted at once that we have:

$$\sum_1^s n_i = \frac{n(n-1)}{2} \text{ and } n_1 = n - 1$$

and since the number n_1 is univocally determined by all others, it may be ignored. Furthermore, it has been established by inspection that n_2 is fully determined by the other n_i's, provided the convention is adopted to eliminate from the classification all nets of less than four atoms and the branched four-atom net, so that n_2 may be ignored also. With these conventions (1) denotes a four-atom unbranched chain, (2, 1) a five-atom unbranched chain, (2) a five-atom branched chain, (0) a five atom net in which a central atom is linked to the other four, etc.

This method of coding appears satisfactory for the following reason.

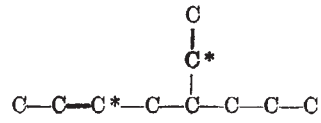
When the question is asked whether two different open-ended nets can correspond to the same code, a search extended up to nets of 10 carbon atoms has revealed only a single family of paired nets in which this occurs, namely, the family the first pair of which is the two nine-atom nets:



both of which have ten pairs of atoms with the distance 3, six pairs with the distance 4 and two pairs with the distance 5, and are therefore represented by the common code (10, 6, 2). The other members of the family are obtained by replacing each single link — by the straight chain —C—C...C— of k atoms in the two C_9 nets shown above so as to obtain two C_{9+8k} nets.

Since there is no occurrence of ambiguity for ten-atom nets, the last case searched, and since the number of nets approximately doubles whenever an atom is added, while the number of available codes increases more rapidly, it is believed that very few cases of ambiguity will be encountered in addition to the family just stated.

A similar code may be defined to denote nearly unambiguously within any given open-ended net the location of any carbon atom to which a special radical may be appended. This location code consists of the successive numbers of carbon atoms which are at distance 1, 2, etc., of the location considered, and here again a limited search has revealed a single family of nets in which there is ambiguity, namely, the family the first member of which is the net:



in which the two asterisked carbon atoms have both the location code (2, 2, 2, 2, 1). The other nets of the family are formed by lengthening by $2k$ atoms the three branches of the net written above while moving the asterisked atoms a distance k away from centre, and the location code of both atoms consists of $3k + 4$ 2's followed by a 1.

If several radicals are added, the codes for the location of each radical should include the distance of every other radical in order to remove any ambiguity in the relative location of the radicals which might otherwise arise from the molecule symmetry.

Marcel J. E. Golay

Technische Hogeschool,
Eindhoven.

Acenaphthene Derivatives and *c*-Mitosis

The effect of acenaphthene (I, R = H) on plant cells, producing mitotic abnormalities, has been known for many years[1,2]. It appears to have an effect similar to that of colchicine, but requiring very low concentrations of material. Introduction of substituents into the acenaphthene nucleus may modify the activity. Schmuck *et al.*[3] found that compounds such as 5-bromoacenaphthene (I, R = Br) and 5-chloroacenaphthene (I, R = Cl) were also active, but when the substituent was a hydrophilic group, as in 5-carboxy acenaphthene (I, R = COOH), the antimitotic activity disappeared. Similar observations were made when bridge-substituted acenaph-