

GENETICAL SOCIETY OF GREAT BRITAIN

ABSTRACTS of Papers read at the HUNDRED AND FORTY-SIXTH MEETING of the Society held on 14th NOVEMBER 1964, at the MIDDLESEX HOSPITAL MEDICAL SCHOOL, LONDON, W.1

A FAMILY WITH ANGIOKERATOMA CORPORIS DIFFUSUM

A. W. JOHNSTON, B. J. WARLAND and S. D. V. WELLER
University College Hospital, London, W.C.1

Angiokeratoma corporis diffusum has recently been more widely recognised and it is probably a lipoid storage disease. Two patients, in whom the diagnosis had been made independently, were subsequently found to be distantly related. The pedigree has been traced through five generations and fits well with sex-linked inheritance. There are six males known to be affected and three more may have had the disease. Although most of the carriers are asymptomatic, one is affected though not as severely as the males. Even in them there is variation in the severity of the symptoms and the extent of the rash. It is also noteworthy that one male is still working aged 58 although he has had two cerebro-vascular accidents.

Studies of the sex linked blood group Xg^a have been performed in cooperation with Dr Ruth Sanger. The data are compatible with linkage, though one crossover has been found.

INHERITED RED BLOOD CELL ABNORMALITIES IN TWO VILLAGES OF N.W. GREECE

G. R. FRASER

Division of Medical Genetics, School of Medicine, University of Washington, Seattle, U.S.A., and Department of Ophthalmology, Royal College of Surgeons, Lincoln's Inn Fields, London, W.C.2

Blood samples from 904 persons, representing 95 per cent. of the entire population, inhabiting two adjoining villages of the Arta region of N.W. Greece, were studied. This area was selected as it was previously known to be a focus of high frequencies of glucose-6-phosphate dehydrogenase deficiency, thalassæmia and hæmoglobin S. Almost half of the individuals investigated were discovered to be carrying at least one of these abnormal genes. A combination of genetical and hæmatological studies served to define several components of the heterogeneous thalassæmia complex (α , β , δ , Pylos). Segregation, mortality and fertility data can throw some light, especially in larger studies, on the selective mechanism involved in the maintenance of high frequencies of this remarkably wide spectrum of genetically determined red cell abnormalities. The effects of frequent internal migrations and external invasions involving various ethnic groups in the Mediterranean basin throughout recorded history should, however, also be considered in any attempted analysis. Relevant data in this context are provided by the geographical distribution of these traits and the linkage relationships on the X chromosome of the locus determining glucose-6-phosphate dehydrogenase deficiency.

This talk is based on a collaborative study and some of the data have been published in the following papers: G. R. Fraser, B. Defaranas, C. A. Kattamis, R. R. Race, R. Sanger and G. Stamatoyannopoulos, *Ann. hum. Genet.*, 27, 395 (1964). G. R. Fraser, C. Kitsos, A. G. Motulsky, G. Stamatoyannopoulos, D. Loukopoulos, P. Fessas, C. Kattamis, B. Defaranas, I. Zannos-Mariolea and C. Choremis, *Ann. N.Y. Acad. Sci.*, in press.

THE INFLUENCE OF ABO BLOOD GROUP AND SECRETOR POLYMORPHISM ON THE GROWTH OF MAMMALIAN CELLS *IN VITRO*

D. A. P. EVANS and A. L. JONES

Department of Medicine, University of Liverpool

and

G. B. B. WHITE

Public Health Laboratory, City of Liverpool

The functions of these polymorphisms have been perennial puzzles. A new hypothesis that the characters involved control the growth of cells will be discussed. In order to test this hypothesis the responses of various types of cell cultures to both (1) salivas from subjects of known phenotypes and (2) pure blood group substances have been investigated. The results of these experiments will be presented.

A NOTE ON A HISTOCOMPATIBILITY TEST (THE NORMAL LYMPHOCYTE TRANSFER TEST) IN MAN

C. A. CLARKE and P. M. SHEPPARD

Department of Medicine and Department of Genetics, University of Liverpool

Brent and Medawar (1963) investigated in guinea-pigs the intensity of the inflammatory response produced by the intradermal injection of lymphocytes from normal blood. They conclude that the response provides an almost exact forecast of the intensity of the reaction which a skin homograft from each donor guinea-pig will elicit after transplantation to a recipient.

In a preliminary investigation of this test in Man we found, using 20 volunteer "recipients" and 4 "donors" (of cells) that neither ABO compatibility nor sex influenced the size of the weal. Furthermore, in about 15 per cent. of volunteers the primary graft-versus-host reaction was negative to one or other of the donor cells. One severe reaction to dextran occurred. The findings will be discussed.

LINKAGE TO THE S-LOCUS IN DIPLOID POTATOES

N. W. SIMMONDS

John Innes Institute, Hertford

The mutant droopy (*dr*) occurs naturally as a recessive in cultivated diploid potatoes which have an oppositional-allele *Nicotiana* type incompatibility system. *Dr/dr* is linked to *S* and this leads to disturbed ratios of *dr* in appropriate crosses. Genetic results will be described.

A MODEL FOR THE FORMATION OF F-PRIME FACTORS IN *ESCHERICHIA COLI* K12

PAUL BRODA and JOHN G. SCAIFE

*Medical Research Council Microbial Genetics Research Unit,
Hammersmith Hospital, London, W.12*

The donor property in *Escherichia coli* K12 is determined by the sex factor, F, which can exist in either of two mutually exclusive states, integrated into the bacterial chromosome (Hfr) or extrachromosomally (F⁺). In the Hfr state the F factor promotes oriented transfer of the chromosome, the sex factor itself being transferred terminally. Hfr cells can revert to F⁺ by the return of the F factor to the extra-chromosomal state; occasionally such a released F factor is found to have incorporated a piece of the bacterial chromosome. Such modified sex factors are termed F-prime factors; like ordinary F factors they can mediate their own transfer to recipient cells.

Previously isolated F-prime factors appear to carry only genes transferred terminally by the ancestral Hfr strain. We report the isolation of an F-prime factor which transfers genes transferred both proximally and terminally by the parent Hfr strain. Evidence will be presented that this F-prime factor has resulted from illegitimate pairing between regions of bacterial chromosome on either side of the sex factor, followed by a single reciprocal recombination event. The application of this model to explain the origin of other F-prime factors will be discussed.

THE RELATION BETWEEN DNA SYNTHESIS AND CHROMOSOME TRANSFER DURING BACTERIAL CONJUGATION

JULIAN D. GROSS

*Medical Research Council Microbial Genetics Research Unit,
Hammersmith Hospital, London, W.12*

In Hfr cells of *E. coli* K₁₂ the sex factor, F, is integrated at a particular site on the bacterial chromosome. When such cells conjugate with suitable recipient cells, they transfer their chromosome in an oriented manner starting at the point at which F is integrated and terminating with F itself. To account for this transfer it has been suggested recently that the formation of contact with a recipient cell triggers replication of the Hfr chromosome beginning at the site of attachment of F, and that one of the replicas is transferred to the recipient cell as it is formed. We have performed experiments involving isotopic labelling of the donor DNA during mating followed by autoradiography of the recipient cells. The results of these experiments support the above hypothesis.

THE PRESENT STATE OF THE LINKAGE MAP OF *STREPTOMYCES CÆLICOLOR*

D. A. HOPWOOD

Genetics Department, University of Glasgow

The Enterobacteria *Escherichia coli* and *Salmonella typhimurium* possess three distinguishing features in their linkage maps: there is a single linkage group; the map is circular; and there is a high degree of clustering of functionally related loci. The Actinomycete *Streptomyces cælicolor* belongs to a different major group of bacteria from the Enterobacteria, and study of this organism should therefore help to establish whether the characteristics of the linkage maps of *E. coli* and *S. typhimurium* are typical of bacteria as a whole. The present state of the linkage map of *S. cælicolor* will be described.

THE INFLUENCE OF LOW DOSES OF RADIATION ON RECOMBINATION IN *CHLAMYDOMONAS REINHARDI*

C. W. LAWRENCE

Wantage Research Laboratory (A.E.R.E.)

It was shown previously (*Heredity*, 16, 83 (1951), *Rad. Botany*, 1, 92 (1961)) that a low dose of gamma radiation influences chiasma frequency at only two short stages in the development of pollen mother cells. The first stage, during which irradiation reduces the number of chiasmata formed, occurs just before the start of meiosis while the second stage, during which irradiation increases chiasma frequency, is situated in late zygotene to pachytene. A similar pattern of events has now been demonstrated for recombination between *arginine-1* and *paba-2* in *Chlamydomonas reinhardi*. It is suggested that these observations are best interpreted by assuming that a low dose of radiation interferes with synthetic processes concerned directly or indirectly with crossing-over.

PROGRESS IN THE EXPERIMENTAL RECREATION OF THE
TUBEROSUM GROUP OF POTATOES

N. W. SIMMONDS

John Innes Institute, Hertford

The cultivated potatoes that belong to the Andigena and Tuberosum Groups are autotetraploid ($2n = 48$); the former Group originated in the Andes of South America and the latter evolved from it by selection in north temperate countries, the source-material being a small number of Andigena clones introduced to Europe late in the sixteenth century. Historical evidence bearing on the rate of Tuberosum evolution will be reviewed. An attempt is being made to recreate the Tuberosum Group from Andigena potatoes and this experiment has the added stimulus that, if successful, the products should be of great practical value in potato breeding. The results of the first five years of the experiment (during which about 60,000 plants have been grown) will be described. Current populations now seem to be about half way to Tuberosum and considerable advances in productivity and disease resistance have been made.

INTENSIVE NATURAL SELECTION OF SPOT-GENOTYPES IN
STABLE POPULATIONS OF *MANIOLA JURTINA CASSITERIDUM* GRAVES

K. G. McWHIRTER

25 Broad Walk, London, N.21

1. Attempts to raise English and Cornish strains of the Meadow Brown Butterfly from the egg stage have failed; in the laboratory all broods are nearly 100 per cent. eliminated by a bacterial pathogen, believed to be *Pseudomonas fluorescens*. All but one of the Scillonian progenies tested were, however, wholly or substantially immune. Sufficient families from St. Mary's. Isles of Scilly, have been raised to demonstrate that spot number is genetically controlled in that stock ($P \sim 0.01$).

2. While low spotted English colonies near Winchester have been shown by Dowdeswell to be parasitised by the Braconid, *Apanteles tetricus*, one of the few low spotted Scillonian populations, that at Top Rock Valley, St. Martin's, was, in 1964, 33 ± 5 per cent. parasitised by another Braconid, *Meteorus versicolor* Wesm. A high spotted colony on St. Mary's was free from this and other hymenopterous parasites. Assuming that sweeping of Scillonian larvæ gives unbiased samples, intensive selective elimination of about 80 per cent. of male high spot genotypes occurs in late larval and pupal phases, whether *Meteorus* is present or not. This parasite could be, but has not been proved to be, helping to eliminate high spot genotypes. The density of Scillonian larvæ was over ten times higher than that of Mainland ones and their ecology is markedly different.