GENETICAL SOCIETY OF AUSTRALIA

2ND ANNUAL GENERAL MEETING

CANBERRA

11-12 JAN 1954

PROGRAMME

ABSTRACTS

Meeting 2

COMMONWEALTH OF AUSTRALIA

COMMONWEALTH SCIENTIFIC AND INDUSTRIAL RESEARCH ORGANIZATION

Animal Genetics Section,
C/o Department of Zoology,
UNIVERSITY OF SYDNEY.

Pre-A.N.Z.A.A.S. Genetical Society Meeting
11th and 12th January, 1954.

PROGRAMME:-

Monday	9.30am	W. B. Mather	Univ of Q'land.
	10.00	R. D. Brock	Cytol
	10.30	Morning tea	
	11.30	M. Hardy	Rendel (NSW).
	12.00	M. Blackwood	BS Dept Univ Melb
	12.30pm	D. L. Hayman	Catcheside
	1.00	Lunch	Mouse genetics.
	2.00	A. M. Clark	Zool Dept. Melb
	2.25	J.S.F.Barker & C.I.Davern	Mutagens " Rendel
	2.50	F. H. W. Morley	Livestock breeding "
	3.15	Afternoon tea	
	4.00	M. J. Mathieson	Neurospora Catcheside
	4.25	B. Holloway	Nat Univ Canberra
	4.50	D. G. Catcheside	"
	7.45pm	Short Business Meeting	
	8.00	M. J. D. White (Introduction by O. H. Frankel)	Cytol poly in grasshoppers
Tuesday	9.30am	J. M. Rendel	Mice? Wool Univ Sydney.
	10.00	B. F. Short	Sheep.
	10.30	Morning tea	
	11.30	H. N. Turner	Dir Animal Health CSIRO. Syd
	12.00	P. G. Schinckel	Univ of Technology - Sydney
	12.30	A.H.Dunlop	17 (Wool Technology)
	2.00pm	Demonstrations:	

2.00 - 2.30. Cine'
2.30 - 3.45. Symp.
3.45. After tea

(i) Developmental analysis of Naked gene
(ii) Methods of mutagen analysis
(iii) M. J. D. White

Unfortunately, it has been impossible to arrange accommodation at either Duntroon or the Boys' Grammar School. Members are therefore asked to make their own arrangements

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A. S. FRASER.

ABSTRACTS

M. BLACKWOOD:- No abstract received.

R. D. BROCK:- Spontaneous chromosome breakage and endosperm failure

Many cases of seed failure, after crossing and in hybrids, is due to failure of the endosperm and abortion of the embryo. Characteristics of these cases are certain mitotic abnormalities, high polyploidy, bridges which persist through resting stage, spindle abnormalities. Investigations of these irregularities have been made in two plants, Lilium and Hyacinth, which are particularly suited to cytological examination of endosperm. The sequence of events which culminates in endosperm failure commences with spontaneous chromosome breakage. A special type of anaphase bridge, "pseudo-chiasma", is followed by mechanical breakage of chromatids. Breakage persists through the bridge-breakage fusion cycle and, owing to increased unbalance, accumulates. Abnormalities are genetically determined but are influenced by the chromosome number of the endosperm. The spontaneous formation of "pseudo-chiasmata" bridges seems to be associated with chromosome reproduction. This sequence of events, leading to endosperm failure in Lilium and Hyancinthus seems to be a general occurrence in other cases of endosperm failure.

D. G. CATCHESIDE:- Genetical map of the Mating type Chromosome of Neurospora crassa

About a dozen loci are situated in a short segment of the mating type chromosome between the locus of mating type and the centromere. Reasonably accurate mapping requires special methods to secure an optimum amount of information in relation to the technical work involved. This has been achieved to some extent by limiting the study to certain classes of recombinant and, for one locus, making use of a lethal interacting specifically with a mutant. It is still uncertain whether all the data can be completely reconciled.

A. M. CLARK:- Further observations on the Biological Activity of Pyronin and Related Dyes

Further data will be presented on the genetic and physiological effects of some xanthene dyes. At low dye concentrations, biological activity can be attributed to reactions with non-polymerized nucleic acids, but at higher concentrations a complex pattern of effects may be produced by inhibition of various enzyme systems.

C. I. DAVERN & J. S. F. BARKER:- Mutagenic Effect of Formalin on Drosophila melanogaster

The paper describes the results obtained from the comparison of the mutagenic effects of formalin on the frequency of sex linked lethals with its effect on the frequency of chromosome II lethals. The effect of the

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M. HARDY:- The expression of the Tabby gene in the mouse coat

A semi-dominant, sex-linked gene Tabby, recently discovered by Falconer, produces tabby markings in the coat of heterozygous females. Homozygous female and hemizygous males were of a different phenotype, lacking two of the three types of pelage hairs present in normal mice, and having a reduction in facial vibrissae and various other abnormalities. Closer study revealed that the expression of Tabby in heterozygotes differed in degree rather than in kind from its expression in homozygotes and hemizygotes. For example, there was in heterozygotes a reduction in the proportion of at least one of the types of pelage hairs, and the number of facial vibrissae (excluding those on the lips) was intermediate between that of normal and of homozygotes or hemizygotes. A study of development revealed striking similarities, in development as well as in final expression, between Tabby homozygotes or hemizygotes and crinkled homozygotes. (The gene crinkled is recessive, not sex-linked, and inherited independently from Tabby). The hypothesis of Falconer, Fraser and King that crinkled causes suppression of follicle formation during two separate periods in early development is applicable also to Tabby. Tissue culture studies of embryonic skin from Tabby mice support this view.

D. L. HAYMAN:- Univalent behaviour [illegible] aria Hybrid

A hybrid, Phalaris coerulescens [illegible] minor (2n=28), has 21 chromosomes and very regularly forms seven bivalents and seven univalents at metaphase I of meiosis, the univalents being larger than the other chromosomes. Other configurations are encountered occasionally. Subterminal non-centric regions become active when the univalents move to the equatorial region of the spindle after the bivalents have disjoined at division I. This leads to chromosome breakage and apparent fusions.

B. W. HOLLOWAY:- Heterocaryosis in Neurospora crassa

Heterocaryon formation between certain biochemical mutants of Neurospora crassa is controlled by a number of genes apart from the biochemical [illegible]. A detailed investigation of the heterocaryon formed between a pantothenic acid requiring mutant and one requiring lysine has demonstrated four and possibly five genes to be concerned in the process of heterocaryon formation. These genes may not only prevent the formation of a heterocaryon but also modify the type of heterocaryotic growth. The characters so affected are the time at which heterocaryotic growth commences, the ability to maintain heterocaryotic growth and the vigour of the growth.

W. B. MATHER:- Chromosome Morphology of some Australian species of Drosophila

The chromosome morphology, both larval brain and larval salivary gland of ten Australian Drosophila species

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M. J. MATHIESON:- The Physiology of histidine - requiring mutants of Neurospora

Three different genes controlling histidine synthesis in Neurospora crassa have been studied. Two of these are very close to mating type and within 0.7 units of each other. The third is on chromosome D about 59 units from the centromere. The three strains differ from each other physiologically but are alike in being inhibited by certain constituents of "complete" medium. The inhibitors appear to prevent the uptake of histidine from the medium. The problem is how far such physiological properties are affected by the genetic background.

F. H. W. MORLEY:- Predicted heterozygote expression of recessive lethals

Frequency of genes determining recessive lethals reaches equilibrium when it has a value of the square root of u/s. If there are N genes capable of mutating to a recessive lethal, and as s = 1.0, the average number of lethals per individual is of the order of N times the square root of u. This is 3 if N = 1000 and $u = 10^{-5}$. Data from Drosophila suggest that this figure is too high, so that lethals probably have, on the average, detrimental effects on heterozygotes. If fitness AA : Aa is 1 : 1-h then the average number of lethals per individual is Nu/h and h is expected to average 0.02. Stern et al have demonstrated h to be about 0.04. These ideas are discussed in relation to livestock breeding.

J. M. RENDEL:- Use of one character as an index of environmental variation in another

Heritable variation of a character is often masked by environmental variation to an extent which makes it impossible to select effectively for the trait desired. It is often possible to allow for the effects of the environment. When these cannct be traced it may be possible to use a second character as an index of environmental effects and correct the first for variation in the second, using the regression of one on the other as the correction factor. An example from mice is used to illustrate the method.

P. G. SCHINCKEL:- The trend of fleece weight in Australia

Examination of published statistics and of limited records from private properties shows that the average fleece weight of sheep in Australia has increased markedly since about 1870. The yearly averages are erratic due to changes in the method of collecting statistics and to seasonal variations. The period since 1870 is characterised by two general trends: between 1870 and 1908 the rate of advance in fleece weight was very substantial: since 1908 it has been at a much reduced rate. It seems likely that much of the early gains were of genetic origin: at least a moderate proportion of later gains are of

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(1) Sheep may have reached a genetic limit for wool production.
(2) Selection may have shifted from selection for fleece weight to other characters. These may be negatively correlated genetically with fleece weight.

The current rate of progress is

B. F. SHORT:- The structure of the Australian Merino population.

The 1921 - 1950 annual returns from flocks entered in the Australian Merino Stud Flock Register have been examined as an index of the structure of the Australian Merino population. Stud flocks mate approximately 3 per cent of the Merino ewe population and provide directly some 70 per cent of all rams used in the non-registered flocks of the industry. The stud population has a definite and continuing structure founded initially upon the several distinct strains of the Australian Merino sheep.

(a) The Fine wool
(b) The Non-Peppin Medium
(c) The Peppin Medium
(d) The South Australian

Within each of these broad groups a hierarchy has developed wherein several well-established flocks compete: The Parent flocks - Total 21 flocks. Each Parent flock is patronised by an attendant group of Daughter flocks (Total 290 flocks) whose introduced breeding stock are wholly derived from the Parent flock or from a sister - member of the same group. The remaining group of registered flocks introduce breeding stock more or less promiscuously from various Parent or Daughter flocks of a particular strain, from each other, and not infrequently from other strains. These are the General flocks: Total 650 flocks. This pattern is examined in detail and its significance to the industry discussed.

H. N. TURNER:- Inter-relationships between the components of fleece weight in sheep.

Information on the extent to which important characters are independent is essential in any animal-breeding programme. Data on the relationships between the components of fleece weight in sheep will be presented and discussed, not only for their place in any selection programme, but as part of general speculation on the mechanisms controlling fleece production.

M. J. D. WHITE:- Cytological Polymorphism in Grasshopper Populations and its Significance

A review of the various types of cytological polymorphism (translocations, pericentric inversions, fusions, deletions and/or duplications of heterochromatin, supernumerary chromosomes) commonly met with in grasshopper populations. Relationship between the various types of structural heterozygosity and the different kinds of chiasma-localization. Evidence for heterosis. Distribution of structural heterozygosity in different populations of the species Trimerotropis sparsa and T. gracilis. Cytological polymorphism at the periphery of the distribution area. Heterozygosity in very small populations. Non-Mendelian inheritance of supernumeraries.

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