SCIENTIFIC BOOKS

CLADOCERA

Studies on the Physiology, Genetics, and Evolution of Some Cladocera. By A. M. BANTA, with the collaboration of THELMA R. WOOD, L. A. BROWN and LESTER INGLE. x + 285 pp., 170 figs., 16 diagrams. Paper No. 39, Department of Genetics, Carnegie Institution of Washington. 1939.

THIS book tells the general story of results obtained in a series of studies of Cladocera which began in 1911 and continued to 1938. The immediate problem in the beginning was concerned with selection in relation to evolution. This group of animals seemed particularly favorable for a study of small heritable variations because many of the forms show considerable variations in different types of habitats. As the investigation progressed, however, the scope of the studies was enlarged to include a number of problems as shown by the headings of the twelve chapters into which the book is divided; the various topics include discussions of selection, sex intergrades, head mutations, control of male and sexual egg production, genetical studies in sexual reproduction, growth, the effect of environment, and finally the adaptation and evolution of the group.

Limited space permits only brief references to some of the more salient points. With regard to sex intergrades, *Simocephalus exspinosus* showed various stages of intergradedness and some clones produced many more individuals of this type than others; the sex reversals were always from male to female. Many of the intergrade individuals were either sterile or had a low reproductive capacity, thus leading to the conclusion that a sex intergrade stock could not survive in nature. With one possible exception, no sex reversals were found in *Daphnia longispina,* but hermaphroditic individuals were noted occasionally; they also had a low reproductive capacity and probably could not survive under natural conditions.

An excavated-head type of *D. longispina* came from a sex intergrade stock, and the character proved to be heritable in both males and females; it was found in the 250th generation following its appearance. Three elements of the environment were found to have some effect on the sex of cladocerans; temperature and quantity of food acted as general or limiting conditions, while crowding also proved effective in inducing liberal male production. Apparently male production was caused by a lowered rate of metabolism of the mother.

In the genetical studies, some culture lines remained vigorous for long periods of time under parthenogenetic reproduction. A culture of *D. longispina* remained vigorous for 14 years (680 generations), but most lines became weak after prolonged parthenogenesis. Clones of *Moina macrocopa* showed no loss of vigor over a period of 23 years (1,572 generations). Some of the declines in clones may have been due to unfavorable culture conditions, but in some cases they may have been due to dominant or semi-dominant mutations that affected vigor.

The growth studies showed that the normal life of *Daphnia longispina* consisted of 3 juvenile, 1 adolescent, and 10 to 19 adult instars, with a life span of 29 days at 25° C. The growth during the adolescent instar was unusually large, even up to a doubling of the body size. These animals increase in size for about 71 per cent. of their lives, remain at the maximum for 17 per cent. and then have a senescent decline for about 12 per cent.

Marked differences in growth rate were found in different clones and even among individuals of the same clone. Such variations were especially noticeable in the slowly developing dwarf clones which produced individuals phenotypically different from one another, though the members of the clone were all genotypically alike. Apparently the dwarf clones were due to some heritable defect in their assimilative mechanism.

The final chapter deals with the adaptation and evolution of the Cladocera. Parthenogenesis is pointed out as one of the most striking characteristics of the group. It enables them to quickly and abundantly populate temporary habitats, such as seasonal pools, as well as permanent bodies of water when conditions are favorable. When crowding or other unfavorable conditions overtake them, they are able to reproduce sexually and form resistant eggs which are able to withstand severe environmental conditions and thus provide for the survival of the various forms.

The book is a fitting climax to the arduous and painstaking studies that have been carried on for such a long period of time.

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REPORTS

THE NATIONAL RESEARCH COUNCIL COMMITTEE ON MATHEMATICAL TABLES AND AIDS TO COMPUTATION

SINCE this committee has been especially active during the past twelve months, it seems desirable that some account of this activity and of the committee's plans should be more generally known. At present its chief aim is to prepare a series of reports on pub-

lished and unpublished mathematical tables of importance for current research in different fields. This does not, of course, imply a survey of every table in each field, but only those of special importance for research at the present time, though it may occasionally be found that old tables of this nature have not been replaced by anything of recent date.

Each report is to contain the following three major divisions:

I. Descriptive survey of all tables in accordance with a carefully prepared plan of classification of the field.

II. Bibliographic details of every table, published or unpublished, which is referred to in the survey. These are alphabetically arranged and refer to every edition and every translation.

III. List of all known errata in every table listed. This feature must frequently be of exceptional value to the worker.

From the descriptive survey one may at once learn every table in any particular part of a field and the exact range of each table. The bibliography indicates the periodicals, books, pamphlets or manuscripts where the tables may be found, and also the location of every manuscript. The new edition of the "Union List of Serials" will soon indicate the libraries of the United States and Canada where the serials mentioned may be found. The committee made up a list of 37 libraries (2 in Canada and the others in 22 states) whose exact holdings, of all books and pamphlets mentioned in each report, are to be indicated.

The present membership of the committee is as follows:

Executive Committee:

Professor R. C. Archibald, *chairman*, Brown University
Professor H. Bateman, California Institute of Technology
Doctor L. J. Comrie, Scientific Computing Service Ltd., London, England
Professor H. T. Davis, Northwestern University
Professor D. H. Lehmer, University of California
Professor H. S. Wilks, Princeton University

Professor S. H. Caldwell, Massachusetts Institute of Technology
Professor W. G. Cochran, Iowa State College of Agriculture and Mechanic Arts
Professor A. T. Craig, State University of Iowa
Professor C. Eisenhart, University of Wisconsin
Professor J. D. Elder, University of Michigan
Professor P. W. Ketchum, University of Illinois
Doctor A. N. Lowan, U. S. Works Progress Administration, 475 Tenth Ave., New York City
Doctor J. C. P. Miller, University of Liverpool, England
Doctor W. A. Shewhart, Bell Telephone Laboratories, New York City
Doctor G. R. Stibitz, Bell Telephone Laboratories, New York City
Professor I. A. Travis, University of Pennsylvania

The present 22 sections (A . . . Z) of different fields, and the six subcommittees already chosen to survey twelve of these sections are as follows:

A. Arithmetic. Mathematical Constants
B. Powers
C. Logarithms
D. Circular Functions
E. Hyperbolic and Exponential Functions
Professor Davis, *chairman*
Professor Elder
Professor Ketchum
Doctor Lowan

F. Theory of Numbers
Professor Lehmer

G. Higher Algebra
Professor Lehmer

H. Numerical Solution of Equations
J. Summation of Series

I. Finite Differences
K. Statistics
Professor Wilks, *chairman*
Professor Cochran
Professor Craig
Professor Eisenhart
Doctor Shewhart

L. Higher Mathematical Functions
M. Integral Tables
Professor Bateman

N. Interest and Investment
O. Life Insurance
P. Engineering
Q. Astronomy
R. Geodesy
S. Physics
T. Chemistry
U. Navigation

Z. Calculating Machines and Mechanical Computation
Doctor Comrie, *chairman*
Professor Caldwell
Professor Lehmer
Doctor Miller
Doctor Stibitz
Professor Travis

It is expected that in the near future other sub-

committees will be organized for dealing with further sections. Professor Lehmer's Report on Section F—Theory of Numbers is now in the press and will probably occupy about 175 pages.

I should be especially glad to receive information from any one with reference to mathematical manuscript tables, of value for our survey, which may be in public or private hands.

I have stated that the chief aim of the committee was to prepare for publication by the National Research Council a series of reports such as are described above. But another aim of almost equal importance is to publish a series of new mathematical tables which the committee has reason for believing to be of importance for different fields of research. In order to make such publications possible the Rockefeller Foundation, last May, appropriated $15,000 to the National Research Council to be used for the establishment in the Division of Physical Sciences of the Council of a revolving fund "for the publication of mathematical tables and aids to computation and bibliography of such tables," under the direction of the Committee on Mathematical Tables and Aids to Computation.

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BROWN UNIVERSITY,
JUNE 26, 1940

SPECIAL ARTICLES

RADIO-IRON IN PLASMA DOES NOT EXCHANGE WITH HEMOGLOBIN IRON IN RED CELLS[1, 2]

RADIO-IRON gives the investigator a relatively simple and accurate method of tracing the course of iron absorption and transfer within the body. When iron is absorbed in the anemic dog it heaps up rapidly in the blood plasma,[3] reaches a peak and falls close to the base line in 6 to 12 hours. Within 4 hours after feeding, radio-iron is found in significant amounts in the hemoglobin of red cells of the anemic dog.[4] When values shift with this rapidity, obviously we must be certain that the iron within the hemoglobin of these circulating cells does not exchange with the plasma radio-iron in the dog under investigation. The following experiments bear on this important point and give evidence that the iron bound in hemoglobin is fixed and incapable of exchange with plasma radio-iron or artificial solutions of radio-iron.

The following experimental procedure was employed. Iron containing the radioactive isotope was fed to a fasting anemic dog. One and a half hours later, 90 ml of blood was withdrawn into 20 ml of isotonic oxalate. Red cells were removed by centrifugalization. One aliquot of 10 ml of plasma was ashed for radioactive iron determination. Six other aliquots were added to washed red blood cells obtained from 10 ml of blood of animals whose blood levels ranged from severe anemia to normal. The suspensions were kept at 37° C. for 24 hours with frequent agitation. The cells were removed in the centrifuge and washed three times with saline. Cells were laked and stroma precipitated by re-establishing isotonicity followed by centrifugalization. The supernatant solution of hemoglobin was ashed for radioactive iron determination.

Activity determinations were made using the Geiger-Müller counter as described in previous publications.[3]

The control plasma aliquot had an activity of 5.3 counts per minute above the background of 3.7 counts per minute on our scale-of-four counter.

In each case measurement of activity of the iron separated from the hemoglobin after the exchange experiment showed close to background rate of counting, indicating that no exchange within the accuracy of measurement had occurred.

From statistical considerations it is considered that in these individual experiments exchange could have been as high as 15 per cent. without having been detected, although in the average of six experiments it is certainly much less than this.

TABLE 1

LACK OF EXCHANGE BETWEEN THE IRON OF HEMOGLOBIN IN RED CELLS AND PHYSIOLOGICALLY BOUND PLASMA RADIO-IRON

Dog	Hematocrit	Hemoglobin level	Activity found counts per min.		Remarks
			Hemoglobin	Plasma	
	%	gm %			
39–196	51.7	18.0	0.2	4.4	Normal adult
39–53	28.9	8.0	0.0	4.8	Anemic
39–144	32.2	10.5	0.0	5.5	Anemic, protein depleted
37–227	18.4	5.4	0.0	4.8	Anemic
39–80	17.3	4.8	0.0	5.9	Anemic, bile fistula
39–169	32.5	10.9	0.4	6.1	Anemic, receiving liver in diet

Control plasma shows an activity of 5.3 counts per minute.

An experiment was carried out to determine whether there was any exchange between hemoglobin in solution and inorganic iron in solution. Ninety ml of

[1] From the Departments of Pathology and Radiology, the University of Rochester School of Medicine and Dentistry, Rochester, N. Y.

[2] We are deeply indebted to Professor E. O. Lawrence and members of the Radiation Laboratory of the University of California for the radioactive iron used in these experiments, and in particular to Dr. M. D. Kamen, who was directly responsible for preparing the isotope.

[3] P. F. Hahn, W. F. Bale, E. O. Lawrence and G. H. Whipple, *Jour. Exp. Med.*, 69: 739, 1939.

[4] L. L. Miller and P. F. Hahn, *Jour. Biol. Chem.*, 134: 585, 1940.