

of uniformity in the forts: some are rectangular (Reculver), others oval (Pevensey), and the areas vary from five to nine acres. Occupation in some commenced in the first century and continued until the fifth; in others there is evidence of two separate periods in the second and fourth centuries. The coastline differs considerably from that of the present day, erosion and silting up, particularly of the Wansunt Channel, making the location of the forts problematical. The Kent Archaeological Society commenced excavation at Richborough in 1922, and the fifth report is now in the press. The cruciform platform is unique, and may have supported a monument to commemorate a triumph during the third century; triple defensive ditches were raised about the same time.

Dr. Maurice Burton gave the presidential address to the Zoological Section, his subject being "Art in Animals". He said that he differs from some of his colleagues in the line drawn between man and the other animals, for we may tend to trust our reason too much. There is opportunity for us all to study the difference between human and animal behaviour. The love behaviour is much the same, that of male and female sticklebacks being a case in point. Maybe, he said, the difference is one of quantity rather than of quality. Dr. Burton spoke of the beauty, to our eyes, of the shells of single-cell animals, the Foraminifera, and of the sponge called the Venus flower basket. He mentioned the ability of lower life forms to take material from outside their bodies to construct beautiful homes—the tube-making worms, caddis fly larvæ and the nests of fishes and birds; the web of a spider compares favourably with the efforts of a civil engineer. The difference between man and the animals is that aesthetic appreciation has evolved man's consciousness of his art. In animals mechanical skill is highly developed. Dr. Burton then dealt with the evolution of the eye from the light-sensitive cell of the lowest organisms. The bower birds have especial skill in the construction of their elaborate houses, for they use natural pigments for colouring sticks, selecting favoured ones and burying those considered distasteful. Colour should be related to the development of the eye, and while at times its value is protective, at others it has a physiological value: it has signal values with the birds and fishes and arouses emotions. The appreciation of sounds by animals when they have no other apparent value than aesthetic was briefly mentioned by Dr. Burton, and also the question of taste.

Dr. Francis Rose, as president of the Botanical Section, spoke on "The Flora of Kent", saying that the earliest plant records are those of Turner, in 1549, dealing largely with the plants of the Dover area; the inaccessibility of the Weald prevented recording from there. The Elizabethan records were from the point of view of the herbalist; Gerard, in 1597, recorded plants still thriving in the same localities. Even during the nineteenth century transport was difficult in the Weald, thus accounting for some of the missing species in the work of Hanbury and Marshall. Dr. Rose commenced his work upon "The Flora of Kent" in 1942, and it will be published during the autumn of this year. Its sections deal with the distribution of species, the ecology, plant distribution as a whole and floral statistics. C. W. Wright chose for the presidential address to the Geological Section the subject of "Unsolved Problems in Cretaceous Stratigraphy and Palaeontology" and commenced by saying that Folkestone can be regarded as the centre of English

geology. Much work is left to be done in spite of the intensive work of Rowe, Jukes-Browne, Whitaker and the Weald Research Committee of the Geologists' Association. There are many surprises around the corner, said Mr. Wright. The beds at the base of the Albian, thought to be allied to the Lower Greensand, may be more closely related to the Gault. Although each ammonite carries its evolutionary life-history, species evolved and disappeared in such relatively short times that the gaps between the species now found causes problems which may never be solved owing to the vast amount of material denuded, so removing the required evidence. Lithographical similarity in various districts can be misleading as regards zoning, as palaeontological evidence has proved a sub-zone difference in some cases. World-wide correlation is exceedingly difficult owing to the lack of evidence, and Mr. Wright emphasized that ammonite material, however fragmentary, is needed to aid the solution of the problems.

During the congress favourable weather conditions enabled the full programme of excursions to be carried out. The archaeologists visited Wye College and Church, ancient occupation sites on the Downs, Studfall Castle, the Roman fort of the Saxon shore and a fortified Manor House at Westhanger. The botanists and zoologists went to Westwell, Hothfield, Little Chart, Saltwood, Romney Warren, Dungeness Bird Observatory and the Folkestone Corporation greenhouses. The geologists made excursions to the Warren Defence Works, the Stour Valley near Ashford, Great Chart, Kennington, Wye and Brabourne.

The sixty-first annual congress of the Union will be held next year in Tunbridge Wells during May.

CARNEGIE UNITED KINGDOM TRUST

REPORT FOR 1954

THE forty-first annual report of the Carnegie United Kingdom Trust*, to which are appended the accounts for the year ended December 31, 1954, covers the fourth year of the present quinquennium and is concerned chiefly with the development and direction of existing schemes. Such good progress has been made with the programme for the development of local museum services that during the year the allocation of £40,000 for the five years was increased to £50,000, most of the fund being earmarked for direct grants to enable museums to improve their standards of display. In this field, the most important event of the year was the reopening of the Taunton Castle Museum after its complete re-organization. The Trust notes that the service of expert reports has continued to be of much value to the museums movement, but that a major difficulty in re-organization has been that the schemes involve the exercise of technical skill beyond the resources of the museums concerned. Grants for reorganizing displays were made during the year to the Banff Museum, Hove Museum of Art, Museum of Leathercraft, London, Torquay Natural History Society Museum, Truro Museum and the Worthing Museum and Art Gallery. During the year, five village hall

* Carnegie United Kingdom Trust. Forty-first Annual Report, 1954. Pp. viii + 43. (Dunfermline: Carnegie United Kingdom Trust, 1955.)

schemes receiving grant-aid were completed, and work began on three other schemes. The Trust welcomes the indication in the Queen's Speech on November 30 that restrictions on village hall expenditure will be eased, and it is hoped that building will be started during the next twelve months on the seven remaining schemes.

During the year, 269 new cases were referred to the Family Discussion Bureau, which also stabilized its function as a training agency. The Family Welfare Association expected to publish in February 1955 a book entitled "Social Casework in Marital Problems: Studies in the Development of a Psycho-dynamic Approach". The Trust is also specially interested in a project of the Association which seeks to provide by research some knowledge of the nature of problem families and to suggest how to deal with them, and also to provide social workers concerned with family problems with practical hints on day-to-day procedure when immediate action is demanded. Eleven Family Service Units are now operating, and the Trust's grant is supporting the development of units, the collection and assessment of research data, and,

mainly, the training of social workers in family service techniques, which is done basically by closely supervised field-work with attendance at special courses organized by universities and professional bodies.

Good progress has been made in defining the work which the National Association for Mental Health, formally inaugurated last July, should attempt in the north of England. The research council set up by the College of Teachers of the Blind, to which the Trust promised a grant of £100 a year for three years for research into the possibility of establishing standard attainment tests for children in blind schools when making selections for further education, has also started research on the design and testing of apparatus to throw light on how the blind detect obstacles and whether the art can be taught; and a grant of £400 has been made to the British Association of the Hard of Hearing for the installation of a recently developed public-address system. A new course in applied social studies at the London School of Economics and Political Science was inaugurated with twenty-five students in October.

RADIATION SENSITIVITY AND THE MITOTIC CYCLE IN *VICIA FABAE*

By DR. JOHN MCLEISH

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THE sensitivity of living organisms to ionizing radiations can be assessed in terms of rapid morphological change, chromosome breakage and gene mutation. It is generally agreed that sensitivity varies not only between individuals but also between the tissues within individuals according to the genetic constitution and physiological activity of their cells. In the dividing cell, sensitivity, which is readily assessed by chromosome breakage, can be influenced by the number of chromosomes¹, their position and mobility in relation to one another² and to the phase through which the cell is passing at the time of irradiation³⁻⁴. It may also be modified by various physical⁵ and chemical⁶ agents.

Yet there have been very few demonstrations of the influencing of sensitivity by genes⁷ or by any of the visible elements comprising the chromosomes themselves⁸. In the latter case, this has been difficult to show since between closely related varieties or within single tissues there are rarely any detectable chromosomal differences which would form the basis of a comparison of radiation effect.

This difficulty can now be overcome to some extent by giving a preliminary chemical treatment to induce localized chromosome breakage. Such a treatment produces, within a single tissue, a mixed population of cells with known differences the variable response of which to a single irradiation can be studied.

In these experiments, secondary lateral roots of *Vicia faba* seedlings growing in tap water were treated with a 0.1 mM aqueous solution of maleic hydrazide for five hours. Maleic hydrazide is known to induce breakage in, or close to, heterochromatic segments⁹; and with the dose employed 83 per cent of breaks occur in and around the large segment in the nucleolar arm of the *M* chromosome. Thus the majority of acentric fragments carry nucleolar organizers. These become randomly distributed between

daughter cells at the completion of one mitosis. Then, by a mechanism which I have described elsewhere¹⁰, a high proportion form viable micronuclei, which persist and reproduce in step with the main nuclei through consecutive mitoses. After 2-3 days, cells are present in the roots with 0-5 nucleolar organizers.

In *Vicia* roots the mean time for the mitotic cycle is of the order of 24 hr.^{11,12}. Therefore, after the maleic hydrazide treatment, when some cells had completed two mitotic cycles, an X-ray dose of 100 r. was given. Roots were then fixed 4, 6, 10, 14 and 18 hr. later (Fig. 1). But all these fixations were made 72 hr. from the start of maleic hydrazide treatment and in all cases the last 1½ hr. were occupied in pre-treatment in 0.05 per cent colchicine to facilitate scoring. Roots receiving maleic hydrazide or X-ray treatment alone were also fixed as controls. Observations were made on Feulgen squash preparations, and the total breakage (chromosome breaks *B*" + chromatid breaks *B'* + minute fragments *mB*"') scored in all classes of metaphase cell. The results for cells with various numbers of nucleolar organizers are summarized in Fig. 2.

Differences in breakage between the different cell types are immediately apparent. But as radiation breakage has been shown to be at random^{13,14} and proportional to chromosome-length¹, breakage frequencies must be corrected to allow valid comparisons between different cell types to be made. Statistical tests can then be applied after making allowances for changes in total chromosome-length per cell resulting from the deficiencies and duplications induced by maleic hydrazide. The frequencies shown in Fig. 2 have been corrected in relation to the normal chromosome complement in this way.

Breakage in cells with 3, 4 and 5 nucleolar organizers is significantly lower than in cells with two