

## GENETICAL SOCIETY OF GREAT BRITAIN

ABSTRACTS of Papers read at the HUNDRED AND SEVENTEENTH MEETING of the Society, held on TUESDAY, 29th MARCH 1955, at WYE COLLEGE, Near Ashford, Kent

### THE ARTERIAL SYSTEM OF THREE INBRED STRAINS OF MICE

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The arterial system has been studied in 25 specimens of each of three inbred strains of mice (C57BL/Gr : CBA/Gr : A/Gr) by means of rubber latex injection and subsequent clearing in benzyl alcohol. There are at least 18 well-defined differences between strains in the arrangement of the arteries and these occur in all parts of the body. In some cases the alternative arterial patterns of a particular region are confined to one strain : in other cases there is a slight overlap and the pattern normally found in one strain occurs occasionally in the other two. Similar variations in the arterial system have been described in other species of mammal and in human anatomy and attributed to unknown factors in development. It is clear that, at least in the mouse, they are to a varying extent under genetic control.

### ANALYSIS OF HETEROKARYOSIS IN A WILD HOMOTHALLIC ASCOMYCETE

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Heterokaryosis has not been previously reported in a wild homothallic ascomycete. Only two out of fifteen *Aspergillus glaucus* isolates from the wild proved to be heterokaryotic. It is suggested that the low incidence of heterokaryosis in nature in a sexual homothallic ascomycete compared with the high frequency reported in asexual fungi by other workers is no accident.

Growth rate of colonies from conidia (asexual) and from ascospores (sexual), the latter both from selfed and crossed perithecia of the heterokaryons, was measured on two different media. In both isolates naturally occurring single gene differences served as markers and total growth in the time interval from 48-192 hours was analysed. Different situations were found in the two isolates. Isolate 29 is a stable heterokaryon whose two constituent nuclear components differ in a single gene or supergene. Line 26 is a very unstable heterokaryon on all media tried whose two constituent nuclear types differ in many genes. The distributions of growth rates of colonies from ascospores having crossed origin indicate control by several polymeric genes or polygenic blocks. These colonies show continuous variation also in morphological characters.

Thus in nature heterokaryons occur with component nuclei differing by several genes.

## SPONTANEOUS NATURE OF A HERITABLE CHANGE TO PRODUCTION OF PENICILLINASE

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The study of the production of enzymes offers many advantages for understanding the specificity of both proteins and genes. Bacteria are ideal for enzyme studies and although less suitable for genetical analysis, one may obtain results capable of a straightforward interpretation by appropriate techniques.

An inherited change from penicillinase sensitivity (due to the inability to produce penicillinase) to penicillin resistance (due to production of large amounts of this enzyme) has been found in *Bacillus cereus*. This change can be proved, by the velvet pad replicate technique, to be a spontaneous event, not caused by the penicillin treatment. Using this method penicillin-resistant variants can be obtained, and the penicillinase production proved, without ever bringing the cells into contact with the antibiotic.

## ON THE TECHNIQUE OF MUTATION EXPERIMENTS WITH *DROSOPHILA*, ESPECIALLY BY THE FEEDING METHOD

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Factors which affect, often drastically, the result of mutation tests with formaldehyde-food are : nutritional value of the food ; the presence of harmful substances in the food ; storing of the treated food before use ; degree of crowding of the larvæ. All these appear to act indirectly through their effect on developmental rate, which in its turn determines the degree and distribution of sensitivity in the larval testis. Differences between strains are marked, but their origin has not yet been analysed. After about 24 hours on formaldehyde-food, larvæ cease to respond to both its toxic and mutagenic action ; this is partly due to deterioration of the food and partly to "adaptation" of the treated cells. Heterogeneity of response between treated larvæ is negligible with formaldehyde, but may be the main reason for the low effectiveness of pyronin as a mutagen. A small increase of mutation rate after addition of a chemical to the food may be due to some general effect on metabolism rather than to a specific action of the substance used ; it is sometimes possible to distinguish experimentally between these alternatives. The sensitivity pattern of the testis to different mutagens is not the same ; it may vary even for mutagens given in the food. This has to be taken into account in quantitative comparisons between mutagens. Still further, uncontrolled conditions may cause fluctuations in mutation rate, so that the real accuracy of estimates of spontaneous or induced mutation rates is less than the statistical error in a single test would suggest. A number of medium-sized tests, with controls, are therefore much preferable to one or two large-scale ones for establishing whether a controlled variable, such as type of treatment or age at treatment, influences mutation rate.

## ABORTIVE TRANSDUCTION OF MOTILITY

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When motility was *transduced* from wild-type (motile) *Salmonella* to non-motile (non-flagellated) strains appearances suggested that a phage-imported genetic factor for flagellation sometimes displaced its "allele" determining non-motility in the recipient cell, which would consequently produce only motile progeny, and sometimes failed to displace its "allele", instead persisting as a non-replicating,

“supra-numerary gene” in (one of) the descendants of the recipient cell ; if the factor is dominant to its “allele”, that descendant containing it would be motile, the others non-motile.

Individual cells made motile by transduction and isolated by micromanipulation give pedigrees generally consistent with these hypotheses ; but it seems that when the cell containing the “supra-numerary gene” divides, the daughter which fails to obtain the “gene” is yet motile, because it receives a few “motility-conferring particles” (probably flagella, or their basal granules), which themselves persist, but do not multiply, within the clone this daughter cell produces. A cell containing *one* such particle is weakly motile, and no more than *one* of its descendants is motile. A cell containing the “gene” is more motile, and produces a clone containing many motile bacteria, *e.g.* c.40 in a clone of c.10<sup>4</sup>. A non-replicating “gene” has been traced for c.22 generations ; a “particle” for c.27 generations.

## SEGREGATION WITHIN INBRED LINES OF CHICKEN

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By examining F<sub>1</sub> crosses in this country and in U.S.A., hypostatic colour factors carried by inbred lines of two white breeds have been identified. In White Plymouth Rocks (recessive white) 11 out of 16 lines are segregating at the **E**-locus and 6 out of 16 at the **S**-locus (sex-linked). In White Leghorns (dominant white) 6 out of 12 lines are segregating at the **E**-locus and 3 out of 7 at the **BI**-locus. The coefficients of inbreeding of the lines vary from 37.5 to 98.7%. The amount of segregation occurring is greater than could reasonably be expected in the absence of selection favouring heterozygotes. A comparison is made with similar results relating to blood-group loci obtained by other workers.

## EXTREME ASYMMETRY IN RESPONSE TO SELECTION

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Extreme asymmetry of response has been encountered in the two-way selection of mice for lactational performance. The realised heritability for continued upward selection is almost zero, while for back selection it approaches unity. In the low line, however, the responses to continued and to back selections are equal and intermediate. Daughter-dam regressions in the two lines are equal.

Models are discussed which may throw some light on the causes of this asymmetry.

## DISTURBED SEGREGATIONS OF AN ALBINO IN LUCERNE

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Lucerne (*Medicago sativa*) is a tetraploid ( $2n = 4x = 32$ ) and data published by Stanford of experiments designed to test whether segregation is disomic or tetrasomic have clearly shown that it is tetrasomic. It has, however, also been suggested that other loci might show disomic segregation.

In the present case segregation appears to be tetrasomic, with the ratios disturbed by two contrary influences. The albino embryos frequently fail to produce mature seeds and there is an overall deficiency of albinos. But a duplex plant selfed gave a significant excess of simplex offspring ; taken with other evidence this suggests that the albino allele interferes with self-incompatibility.

The implications of this for lucerne population structure and for self-incompatibility are discussed.