mains failures); and, secondly, of the eventual incorporation among the primaries of the quartz clocks newly installed, and others to be installed, at the Observatory. After that, improvements in the time service will depend not so much on horological developments as on improvement of the astronomical observations. Although minor improvements are possible in the standard small transit instruments at present in use (an optical autocollimation method of level determination is mentioned), their supersession by a photographic reflex zenith tube is forecast by the Astronomer Royal, and preparations for the new telescope are already at the design stage. The Admiralty has sanctioned construction of an instrument of aperture 10 in. and focal length 11 ft. 3 in., giving a scale of 1 minute of arc to 1 mm., and the main details have already been settled. This instrument should improve materially the accuracy of the time determinations. Together with the purely horological developments reported and forecast in this report, it should make possible the provision in the future of a time service equal to all the exacting demands made upon it, and second to none in the world.

CARNEGIE INSTITUTION OF WASHINGTON

ANNUAL REPORT

THE Year Book No. 42 of the Carnegie Institution of Washington, covering the year July 1, 1942-June 30, 1943, includes the reports of the Executive Committee, the auditors, and of the president, together with reports of departmental activities and co-operative studies. The president's report points out that although the total research effort of the Institution is more than twice as great as in the year just prior to the War, the efforts of the research staff are now so largely devoted to war research that the regular programmes have been severely curtailed. The services of seventy members of the Institution staff have been loaned for war work in other organizations. The Geophysical Laboratory is now completely devoted to a war programme for which its facilities and staff are specially fitted, and the Department of Terrestrial Magnetism is similarly occupied. The Mount Wilson Observatory has several important programmes under way utilizing the special knowledge of astronomers and physicists, and the war effort continues to demand more outstanding talent in the physical sciences than is available and to utilize to a lesser extent men from the biological sciences.

Investigations of the Division of Plant Biology referred to in the report are those on the biochemistry of algae, including the selection and isolation of algae, their pigments, effects of environment on their pigment content, and the production of organic matter by *Chlorella pyrenoidosa*. Investigations on the nature of substances produced directly by photosynthesis in sunflower leaves have continued, and improved methods of pigment analysis have been developed which show promise of application to other fields of chemical and biochemical investigation. In addition to investigations on the breeding of new forage grasses of importance for food production, excellent progress is reported in the normal programmes of biochemical investigation and experimental tax-

onomy. In the Department of Genetics, research in endocrinology, especially in regard to the action of the parathyroid gland, is being completed, and an interesting mutation in mice which aids in interpreting certain processes of normal development is being studied. Other investigations concern broken chromosomes in maize, the genetics of the mouse, hormone action in carbohydrate and fat metabolism, the effects of ultra-violet radiation on mitosis, radiation theory and breeding studies on the Russian dandelion.

At the Mount Wilson Observatory the remarkable reversal of sign of magnetic polarity characteristic of a new solar cycle has been fully confirmed. Advances in the efficiency of the stellar spectrographs have led to notable discoveries regarding the structure of the expanding shells surrounding the novæ of our galactic system and have aided in the interpretation of these objects. The discovery of a shell round the novæ in Auriga of 1891 is of exceptional interest. The powerful spectrographs in use with the 100-in. telescope have opened new fields in the analysis of stellar spectra, and in the study of differential motions in the stellar atmospheres, and of the distribution and composition of the gaseous clouds of interstellar space. The cyclotron at the Department of Terrestrial Magnetism has been completed, and cosmic data were assembled and analysed to increase the understanding of solar geomagnetic and ionospheric relations and to improve the technique of short-term forecasting of ionospheric disturbances. The value of the ionospheric programme undertaken by the Department has been emphasized by the urgent need of particulars regarding the relations of ionospheric variations and disturbances and the many confidential studies for operational application which have been made. Tables of changes in the annual mean value of the geomagnetic field with sunspot cycle, the average annual variations, daily post-perturbations and average solar daily variations for the period 1905-42 were nearly completed.

The final section of the president's report considers the broad problem of the status of scientific research in the United States after the War and the unique position of the Institution. The importance of independent scientific bodies such as the Carnegie Institution in the pattern of scientific research likely to develop after the War is emphasized, and in a frank discussion of the probable endowment position of research generally as between the universities, the Government, and independent scientific institutions, the necessity of studying the trends carefully is stressed.

DROSOPHILA MELANOGASTER

THE American fruit fly holds a unique position in biology; this animal has probably been more intensively studied from all angles of biology than any other. The immense literature and specialized language illustrates the intensity of attention it has received. Yet some geneticists, and a much smaller proportion of botanists and zoologists, know very little of the results of this intense experimentation. It was understandable that during its early years of captivity it should be of particular interest for the development of the chromosome theory of heredity. As a consequence the excuse that it was a laboratory plaything might be considered to be reasonable.

Since that time, however, this *Drosophila* has provided most important data in subjects which are considered to be the province of the taxonomist, ecologist and morphologist.

Its intrinsic value as an organism about which we know more of its heritable characters than of any other living thing gives *Drosophila* a position which cannot be ignored when discussing the evolutionary problems and behaviour of organisms in the wild. The 'drosophilists' have realized the importance of wild population studies and are providing and accumulating many data in the United States.

It is fortunate that two monographs have just been issued^{1,2} under the names of the late Dr. C. Bridges and Dr. K. S. Brehme, and Prof. J. T. Patterson, respectively. The first is a valuable and possibly classical work on the known characters of *Drosophila*. After listing the symbolization used in *Drosophila* literature in a form comprehensible to an ordinary geneticist, the inherited characters are described, together with the positions of the related genes on the chromosomes, their origins and authorities. These data, included in two hundred pages, are followed by chromosome maps of the genes which leave all other published maps far behind. A fitting conclusion to the publication is the inclusion of the salivary chromosome maps originally published in the *Journal of Heredity*. The conception of this work was designed by Dr. M. Demerec, director of the Carnegie Institution, and with the co-operation of many geneticists the compilation by Dr. Brehme is a fitting memorial to Dr. Bridges. This publication gives the biologist an accurate description of the genetic characters of *Drosophila melanogaster*.

The publication by Patterson and his co-workers carries, as it were, the attack into the enemy's camp. Here the species of *Drosophila* which have been found in the south-west of the United States and Mexico are described with the meticulous care of the systematist, and each is illustrated with coloured plates. Twenty-four new forms are described for the first time, while numerous data from collecting work provides an insight into geographical distribution and reasons for the fluctuations in numbers in wild populations. J. T. Patterson and R. P. Wagner consider the distribution of the species of *Drosophila* throughout the United States and give data on the reactions of different species to ecological factors. L. J. Wharton describes the metaphase complements and the salivary gland chromosomes of eighty *Drosophila* species.

As a result of these investigations on an animal the genetical constitution of which is better known than that of any other, it is possible to raise doubts and to call for reconsideration of important current and established theories, some of which are keystones in branches of biology. For example, it is clearly seen that homology between parts of chromosomes in related species cannot be assumed without hybridization experiments and linkage studies. Similar characters in different species may depend on different genic origins. This being so, to what extent can homology of characters in different organisms be utilized as has been done in the past by morphologists as a criterion in evolution? Does the different origin and development of a character affect the validity of the evidence derived from analysing such characters in different phyla?

Again, there is strong evidence in *Drosophila* that phylogenetic relationships based on metaphase chromosome idiograms may be invalid unless sup-

ported by salivary gland chromosome analysis or cross-over configurations and other genetical criteria.

On the problem of speciation, the distribution of the species of *Drosophila* in the United States is interesting. A very few species are widespread while a larger number of species, many of which are local, are found in areas where there is great environmental diversity.

The reviewer is impressed by the painstaking work, the absence of contentious or other theories and the manner in which the solid results become related into a coherent whole. The evidence touches on many fields of biology and it is salutary, and we believe necessary, to consider it in relation to current theories in different branches of botany and zoology.

F. W. SANSOME.

¹ Bridges, C. B., and Brehme, K. S., "The Mutants of *Drosophila melanogaster*", Carnegie Institution of Washington Pub. 552 (1944).

² Patterson, J. T., "Studies in the Genetics of *Drosophila* III", University of Texas Pub. 4313 (1944), 2.50 dollars.

SUMERIAN MYTHOLOGY*

TO-DAY everyone in the least interested in archaeology has heard of the Sumerian culture of Mesopotamia and the cuneiform system of writing that was developed there. Not everyone realizes that only so recently as 1850 was the existence of this all-important non-Indo-European and non-Semitic people so much as suspected. Nowadays, of course, the Sumerians take pride of place as the dominant cultural element in Mesopotamia from the fourth to nearly the beginning of the second millennium B.C., and the influence of their culture is known to have spread far and wide and to have lasted long after the folk themselves had been swamped by their Semitic neighbours. Why are there to-day sixty seconds in a minute, sixty minutes in an hour, and 6×60 degrees in a circle? Because the Sumerians used a unit of sixty. Their unit of weight, the mina, seems to have been just about equal to the Imperial pound.

The Sumerians used tablets of clay to write on, and many thousands of these have turned up in the course of excavations. More particularly is this true of the American excavations at Nippur, which were carried on at intervals between 1889 and 1900. But the writing is difficult to interpret and much of the material is broken; and in consequence a great deal still remains to be deciphered. Most of the quarter of a million or so tablets that have been unearthed are concerned with matters of business, but a small proportion, dating mostly to about 2000 B.C., can be classed as 'literary' tablets, and these are inscribed with Sumerian epics, myths, hymns, lamentations, proverbs and words of wisdom. There are also a number inscribed with mathematical texts and incantations. Mr. S. N. Kramer is concerned to publish much of this hitherto undeciphered material in a number of volumes, of which this one on Sumerian mythology is the first. He has had the opportunity of working for nearly two years at the Nippur collections now in Turkey, as well as at those from the same site now housed in the United States. This first volume is extremely well put together and illustrated. It does not assume a greater knowledge of Mesopotamian

* Memoirs of the American Philosophical Society. Vol. 21: Sumerian Mythology, a Study of Spiritual and Literary Achievement in the Third Millennium B.C. Pp. xiv + 125 + 21 plates. By S. N. Kramer. (Philadelphia, 1944.)