

RESEARCH ITEMS

Inheritance of Tuberculosis

It has been difficult in the past to evaluate correctly the evidence for the inheritance of tuberculosis or of tendencies which might facilitate infection. Obviously twins provide material which might give valuable evidence on this matter. The analysis of twins has been developed by F. J. Kallmann and D. Reischer (*J. Hered.*, 34, 293; 1943), with highly significant results. 616 twins, 930 sibs, 74 half-sibs and 668 parents in 308 complete families containing twins have been statistically analysed regarding the incidence of tuberculosis. The chance of contracting the disease increases in strict proportion to the degree of consanguinity to a tuberculous patient. The fact that monozygous twins exhibit 16 times as much similarity in resistance as compared with dizygous twins when all criteria are considered indicates that heredity, probably of a multifactorial nature, influences resistance. The authors point out that resistance to the invasion of the bacillus may be different from the factors of resistance to the spread of the established disease. This is supported by the fact that while there is a difference of 1:16 between resistance to progressive disease, there is only a difference of 1:3.5 in resistance to any form of clinical tuberculosis in monozygous and dizygous twins. The authors are proceeding further with this important analysis.

Freshwater Bryozoa

MARY D. ROGICK, in her "Studies of Fresh-water Bryozoa. XIV. The Occurrence of *Stoilella indica* in North America" (*Ann. New York Acad. Sci.*, 45; 1943), records *Stoilella indica* Annandale from North America for the first time. The genus was known hitherto only from Asia and South America. This freshwater bryozoon was collected in a pond in Westtown, Chester County, Pennsylvania, where it was fairly abundant on submerged twigs. The pond is fed from a spring passing through a meadow and contains much submerged pond-weed and some lily pads. Filamentous algae were abundant on the submerged twigs, logs and other objects. In a larger pond nearby, four other species of freshwater Bryozoa occurred. A note on statoblasts in general suggests a simplification in nomenclature, and the terms floatoblasts, sessoblasts and spinoblasts are used for floating, sessile and spiny statoblasts respectively.

Biotin Content of Enzymes

AMONG the members of the vitamin B complex, thiamin, riboflavin, and nicotinic acid occur in combination with a protein, that is, as the prosthetic groups of enzymes involved in respiration. The other members have been assigned no definite role in cellular metabolism. Several of these, notably biotin and *para*-aminobenzoic acid, occur in tissue in a bound form and are liberated only on strong hydrolysis. It might be expected that they also function as prosthetic groups of enzymes. D. R. Miller, J. O. Lampen and W. H. Peterson (*J. Amer. Chem. Soc.*, 65, 2369; 1943) find, however, that the biotin and *para*-aminobenzoic acid contents of six crystalline and three non-crystalline enzyme preparations, and one crystalline protein not an enzyme, lead to minimum molecular weights far in excess of the figures assigned to these enzymes. It is assumed, therefore, that the biotin and the acid are more prob-

ably contained as impurities in the crystalline proteins rather than forming an integral part of the enzyme.

Physiology of Pollen

D. LEWIS (*J. Genetics*, 45, 117 and 261; 1943-44) has published further results of his work on the physiology of pollen, which is having far-reaching scientific as well as practical results. He shows that autotetraploidy weakens the inhibition of incompatible pollen. By suitable crosses in synthetic polyploids of *Oenothera organensis*, he has shown that the reduction of the inhibition is due solely to the diploidy of the pollen and not to the tetraploidy of the style. Pollen grains with two different *S* allelomorphs have been used on styles with one or both genes. In some cases there was a difference in compatibility, in others the result was indifferent. These results are considered in relation to the hypothesis that the *S* allelomorphs are competing for an antigenic substance similar to the antigen-antibody reaction in animals. Among many details of importance the author indicates that the effect of one *S* allelomorph of one pollen grain may sometimes be influenced by an association with another *S* allelomorph before pollen-grain formation. In the second paper, the author shows how the discovery of the weakened inhibition to diploid pollen may be used in the production of useful polyploid economic plants. By treating the pollen-mother cells with heat shocks, pollen grains with the unreduced number of chromosomes may be produced. If these pollen grains are heterozygous for the *S* allelomorphs, they will function on a diploid style, whereas the haploid pollen grain will be inhibited by the normal incompatible mechanism. By this method, triploid pears have been produced, and results in plums, cherries and apples indicate that much use should be made of Lewis's method in the future.

Inheritance of *Tristyly* in *Lythrum Salicaria*

THE historic work of C. Darwin and Lady Barlow upon the inheritance of long-, mid- and short-styled plants of the loosestrife raised several unsolved problems. East published a hypothesis of lethal mid-genes to attempt to explain the results of crossing. This hypothesis left a number of unaccounted exceptions. R. A. Fisher and K. Mather (*Ann. Eugenics*, 12, 1; 1943) have followed their letter in *Nature* (150, 430; 1942) on this subject with extended results. They show that East's theory that the mid-gene was lethal when homozygous is wrong. By special methods of open pollination and statistics they have analysed large progenies and infer that the inheritance of long, mid and short is polysomic in type. Whether the inheritance is tetrasomic or hexasomic is unknown, but experiments are in progress. The authors have grown an open-pollinated population at Chelsea Physic Garden, and find that the mids have reduced fertility both in seed and pollen. This is different from that discovered by Darwin, and they suggest, therefore, that the experiment might be repeated at Down House, where the original work was performed.

Iron Hill Igneous Complex, Colorado

THE detailed report by E. S. Larsen on the rocks and minerals of the Iron Hill stock in south-west Colorado (*U.S. Geol. Surv., Prof. Paper* 197 A; 1942) is an important and long-awaited contribution to descriptive petrology. The stock has an area of

twelve square miles; it is emplaced in Pre-Cambrian granites and is overlain by late Jurassic sandstones. The sequence of rocks in the complex is as follows: (a) A mass of dolomitic marble which forms an isolated hill a mile across, as well as several small inclusions within the later rocks. From the evidence of bodies of similar marble in the neighbourhood it is believed that the main mass is of hydrothermal origin, though it may have been intruded as a carbonate magma. (b) A coarse-grained melilite rock known as uncomphgrite. (c) A pyroxenitic suite which makes up about 70 per cent of the area and ranges from diopside-rock to types composed of biotite, perovskite-magnetite and apatite-perovskite, with varieties containing feldspar, nepheline and sphene. (d) Ijolite composed of pyroxene, garnet and nepheline. In places nepheline appears to have 'soaked' into the pyroxenites. (e) Soda-syenite, commonly banded and associated with (f) a later nepheline-syenite; both (e) and (f) tend to occur near the borders of the stock. (g) A series of dykes of either nepheline-gabbro or quartz-gabbro, or in some cases both. Hydrothermal solutions were active throughout the history of the stock. To explain the origin of the complex the author postulates crystal differentiation of a basaltic magma modified by assimilation of marble in depth, but he himself points out one serious weakness in this conventional hypothesis, namely, its failure to account for the very high TiO_2 and P_2O_5 which characterize most of the rocks.

Magnetic Susceptibility of Iron Tetracarbonyl

IRON tetracarbonyl, which has a molecular weight roughly corresponding with the formula $[\text{Fe}(\text{CO})_4]_2$ is, like the other metal carbonyls, diamagnetic. The susceptibility values reported vary rather widely, and the value has been redetermined by H. G. Cutforth and P. W. Selwood (*J. Amer. Chem. Soc.*, 65, 2414; 1943). A well-crystallized material was prepared by way of the carbonyl $\text{Fe}_3(\text{CO})_9$ from $\text{Fe}(\text{CO})_5$. The actual material was found to be paramagnetic, suggesting para- or ferro-magnetic impurities. Measurements over a range of field strength showed that the susceptibility depended on the field. By plotting susceptibility against the reciprocal of field strength, extrapolating to infinite field strength gave a susceptibility of -0.07×10^{-6} , which is of the order expected, though rather small.

Electric Arc between Solid Carbons and Graphite Electrodes

IN a paper by J. T. MacGregor-Morris (*J. Inst. Elec. Eng.*, 91, Pt. 1, No. 41; May 1944) entitled "Experiments on the Candle-Power and Brightness of the Positive Crater of the Electric Arc, using Solid Carbons and Graphite Electrodes", a critical examination is made of the ways in which a standard of high-intensity light could be developed using the positive crater of an electric arc between carbon electrodes in air, and an account is given of much hitherto unpublished experimental work bearing on this problem. A three-electrode arc was adopted in the researches, and a physical photometer was used in which a galvanometer deflexion automatically gave a measure of the light output of the arc. The accuracy of the method exceeds that possible with visual photometry, and rapid variations of candle-power can be observed. Graphite electrodes and a wide range of uncoated soot electrodes were used. For a standard, either the candle-power of the

positive crater measured along the axis of the anode might be used, or the brightness of a small portion of the crater near the centre. Measurements are given of the effect on candle-power and brightness of many factors including diameter, resistivity and purity of the anode, arc current, negative electrodes, atmospheric pressure and absorption due to arc flame. Special attention is given to the elimination of a phenomenon the existence of which is generally not obvious, namely, the rapid rotation of the arc stream, which is accompanied by a reduction of candle-power and brightness of uncertain amount. A critical comparison is made with other published work, especially work in other countries, and it is concluded that a standard can best be developed utilizing brightness, an accuracy of 1 per cent being so far attained.

The Starch-Iodine Complex

THE nature of the blue material formed by the action of iodine on starch has been much discussed. In a series of papers by R. E. Rundle and co-workers (*J. Amer. Chem. Soc.*, 65, 554, 558, 1707, 2200; 1943; 66, 111, 130; 1944) evidence is presented for the view that the starch molecules are helical chains with a helix diameter of about 13.7 Å., a length per turn of about 8 Å., and about six glucose residues per turn, and in the starch-iodine complex the iodine molecules occupy the interior of the helices. Absorption spectra are said to confirm the existence of amylose and amylopectin as two components in whole starch. The amount of iodine bound in complex formation with amylose increases as the concentration of iodide decreases, becoming one iodine molecule for six glucose residues for infinitely dilute iodide solutions.

New Methods in Stellar Dynamics

S. CHANDRASEKHAR (*Ann. New York Acad. Sci.*, 45, Art. 3, 131; 1943) has prepared an abridged version of new methods developed by him for the investigation of the dynamics of stellar systems. An outline of the general principles of a statistical theory of stellar dynamics is provided in the paper. An interesting point is mentioned in dealing with the statistics of a gravitational field which arises from a random distribution of stars. The acceleration which a star suffers during a certain interval can be formally expressed as the sum of two terms: (1) a systematic term due to the action of the gravitational field of the smoothed out distribution; (2) a stochastic term representing the influence of the near neighbours. There is a similarity between the problem presented by stellar dynamics, as stated in the above fashion, and the problems which occur in the modern theories of Brownian motion. Part 3 of the paper deals with the rate of escape of stars from clusters and the evidence for the operation of dynamical friction; the Pleiades cluster is considered in relation to the results obtained. When dynamical friction is ignored, a half-life for the Pleiades of 5×10^7 years is predicted; but if it is taken into consideration, the half-life is 3×10^9 years, and there is little doubt but that dynamical friction provides the principal mechanism for the continued existence of the galactic clusters like the Pleiades for times of the order 3×10^9 years. Allowing for dynamical friction, however, will not account for half-lives of the order 10^{10} years for such clusters, and this provides support for the now currently adopted 'short time-scale' of the order 3×10^9 years.