

Research Items

Fertility and Contraception in the United States

DATA relating to the reproduction histories of 30,949 women (white and negro) overtly fertile in 1931 and 1932, and residing in or near twenty-six large cities in fifteen States east of the Mississippi and north of the southernmost tier of States, have been collected and are in course of analysis by Prof. Raymond Pearl. An important factor in any discussion of this material is the extent and effectiveness of contraception. It can alter completely the expression of variation in natural innate fertility. An attempt to evaluate the influence of this factor (*Science*, 83, May 22, 1936) shows that among the white population under investigation, 54 per cent have not practised contraception and among the negroes 83 per cent. Contrasting the two classes of contraceptors and non-contraceptors in white and negro respectively, it appears that in white and negro non-contraceptors, the pregnancy rates are identical; but among contraceptors, in the whites contraception is effective in reducing pregnancy 25-50 per cent in the various age classes, while among negroes it is without significant statistical effect in lowering the pregnancy rates below those of comparable classes of non-contraceptors. This confirms the experience of clinics that negroes do not practise contraception effectively, even after instruction. Clearly if no other variables were involved, this would result in a change in the relative proportions of the two elements in the population, which would be apparent in a very short time. There is, however, a much higher rate of production wastage (abortions, miscarriages and still-births), largely owing to the prevalence of venereal disease, among the negroes. This acts as one of several compensating factors in the birth-rate.

Antiscorbutic Activity of a Derivative of Gluconic Acid

It is now known that a number of compounds chemically related to *l*-ascorbic acid or vitamin C can exert some degree of antiscorbutic activity. An addition to the list is announced in a letter addressed to the Editor by Prof. B. A. Lawrow, Prof. W. M. Rodionow, E. M. Bomdas and N. S. Jarussowa, of the Vitamin Department of the Institute of Nutrition, Moscow. They have found that the methyl ester of 2-ketogluconic acid exerts antiscorbutic activity in guinea-pigs in doses of 100 mgm. or more: 50 mgm. had a curative action in about half of a group of animals suffering from scurvy, but 25 mgm. had very little effect. This ester is an intermediate product in the synthesis of *d*-arabo-ascorbic acid, which has about one-twentieth of the antiscorbutic potency of vitamin C itself (see S. S. Zilva, *Biochem. J.*, 29, 1612; 1935). It thus appears that the ester of ketogluconic acid has about 1 per cent of the activity of *l*-ascorbic acid or vitamin C. The chemical difference between the two ascorbic acids lies in the position of a hydroxyl group in the chain. The Russian authors do not discount the possibility that the gluconic ester is converted first into *d*-arabo-ascorbic acid in the animal body and that the antiscorbutic activity is due to this compound: they also state they they are extending their investigation

to include an examination of the action of the ester of ketogluconic acid, which occupies a corresponding position in the synthesis of *l*-ascorbic acid. The question whether antiscorbutic activity depends upon the presence of a cyclic structure in the molecule or can also be exerted by open-chain compounds must await further investigation, but may be difficult to decide if the conditions of conversion *in vitro* can be duplicated in the body.

Sex Change in a Fish

THE actual change of sex that takes place in a teleostean fish, *Sparus longispinis*, is the subject of a memoir by Kinoshita (*J. Sci. Hiroshima Univ.*, Ser. B, Div. 1, 4; 1936). In early life the gonad consists of a thread-like testis. Shortly after, oocytes make their appearance in tissue alongside the testis which now contains ripe spermatozoa. More of them make their appearance until a hermaphrodite condition is realized, but only functional sperms are produced. The final stage is brought about by the degeneration of the gonad of one sex, either male or female, thus leaving the old fish of the other sex. It is only when this stage is reached that functional ova are produced.

Fungi and Graft Unions

THE partnership between stock and scion of a grafted plant is usually well adjusted. There is, however, undoubted evidence that fruit-tree stocks can influence the type of scion growth, and the scion can, under different conditions, control growth of the whole tree. Mr. T. E. T. Bond has investigated the possibility that such relations would have an effect upon the relative susceptibility of herbaceous stocks and scions to attack by disease-producing fungi (*Ann. App. Biol.*, 23, No. 1, 11-29, February 1936). Various graft combinations of potato, tomato, woody nightshade, deadly nightshade, thorn-apple, *Physalis* sp. and henbane were prepared, and were inoculated on one side of the union with either of the fungi *Phytophthora infestans* or *Cladosporium fulvum*. The resulting attacks by these fungi were the same as upon ungrafted material, thus showing no influence of the other participant in the graft union, either in preventing, or helping, fungal attack in the herbaceous plants used for the experiment.

A Disease of the Japanese Laurel

THE common variegated Japanese laurel, *Aucuba japonica*, is but rarely the host of any fungus or bacterial parasite. Dr. G. Trapp has, however, isolated an organism, *Pseudomonas aucubicola*, a new species, which is very closely concerned in a 'die-back' disease of this popular shrub ("A Bacillus isolated from Diseased Plants of *Aucuba japonica* (Thunb.)", *Phytopath.*, 26, No. 3, 257-265, March 1936). Though the organism was consistently isolated from stem, leaf and root lesions of infected plants, very intensive attempts to re-inoculate healthy plants failed to reproduce the malady. It is considered that *P. aucubicola* is not a primary parasite, but can avail

itself of a slightly diseased condition induced by some other cause. Morphological, cultural and physiological characters of the organism are set forth at length in the paper.

Atmospheric Vorticity

THE *Journal of the Faculty of Science*, Imperial University of Tokyo, Section 1, vol. 3, part 2, August 1935, contains a number of meteorological papers dealing with atmospheric vorticity. The first, by K. Nakata, with an introduction by Prof. S. Fujiwhara, is a study of the vertical component of vorticity. A number of synoptic weather charts are shown on which are drawn lines of isovorticity together with ordinary isobars for sea-level, for the neighbourhood of Japan for certain dates in the winters of 1922 and 1923. These show that the areas of positive (cyclonic) and negative (anticyclonic) vorticity generally nearly coincide with the cyclonic and anticyclonic areas, but that the two pairs of systems often differ in detail; that the different systems travel together; but that the distribution of vorticity is irregular in the regions lying between an anticyclone and a cyclone. The centres of maximum and minimum vorticity, in spite of the irregularities just mentioned, appeared to coincide very nearly with the main centres of low and high pressure. Later papers in the series by other Japanese writers extend the relationship to features other than the distribution of atmospheric pressure, including cloud and rainfall, and deal with the case of the typhoon. Very little is said of the difficulties that must have arisen from lack of sufficient observational material, and in the application of the classical hydro-dynamical equations to a complex and highly compressible fluid like the atmosphere; it is difficult to assess the importance for meteorology of the very laborious and difficult computations involved in this attack upon a subject which is undoubtedly of the greatest importance for progress in meteorology.

Electrical Contacts

ALL engineers who are familiar with the working of spark coils and the phenomena which take place where the brushes press on the commutator of a dynamo realize the importance of the study of electrical arcs and discharges, but it is only recently that their effects on the resistances of the materials in contact have been considered. In *World Power* of May, G. Windred has given a useful review of recent literature on the subject. The value of the contact resistance between two metals depends largely upon the conditions at the interface between them, but it is also largely affected by the formation of oxides on the faces. It is known that copper oxides produce a marked increase on the contact resistance. For a given current this increases the heating and the cumulative rate of deposit of the oxide. At a certain critical temperature, there is a sudden fall in the contact resistance, and this is of importance in the design of heavy-current contact breakers. The main factors which influence the life of electrical contacts are their hardness and their resistance to the effects of arcing. The relays used in modern telephone practice must operate faultlessly over long periods of time and with the minimum of inspection; their effective life depending on the duty cycle which they perform and the amount of attention which they receive. The disadvantages of using copper and brass are their low melting points and their susceptibility

to corrosion. This led in the early days to the use of precious metals for electrical contacts. Papers by Carter and Kingsbury published in America (*Bell Journal Reprints*, April 1928) contain practically all our knowledge of this important subject. Kingsbury deals with the important subject of contact erosion and gives experimental data obtained from eight different contact metals showing their losses in weight, volume and atomic proportions relative to platinum.

Organic Derivatives of Silicon

IN the Bakerian Lecture to the Royal Society delivered on June 25, Prof. F. S. Kipping reviewed the work of the past thirty-five years at University College, Nottingham, on organic derivatives of silicon. With the object of determining whether silicon could give rise, like carbon, to dissymmetric molecules, a number of derivatives belonging to the two types $\text{SiR}_1\text{R}_2\text{R}_3\text{R}_4$ and $(\text{R}_1\text{R}_2\text{R}_3\text{Si})_2\text{O}$ and each containing at least one aromatic nucleus, were prepared. These optically inactive compounds were converted to sulphonic acids, and resolutions with active bases were attempted. In each case only one active base gave the desired result. A remarkable feature was that in many cases the *d*- and *l*-acids, when combined separately with another active base, gave salts which were indistinguishable in all physical properties, including specific rotation. In the course of other investigations, it was found possible to direct attention to the great differences in behaviour between similarly constituted compounds of carbon and silicon. Thus the chlorides SiR_3Cl are easily hydrolysed by cold water to silicols SiR_3OH , which pass readily into oxides $\text{SiR}_3\text{O}\cdot\text{SiR}_3$. In no case has the formation of a simple silicone, $\text{R}_2\text{Si}\cdot\text{O}$, been observed, and indeed it seems probable that the group $\text{>Si}\cdot\text{O}$ does not exist, nor is there any evidence of the formation of an ethylenic bond between carbon and silicon or between two silicon atoms. The diols $\text{SiR}_2(\text{OH})_2$ and triols $\text{SiR}(\text{OH})_3$ give rise to complex mixtures by progressive condensations, the study of which throws light on the structure of mineral silicates. Acids of the type $\text{R}\cdot\text{SiO}\cdot\text{OH}$ are probably not formed. The general conclusion is that corresponding carbon and silicon compounds show very little similarity in behaviour, only a few types of carbon compounds being represented by analogous derivatives of silicon.

Monogenic Functions

A FUNCTION of a complex variable is called monogenic at a point if at that point it possesses a unique finite derivative. It is well known that such a function satisfies the differential equations of Cauchy-Riemann; but the converse is not true. The problem of determining conditions that are sufficient for monogeneity and yet are free from unnecessary restrictions has not yet been completely solved, but an account of recent progress is given by Prof. D. Menchoff of Moscow ("Les conditions de monogénéité"; *Actualités scientifiques et industrielles* 329. Paris: Hermann et Cie., 1936). It is surprising to find that the demonstrations seem necessarily to involve complicated ideas of the modern theory of functions, even when the properties dealt with are apparently independent of these ideas. Perhaps some mathematician will take up the challenge, and supply the simpler proofs which, one is tempted to say, must exist.