

It is clear that any substance capable of giving ω -hydroxy lævulinic aldehyde under the conditions of acid concentration and temperature as used in the Dische and Feulgen reactions will give a positive result. Since Pummerer and Gump⁸ hold the view that (IV) is an intermediate in the conversion by acids of ω -hydroxymethylfurfural into lævulinic acid, sucrose and fructose (which readily yield ω -hydroxymethylfurfural with acids) and ω -hydroxymethylfurfural itself, were separately heated under slightly increased acid concentration with diphenylamine. A blue coloration identical with that given by (IV) was obtained. Thus our work has shown that the Dische and Feulgen reactions must be carried out under rigidly controlled conditions and with great care. Interpretation of positive results as indicating the presence of deoxyribonucleic acid must be supported by other evidence such as purine nitrogen/phosphorus ratios and spectrographic analysis. Since the natural mode of linkage of (III) with purines and pyrimidines shows important differences^{3,5}, we are investigating the production of (IV) from various compounds of (III) (*d*-form). Full details of this work will be published elsewhere.

We are greatly indebted to Dr. F. J. Llewellyn for the X-ray powder photographs.

¹ Darlington and La Cour, "The Handling of Chromosomes" (Allen and Unwin, 1942).

² Feulgen and Rossenbeck, *Z. physiol. Chem.*, **135**, 203 (1924). Widstrom, *Biochem. Z.*, **199**, 298 (1928).

³ Dische, *Microchemie*, **8**, 4 (1930). Sevag, Smollens and Lackmann, *J. Biol. Chem.*, **134**, 523 (1940).

⁴ Milovidov, *Protoplasma*, **31**, 246 (1938).

⁵ Mirsky, "Advances in Enzymology" (Interscience Publishers, New York, **3**, 1 (1943). Avery, Macleod and McCarty, *J. Exp. Med.*, **79**, 137 (1944).

⁶ Pirie, *Brit. J. Exp. Path.*, **17**, 269 (1936).

⁷ Meisenheimer and Jung, *Ber.*, **60**, 1462 (1927).

⁸ Pummerer and Gump, *Ber.*, **56**, 999 (1923).

⁹ Levene and Mori, *J. Biol. Chem.*, **83**, 803 (1929).

¹⁰ Pummerer, Guyot and Birkofer, *Ber.*, **68**, 480 (1935).

ANT GYNANDROMORPHS AND OTHER MOSAICS

By DEREK WRAGGE MORLEY

Department of Agriculture, University of Cambridge

AT a meeting of the Royal Entomological Society of London on December 5, 1945, Mr. H. Donisthorpe¹ exhibited fifty gynandromorphs of *Myrmica scabrinodis sabuleti*, Mein, all taken from a single colony on the Isle of Ireland's Eye, Dublin Bay.

Wheeler² has described in detail a colony of *Acromyrmex octospinosus*, Reich, in which ten gynandromorphs and many other anomalous forms (including forty-one so-called 'gynergates' (female-worker mosaics)) were present. In the introduction to the same book a colony of *Cephalotes atratus quadridens*, De Geer, containing "at least 4,000 gynandromorphs", which was discovered by Weber, is mentioned. Although Weber's 4,000 'gynandromorphs' have never been described, Whiting³ states that in fully 95 per cent the male component is confined to the head.

The ant gynandromorphs may be divided into two fairly distinct categories: (1) antero-posterior gynandromorphs; (2) lateral gynandromorphs. The former class comprises chiefly the ergatomorphic males described by Santschi⁴ for *Cataglyphis*, Wheeler⁵ for a fossil *Iridomyrmex*, and Lominecki⁶ for *Myrmica*

rugulosa. Typically these forms have the head, thorax and gaster predominantly worker or female, and the genitalia and antennæ male.

Wheeler⁷ interprets these anomalous forms, together with all the ergatomorphic males of *Ponera punctatissima*, *Ponera eduardi* and other species of that genus, as "antero-lateral gynandromorphs or intersexes". I take this to mean, quite rightly in my opinion, that Wheeler did not regard these as true sex-mosaics or gynandromorphs, but as intersexes in the sense of Goldschmidt's⁸ *Lymantria* ones.

The true genetic mosaic involves some form of aberrant division in the earliest stages of cell-division in the egg, and usually involves at least partial chromosome elimination. It is typified by the occurrence of scattered mosaicism in many different parts of the body. The intersex begins development as one sex; but later, owing to a change in physiological conditions, development shifts so that the organs eventually developed are according to the pattern of the opposite sex. The intersex is typified by a less scattered form of mosaicism, as in the antero-lateral gynandromorphs.

For this reason it is preferable to regard the so-called dinergatandromorphs (soldier-male mosaics) of Wheeler⁹ (*Camponotus*) and Vandel¹⁰ (*Pheidole*), together with Wheeler's² 'gynergates' (female-worker mosaics) as phenotypic intersexes. There can be little doubt that most, if not all, of Weber's 4,000 gynandromorphs are also intersexes.

Whiting³ suggests that the occurrence of large numbers of these mosaic forms in single colonies is due to genetic factors and postulates a mixture of strong with weak sex factors within the colony. Thus there may be a tendency for "the diploid intercaste [to] begin development towards the worker end of the series and later deviate across the sex boundary towards the male, while the haploid caste starting as a male deviates towards or beyond the female". Donisthorpe's gynandromorphs are of special interest in that while the mosaicism is, I understand, scattered, it has been suggested that their occurrence in such numbers is due to strong local shocks caused by a vibrator situated in Dublin Bay near Ireland's Eye island.

The bearing of these mosaic forms on the problem of caste determination in ants is obvious. The male-female determination is undoubtedly genetic, and this is supported by the occurrence of what appears to be true mosaic gynandromorphs.

Huxley¹¹ has shown that the soldier-worker series in some of the harvesting ants form a typical acromegalic growth-curve. The experimental work of Goetsch¹² and Gregg¹³ on this problem is, however, inconclusive. The same applies in the case of worker-female determination: Ezhikov¹⁴ subjected *Camponotus* and *Myrmica* larvae to hunger, but failed to obtain forms transitional between the worker and female, although he obtained females reduced in size. Wesson's¹⁵ work is interesting but statistically inconclusive. More recently, Flanders¹⁶ has put forward the hypothesis that the worker-female determination depends on the amount of nutrient in the egg, and thus on the rate of oviposition. There is, however, no myrmecological experimental evidence to support this theory. Much of the large body of experimental work on this subject has been ably summarized and discussed by Light¹⁷.

Tulloch¹⁸ has described a *Myrmecia* lateral 'gynergate'. In this specimen one side possesses for the most part typically female characteristics and the

other typically worker ones. On the female side of the thorax a vestigial hind wing is still present, with the place of insertion of the fore-wing clearly marked. The parascutal ridge and transental suture together with other female characters are present. The node is asymmetrical.

Is this a true sex-mosaic? It is difficult to say, but it is the only ant 'gynergate' so far described to have the appearance of a genuine mosaic. It is not, by itself, sufficient evidence for the rejection of the trophogenic hypothesis for female-worker determination, which would appear more probable in the light of the trophogenic mechanism known to exist in the closely allied bees.

- ¹ Donisthorpe, H. St. J. K., *Proc. Roy. Ent. Soc. Lond. (C)*, **10**, 34 (1945); *Entom.*, in the press.
- ² Wheeler, W. Morton, "Mosaics and other Anomalies amongst Ants" (Camb., Mass., 1937).
- ³ Whiting, P. W., *J. Hered.*, **29**, 189 (1938).
- ⁴ Santschi, F., *Bull. Soc. Vaud. Sci. Nat.*, **53**, 175 (1920).
- ⁵ Wheeler, W. Morton, *Schrift. physik. ökonom. Gesell. Königsberg*, **55**, 1 (1914).
- ⁶ Lomincki, F., *Kosmos*, Lwow, **49**, 817 (1924).
- ⁷ Wheeler, W. Morton, *Psyche*, **38**, 80 (1931).
- ⁸ Goldschmidt, R., "Physiological Genetics" (New York, 1938).
- ⁹ Wheeler, W. Morton, *Psyche*, **26**, 1 (1919).
- ¹⁰ Vandel, A., *Bull. Soc. Biol. France Belg.*, **65**, 114 (1931).
- ¹¹ Huxley, J. S., "Problems of Relative Growth" (London, 1932).
- ¹² Goetsch, W., *Naturwiss.*, **25**, 803 (1937).
- ¹³ Gregg, R. E., *Ecology*, **23**, 295 (1942).
- ¹⁴ Ezhikov, T., *Amer. Nat.*, **38**, 333 (1934).
- ¹⁵ Wesson, I. G., jun., *Psyche*, **42**, 105 (1940).
- ¹⁶ Flanders, S. E., *Science*, **101**, 245 (1945).
- ¹⁷ Light, S. F., *Quart. Rev. Biol.*, **17**, 312 (1942); **18**, 46 (1943).
- ¹⁸ Tulloch, G. S., *Psyche*, **39**, 48 (1932).

NATIONAL CENTRAL LIBRARY

THE twenty-eighth and twenty-ninth annual reports of the executive committee of the National Central Library, London, W.1, published as one report, cover the two years ended February 28, 1945. The most notable event in the history of the library in 1944 was the retirement for reasons of ill-health of Dr. Luxmoore Newcombe, its first librarian, to whose work a warm tribute is paid. Mr. R. H. Hill was appointed librarian and secretary to the Trustees as from January 1, 1945. Another serious loss to the staff was due to the appointment of Mr. J. H. P. Pafford, sub-librarian, as Goldsmith's librarian of the University of London. The work of the Library continued to be carried out, though with increasing difficulty, in the intact portion of the Malet Place premises and in the temporary quarters at Bourne End. Damage due to enemy action in April 1941 reduced the number of books in the Library from 176,961 to 72,612, a figure which had been increased to 88,760 by the end of February 1945. Total issues of books during the two years were 55,539, and 57,672, respectively, of which 3,553 and 4,580 were to university libraries, 4,414 and 4,398 to special outlier libraries and 6,354 and 6,568 to the libraries of Government Departments, research and industrial organisations, etc., the corresponding figures for 1938-39 being 58,683, 3,538, 5,289 and 2,588, respectively. The group of outlier libraries now includes 137 special libraries, 2 urban libraries and 23 London borough libraries, libraries added during the two years including the Austin Motor Co., Ltd., Birmingham, Cement and Concrete Association, Evans Biological Institute, Royal Veterinary College and the Textile Institute. Eighteen university libraries and fifty-two

special libraries are now co-operating in the regional systems, but no figures are available for the issue of books to university libraries, although 5,889 books were lent by them to other libraries in 1943-44 and 7,151 in 1944-45. An increase of 132,408 entries in the union catalogues is now reported, the grand total now standing at 4,373,798, of which a hundred thousand at the National Central Library relate to university periodicals.

After consideration of suggestions made by the Library Association as an outcome of the McColvin Report, the trustees have indicated their agreement with three recommendations concerning the National Central Library made to the Council of the Association. These relate to the provision of a department of the central government charged with the duty of guiding, co-ordinating and encouraging the development of local library services, of making grants-in-aid, and of promoting the establishment and maintenance of those departments of the service which can most efficiently be provided for areas larger than those of library authorities—among which would fall inter-library co-operation and the work of the National Central Library. Secondly, better local provision should be made by larger authorities with more comprehensive book-stocks, thus strengthening and developing the National Central Library so as to provide for the interchange of the more specialized older and less readily obtainable material. The third proposal relates to the establishment as part of, or in close association with, the National Central Library, of a central cataloguing department; and the trustees have already adopted a memorandum on the establishment of such a department. The executive committee has also approved the appointment of a committee to consider the compilation of a complete union catalogue of periodicals in British libraries of all types, and work on this project has now begun.

RHEOLOGY IN THE FOOD INDUSTRY

RHEOLOGY in the food industry was the subject of discussion at a joint meeting of the British Rheologists' Club and the Royal Institute of Chemistry of Great Britain and Ireland (London and S.E. Counties Section) held on April 2 at the Royal Society of Arts, London, Dr. G. L. Riddell being in the chair.

Dr. E. C. Bate-Smith, of the Low Temperature Research Station, Cambridge, indicated opportunities for the use of rheological methods and principles in the examination of meat during the period between slaughtering and butchering when 'setting' or rigor mortis occurs. The changes due to coagulation of muscle proteins can be followed by measurements of the elastic modulus of the muscle fibre (single fibres obey Hooke's law but connective tissue shows elastic return creep) and the rate of change indicates the quality of the meat, deficiency in glycogen, etc. Various methods and standard machines were described for measuring the toughness of meat. In the discussion, Dr. J. G. A. Griffiths inquired about the large scatter of results for toughness obtained by machines in which the meat specimen is sheared or punched by a moving 'tooth' and the peak load measured, and Mr. W. Baker suggested that the differences between results obtained by the machine