This close similarity is no doubt due to the essential dynamical similarity of the two processes. The charge of the Lichtenberg figure corresponds to the mass of the liquid drop and the voltage corresponds to the height of fall of the liquid drop. Both processes are almost instantaneous. The Lichtenberg figure may, therefore, be regarded as a splash produced by a drop of electricity.

The Lichtenberg figure is obtained only on insulators like glass, ebonite, etc. On a good conductor the electricity immediately spreads. However, for different substances the diameters of the Lichtenberg figures are different. In the corresponding case of the splash of the liquid drop, the diameter of the splash varies with the absorbing properties of the material on which it is produced. If any absorbent paper like filter-paper is used, the diameter of the splash is increased. This suggests that a good conductor acts like an infinite absorber of the electric charge and produces as it were a Lichtenberg figure having the size and shape of the conductor itself.

The analogy cannot obviously be pushed too far, but as far as it goes, it is interesting enough.

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PARACHORS AND MOLECULAR DIMENSIONS

AN equation to calculate molecular diameters in the liquid state from parachors has been already proposed by the author.[1] In the case of gaseous substances, molecular dimensions can be calculated by correlating the Van der Waals constant $b=\frac{V_c}{3}$ with parachor in the following manner. According to Sugden,[2] the mean value of $\frac{[P]}{V_c}=0\cdot77$, where [P] and V_c are the parachor and critical volume respectively. Hence we get $b=\frac{[P]}{2\cdot31}$. If molecules are assumed to be spherical in shape and if a substance is regarded as an assemblage of spheres of diameter σ packed together as closely as possible,[3] it has been calculated that $b=\frac{2}{3}\pi\sigma^3N$, where N is the Avogadro constant. Thus,

$$\sigma=0\cdot7\,[P]^{\frac{1}{3}}\times10^{-8}\text{ cm.} \qquad \text{(i)}$$

The reliability of the ratio $\frac{[P]}{V_c}=0\cdot77$ has now been determined by Herzog[4] to be of the order of $\pm$ 30%. Allowing a maximum deviation of $\pm$30% for this ratio, the reliability for σ will be of the order of $\pm$10%, since the above equation for calculating σ from [P] involves a cube-root of [P]. Calculations of molecular dimensions from parachors can be of great use in the study of chemical kinetics of reactions, since parachor data are more readily available than other data required to calculate molecular diameters.

If more reliable calculations are desired, the following method may be adopted. A dimensional analysis of the parachor gives the equation[5] $[P]=KV_c^{5/6}\,T_c^{1/4}$, the value of $K=0\cdot41$ being proposed by Ferguson.[6] Rewriting,

$$V_c=2\cdot92\,\frac{[P]^{1\cdot2}}{T_c^{0\cdot3}}.$$

Substituting for V_c by 3*b* and for *b* as in (i), we get

$$2\pi\sigma^3N=2\cdot92\,\frac{[P]^{1\cdot2}}{T_c^{0\cdot3}}.$$

Hence

$$\sigma=0\cdot92\,\frac{[P]^{0\cdot4}}{T_c^{0\cdot1}}\times10^{-8}\text{ cm.} \qquad \text{(ii)}$$

Equation (ii) has a reliability of about $\pm2\cdot2$% for all compounds excepting the following:— those having the functional groups $-C=0$, $-C\equiv N$, $-$ COOH, and $-$ OH, and one to three additional non-functional carbons.[4] For such substances, the following equation

$$\sigma=0\cdot96\,\frac{[P]^{0\cdot4}}{T_c^{0\cdot1}}\times10^{-8}\text{ cm.}$$

holds good with a reliability of $\pm3\cdot5$%.

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May 15, 1945.
M. S. TELANG.

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POSITIVELY CHARGED FERRIC VANADATE SOL

IN a communication[1] from this laboratory, the preparation of negatively charged ferric vanadate sol was described. It is now observed in presence of glucose ferric chloride dissolves a considerable amount of ammonium vanadate, to give a red coloured sol which bears a positive charge. The sol under investigation was prepared by dissolving 40 c.c. of ammonium vanadate solution (corresponding to 6·49 gms. of V_2O_5 per litre). In 20 c.c. of ferric chloride solution (corresponding to 34·92 gms. of Fe_2O_3 per litre) in presence of 20 c.c. of 20 per cent. glucose solution. The sol. was kept in a parchment paper and was dialysed for two days.

Composition of the Sol.—The amount of iron and vanadium in a known volume of the sol were determined by the standard methods of analysis. The combined iron corresponding to this amount of vanadium was calculated on the assumption that the ferric vanadate is $FeVO_4$. The rest of the iron is present as hydrated ferric oxide. From the ratio of the free to the combined iron, the emperical formula of the sol can be suggested.

Per litre:
Total iron—5·5282 gms.
Combined vanadium (V_2O_5)—3·1832 gms.
Combined iron—1·9540 gms.
Free iron—3·5742 gms.
Viscosity of the sol (30° C.)—0·00864 gms.
Viscosity of water (30° C.)—0·00803 gms.
Water bound—0·3519 gms.
Empirical formula—9 Fe_2O_3.10 $FeVO_4 . 6H_2O$.

The amount of bound water per litre of the sol was calculated from the Hatschek's[2] equation expressed in the following form:

$$\text{Bound water per litre} = \frac{1000}{A} = 1000\left(\frac{\eta_t - \eta_w}{\eta_t}\right)^3$$

where A is the ratio of the total volume of water in the sol to the volume of the water bound, η_w is the viscosity of the water at 30°C. and η_t is the viscosity of the sol at the same temperature (*cf.* Prakash).[3]

Detailed procedure of the study of the sol will be published elsewhere.

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July 4, 1945.

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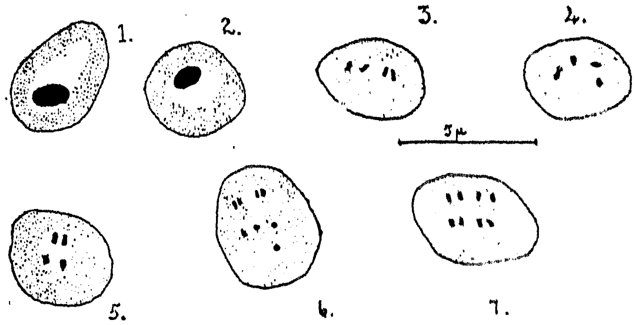
INDUCTION OF POLYPLOIDY IN *SACCHAROMYCES CEREVISIAE*

BAUCH[1,2] claims the production of new races of yeast by treatment with camphor and acenaphthene. Since these new races were bigger than the original strains he tentatively suggests that the chromosome numbers ought to have been doubled, tripled or quadrupled. However, no cytological confirmation seems to have been attempted. Since this line of attack offered interesting possibilities some experiments were conducted in this direction.

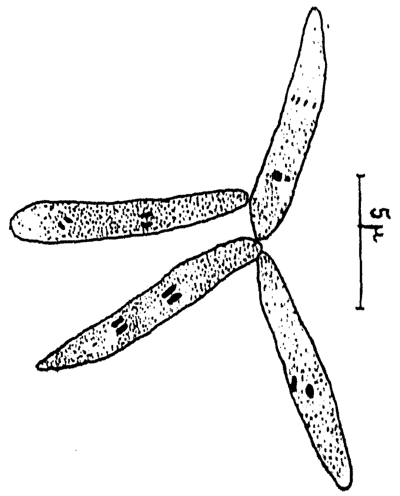
Sterile test-tubes of wort were inoculated with a loopful of Sc 9 (N.C.T.C. 3007) from a wort-agar slant and a few cyrstals of acenaphthene were added to the tubes. The time of treatment was arbitrarily fixed at 6 hours in order to have sufficient material for smearing. At the end of the above period the material in the tube was centrifuged and smears were made at definite intervals to get the mitotic figures. The slides were fixed in Carnoy and stained in Heidenhain's hæmatoxylin.

The pictures obtained were very interesting. Long thread-like mycelial growths are common, the cells measuring 9-10 μ in length and 1·5-2·0 μ in width (Fig. 8). Resting cells vary in dimensions from 3·5 μ to 5·5 μ and have a clear cytoplasm having a large vacuole and a stained nucleus (Figs. 1 and 2).

What strikes one is the large number of cells having four chromosomes disposed in various ways (Figs. 3, 4 and 5). Cells showing eight such chromosome-like structures are also common (Figs. 6 and 7). The measurements of the chromosomes are not given since the equipment at my disposal does not enable accurate measurements to be made. However, they appear to be far smaller than those



8



of the control strain (see Subramaniam and Ranganathan[3]). This disparity in the size of the chromosomes in different strains might have been the cause for the controversy concerning the identification of certain structures seen in the yeast cell during vegetative division, as the chromosomes (see Subramaniam and Ranganathan[4]).

What appears to be a tetraploid strain has been isolated by planting and this is now being purified. Uptill now all the cultures have been kept in the vegetative condition. Whether these strains would retain their chromosome constitution after repeated sporulation and whether they have any economic importance can only be judged after extensive tests.

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Bangalore, M. K. SUBRAMANIAM.
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