

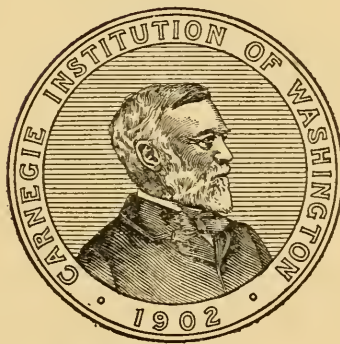
CARNEGIE INSTITUTION

OF

WASHINGTON

YEAR BOOK No. 17

1918



PUBLISHED BY THE CARNEGIE INSTITUTION OF WASHINGTON

FEBRUARY 1919

DEPARTMENT OF EXPERIMENTAL EVOLUTION.*

C. B. DAVENPORT, DIRECTOR.

The exigencies of the world war have called for the assistance of every able-bodied man who could be spared from his family and whose ordinary occupation was such that it could be temporarily replaced by work of more immediate aid in the crisis. The response of those in this Institution has been facilitated by the generous action of the Trustees. Consequently, of the staff of this Department, three besides the Director, or over half in all, have at this writing temporarily left their work at the Station to assist in the war. Dr. E. Carleton MacDowell, a member of the Society of Friends, was the first to answer the call. He began to train in June 1917, and later in the summer he sailed for France as one of a reconstruction unit of the Red Cross. In France he helped rebuild homes in the devastated area; sometimes only a few miles back of the trenches. Meanwhile his experiments on the effect of alcohol on the germ-plasm of rats have been continued, along lines planned by him, with the aid of his effective assistant, Miss Emilie Vicari.

Dr. Charles W. Metz was unable, for physical reasons, to enter the service as a combatant. In the early autumn of 1917 he answered the call sent out first by the Red Cross for assistance with anti-malaria work in the neighborhood of the southern cantonments. He was shortly after transferred to the Public Health Service. He served at Hattiesburg, later at Montgomery, Alabama, and at Lakeland, Florida, making investigations into the problems of elimination of the malarial mosquito. Malaria, formerly so dangerous an enemy of soldiers in semitropical and tropical countries, was reduced in our southern camps last summer to negligible proportions by the work in which Mr. Metz is participating.

In October 1917 the Director of the Department became a member of the committee on anthropology, National Research Council. This led eventually to his appointment as major in the Sanitary Corps of the Medical Department of the Army. As head of the section of anthropology, division of medical records, he looks after the interests of the physical examination service of the Army, and assists the Army in questions of racial dimensions and differences; he has also participated in the statistical treatment of the data of the division of medical records.

On August 9, Dr. Oscar Riddle was appointed captain in the Sanitary Corps, U. S. Army, to assist, with his expert knowledge of biochemistry, in the work of the food division.

Of those members of the staff who have not, at this writing, entered the Army, two have been unable to do so because of their duties toward

*Situating at Cold Spring Harbor, Long Island, New York.

their families of young children, and one because he has undertaken, as a war measure, an extensive project for perfecting a superior race of prolific beans. The spirit of response to the urgent call of threatened civilization has not been the less complete in those who have served at home.

Of those who a year ago were assisting the staff, all the young men except one are in the service. On account of loyalty to their work, and often against their best interests, they remained with us until definitely called to aid in the war. In the autumn Mr. B. T. Avery left with his regiment for France and died there. Mr. Donald S. Welch and Mr. Karl E. Anderson answered the call in the spring. Others of our assistants of last year are now in the service as combatants or in the Medical Corps. With one exception all laboratory assistants have been replaced by women.

ACCOUNT OF RESEARCHES IN PROGRESS.

On account of war conditions no attempt will be made in this report to analyze the relations of the work done to the general problem of evolution. Our first effort has been to maintain breeding-lines upon whose continuity the success of future work depends. This continuity is insured by the able assistants who are carrying on the strains while members of the staff are in various lines of war work.

Since early in the year the work of the Director has been with the National Research Council and the Sanitary Corps of the Medical Department of the Army. His work has taken him to all but two of the cantonments. In addition to this work he organized and has constantly supervised a plant for breeding white mice for the Medical Department of the Army. The present output of this plant is about 500 mice per month. The mice are used in testing for pneumonia in Army camps.

A survey of the organizations, and interviews with the leading representatives, of the Central-European peoples, Balkan states, and Baltic provinces located in New York City was started by the Director and has been continued by his assistant, Miss Mary T. Scudder. This work has been partly subsidized by the National Research Council. The information secured has been regularly supplied to the Government. The work has been extended to Pittsburgh and Chicago.

During the early part of the year a beginning was made of a study of the family history and juvenile traits of military officers. Much time was also given to reading the proofs of the book entitled "Naval Officers: Their Heredity and Development."

Dr. Oscar Riddle reports as follows:

"Since October 1917, the work with the final proofs of volume 1 of the Whitman books has been completed. It is expected that this volume will be

issued during the calendar year. The proofs of volume II of the same series of books has been carried through two galleys with the aid of Dr. Banta.

"Throughout the entire year Dr. Riddle's chief effort has been directed to the assembling of a complete account of his past seven years' study of sex in pigeons. Although this work has been carried on with the utmost speed, it was not possible to make the book ready for publication before his entrance into war service. Nearly 700 tables of data have been completed, seriated, and numbered. The outline of the entire book is complete, though a few tables of data and a textual exposition of the results are still wanting. In this account work with the common pigeons has been almost entirely omitted. The previous experience of his assistant, Miss Holmes, will, however, enable her nearly to complete similar tabulations for that large body of data, probably during the next six months.

"Three new studies have been undertaken during the present year:

"(a) The effects of quinine on the production of egg yolk and egg albumen in the pigeon. This study, carried out in collaboration with Mr. Carl E. Anderson, has shown that the known nitrogen-conserving action of quinine extends to the production of the two above-mentioned substances. Relatively less egg albumen, and yolks of smaller size, result from dosage (1 grain daily) with quinine. In this case the smaller size of the yolks (ova) is probably induced by an effect upon the nitrogen metabolism rather than upon the general metabolism, and effects upon the production of sex from these treated germs are possibly not to be expected. Because of the previously observed relation of the general metabolism to sex the data for the sexes which arise from these treated germs is being carefully studied.

"(b) The effects of urotropin on the size and developmental capacities—with particular reference to sex—have now been studied during several months and the work is still being continued. It is known that this compound breaks up in the tissues into ammonia and formaldehyde. We have demonstrated that urotropin is absorbed by the ovum. This drug, therefore, offers the possibility of affecting the general metabolism of the egg-cell during its entire growth period. The results should be reported later when both the data for yolk size and for sex are complete.

"(c) The chemical composition of the brains of ataxic (?) pigeons is being studied in collaboration with Miss Mathilda L. Koch, of the Psychiatric Institute of the New York State Hospitals. The first appearance of this disorder of the voluntary movements (in an individual hatched from a *weakened* germ) and the transmissibility of the character to the fourth generation have been reported in the Year Books of previous years. The results of our first chemical study of these brains indicate that the brains of affected individuals are chemically under-differentiated, *i. e.*, juvenile or infantile in comparison with brains of normal individuals of the same age and strain. This material offers the greatest advantages for a study of the chemical aspects of hereditary mental disease, and a further study is in progress.

"In addition to these new lines of study nearly all of the several lines of investigation conducted by us during the past seven years on the nature and reversibility of sex have been continued. These results again confirm our earlier conclusions. They have, in greater part, been incorporated into the summary of our completed studies on sex.

"Mr. Karl E. Anderson assisted our general work until May 1, 1918. He collaborated in a study of the effects of quinine on certain aspects of the physiology of reproduction in doves and pigeons. Mr. Anderson joined the Army on May 1. His present duties are with the Sanitary Corps.

"Miss Ellinor H. Behre has recently undertaken a continuation of much of the work done by former assistants and the carrying out of some further studies hitherto impossible, or possible in only a very limited way.

"During the past year Miss Mary J. Holmes has been of great and especial assistance in Dr. Riddle's chief work. She has rendered irreplaceable service in the further work with his data and manuscripts."

Dr. A. M. Banta reports as follows in regard to his researches concerning additional strains of sex intergrades in *Daphnia longispina*:

"The most interesting development of the year has been the finding of sex intergrades in additional lines of *Daphnia longispina*.

"In addition to the sex-intergrade strains of *Simocephalus verulus* and the intergrade strains of *Daphnia longispina* reported a year ago, intergrades have been found repeatedly in the plus strain of No. 768. Further, sex intergrades have occurred in the strain of No. 768 kept in a dark closet, in the minus strain of No. 768, in No. 897, and in No. 898. Of the six strains of *Daphnia longispina* reared in the laboratory during the past year, No. 899 alone has failed to yield sex intergrades.

"Two additional probable occurrences of sex intergrades are of interest in this connection: (a) In 1915, along with a few males found in two strains of *Daphnia longispina*, were a few individuals then considered gynandromorphs. They were rather weak individuals when found and failed to produce young. From descriptions I am now convinced they were intergrades. (b) R. de la Vaulx has found what he called 'androgynous females,' or gynandromorphs, in *Daphnia atkinsoni*. From this account they clearly appear to have been sex intergrades.

"These extensions of the known occurrences of sex intergrades among Cladocera indicate that a condition of sex intergradeness in Cladocera is less unusual than was at first supposed; that maleness and femaleness are even less exclusive phenomena, so far as indicated by morphological characters in Cladocera, than was believed. With the relativity of sex so emphatically shown in hybrid pigeons, in hybrid moths, and in different species of Cladocera (see report for 1917), one wonders if the relativity of sex ends with pigeons, gypsy moths, and water fleas. There seems every reason to think it does not.

"We are coming to the time when it would seem imperative to revise our notions of the fixity of sex. The clear cases of sex intergrades or sex intermediates just referred to seem no more nor less illustrations of the relativity of sex than one sees in the 'crowing hen' and the 'sitting cock' or in the masculine woman and in the man who in almost intangible physical characteristics, in speech, in dress, in tastes and habits of behavior, and in methods of thought reveals himself as lacking in something which makes for the fully equipped male and as possessing qualities ordinarily recognized as characteristics of the female.

"Further, it does not seem necessary to suppose that relativity of sex is restricted to cases in which its very conspicuousness forces itself upon our unwilling attention in opposition to our fixed conceptions of maleness and femaleness as complete, opposed, and mutually exclusive phenomena. Indeed the more reasonable supposition may be that sex is always relative; that while most sexual individuals of whatever species are prevaillingly male or prevaillingly female, every individual may have something of the other sex intermingled with the prevailing sexual characters."

As to his studies upon the selection in the sex-intergrade strains, Dr. Banta reports as follows:

"From 8 sex intergrades from the same culture-bottle (the first undoubted intergrades found in *Daphnia longispina*), 8 intergrade strains were propagated. Strains II and VII were lost. The remaining 6 strains, after having been propagated without reference to selection for two or three generations, were subjected to selection. The basis of the selection was the degree of intergradeness of the female intergrades chosen to propagate the strains. Strains I, IV, and VI were used in an attempt to make them more strongly intergrade through selection, and strains III, V, and VIII were selected to cause them, if possible, to produce more nearly normal females. In general, the selections have been somewhat effective. In most later generations the stock in the strains selected away from the intergrade characters has been moderately or only slightly intergrade, while in some cases the stock has been almost wholly normal female. In the strains selected to make them strongly intergrade the stock has usually been strongly intergrade. Environmental conditions are effectual in influencing the stock, so that at times the strains selected toward normal femaleness have been markedly intergrade, but in general there is a fairly pronounced difference between the characters of the stock in strains selected toward femaleness and in strains selected toward a more strongly intergrading condition."

Dr. Banta has attempted little direct experimentation on sex-determination since his last report, as he has been awaiting the arrival of the Bovee potentiometer which is almost indispensable to the work. He reports as follows upon the environment and sex determination in Cladocera:

"The earlier evidence, previously reported, consisted of the following:

"(a) A simultaneous occurrence of males in two strains of *Daphnia longispina* at a time when there were great numbers of males among the 'wild' *Daphnia pulex* and *Moina* sp. in the pond from which the culture water was obtained. (During almost four years of the history of the Cladocera stock in the laboratory up to that time no males had occurred.)

"(b) The ratios of the various sex forms produced in the several sex-intergrade strains are frequently contemporaneously changed—the stock as a whole (there being mothers of different ages and from different strains *but all kept on the same food*) at one time running strongly toward femaleness, *i. e.*, prevailing normal females and slightly intergrade females. At another time the distribution of the normal females, female intergrades of various degrees of maleness, male intergrades, and males is somewhat uniform. At still another time the stock runs largely toward maleness, there being an abnormally large percentage of males and male intergrades, and so few female intergrades (or normal females) that at times some of the stock is in danger of being lost from lack of females or female intergrades capable of producing young. The influence of environmental factors alone explains such changes in proportions of the female, male, and intergrade forms.

"(c) In experiments with sex control as the object the experiments have not all been successful, but males have usually appeared in smaller or larger numbers in the culture-bottles in which they were expected.

"(d) The striking 'epidemic' of males in the laboratory in May 1917, when in the preceding 5½ years so few males had appeared in the laboratory stock, comes at a time when there were many males among the 'wild' stock in the outdoor pond from which the culture-water was obtained, and so added to the evidence that environmental influences are the causative agent for the production of males.

"The occurrence of males is more general in the culture-water now being used than in that formerly used.

"Since the epidemic of males in May 1917 we have carefully examined our discarded bottles of Cladocera for males. In all this stock males occurred but three times before May 1917. The large number of males in the indoor cultures came when the outdoor pond from which the culture-water was obtained also contained vast numbers of males among the wild stock, as is noted above.

"In the several species and in the groups within the various species having various periods of laboratory history, the occurrence of males has been remarkably consistent. In most of the groups some males have been found in every month from May 1917 to June 1918. But the point of interest lies in the relative frequency of the males in the different groups. At a time when males are relatively abundant within one species or a group, within a species they are relatively frequent in all the other groups. When males are very scarce in one group they are also scarce in the other groups.

"Curves showing the incidence of males for the various species and groups of Cladocera in the laboratory are remarkably consistent in form. Following the frequency of males in May 1917, represented by a relatively high part in the curve, in July and August there was a very low place in the curve, males occurring infrequently; then came a high point in October and November; a small drop in December; and the highest point of all in January; this was followed by a moderately low point in April and May, with a marked rise again in June.

"While these curves for the different species and groups with different laboratory history are of course not identical, their degree of similarity is very striking. When one recalls that this Cladocera stock consists of seven species, was obtained at different places, some remotely separated from where most of it was derived, and at widely different times, this remarkable close similarity of the frequency curve for male production is very striking.

"The only factors which have been consistent throughout are the environmental factors. The diverse stock has had the same food and has been subject to the same environmental conditions, varying somewhat from month to month, but for all the stock the same for any particular month. Hence it seems clear that male production is subject to environmental control."

The Cladocera stock now being used consists of the following:

Species.	Frequency of strains.	Origin.	No. of months in laboratory.	No. gen. of descent.	Species.	Frequency of strains.	Origin.	No. of months in laboratory.	No. gen. of descent.
Daphniapulex.	{ 7	Pond II	83	271-294	Simocephalus serulatus . . .	{ 2 4	Pond IV Lakeland, Florida.	37	89-123
	1	Pond II	43	156				19	58- 63
	2	Pond III	41	149-152	Muina affinis.. Muina macro- copa.	4	Pond III	39	223-239
	1	Pond II	39	144				5	27
	1	W. P.	17	61				Muina recti- rostris.	3	Pond III	5	20- 21
5	W. P.	14	45- 61	19	54- 56				
Simocephalus vetulus.	{ 4	Pond IV	74	215-246	Macrothrix sp.	2 (?)	Pond III Lakeland, Florida.	5	20- 21
	3	Pond I	72	236-241				19	54- 56
	5	Pond IV	46	150-157					

Dr. Banta has spent much time, since Dr. Riddle entered the Army, in revising the proofs of the Whitman volumes. Nearly all of 150 pages of tables have been checked and verified by him.

The experiments with cave forms have been continued. More young have been produced in the cave and the rearing has been more successful than in any previous year. During January 1918, Dr. Banta collected material in caves near Bloomington, Mitchell, and New Albany, Indiana. The water-level in the caves was low, so that the conditions were favorable for collecting and additional living material of the species desired was obtained and shipped to Cold Spring Harbor.

Dr. Charles W. Metz reports as follows on his work with the evolution of the germ-plasm. His studies are made with a fruit fly.

"In view of the fact that I have been engaged in war work during the entire year covered by this report, the research activities in which I was formerly engaged have been greatly curtailed. The essential work of caring for the mutant stocks of *Drosophila* and the continuation of several of the experiments, however, have been efficiently managed by Dr. Alexander Weinstein in my absence.

"Although a considerable amount of data has been obtained, there has been no opportunity to work it up, and it is difficult to draw conclusions or make generalizations at this time. Consequently, the following items are intended mainly to show the general nature and trend of the results.

"Several new mutant characters have been found by Dr. Weinstein in *Drosophila virilis*, and the linkage relations of these and some of those previously discovered have been determined. These serve to enlarge the linkage groups already identified in this fly.

"The investigation of incompatibility between mutant (and apparently allelomorphic) characters in *D. virilis* has been continued. Three characters are involved in this series.

"Considerable work has been done in the way of further analyzing the group of sex-linked characters in this species and comparing it with the sex-linked group in *D. ampelophila*. A sufficiently large series of characters is now available in the sex-linked group of *virilis* to make possible a fairly accurate determination of linkage and cross-over values and a comparison of these values with those in *ampelophila*. The results continue to indicate a correspondence between the sex-chromosome constitution of the two species, although showing a specific difference in the rate of crossing over.

"In addition to these features, Dr. Weinstein has been conducting experiments on 'coincidence' of crossing over in *D. virilis*, a line of work not previously attempted with this material."

About three years ago Dr. E. C. MacDowell began experimentation on the effect of ingestion of alcohol on rats to test the view that alcohol can permanently affect the germ-plasm. During Dr. MacDowell's absence in France the work has been carried on by his assistant, Miss Vicari. The following report is submitted:

"*Relative intelligence of rats of alcoholic and non-alcoholic parentage.*—The alcoholization of the albino rats has been continued in the first generation and carried on to the second. The main work of the year has been testing the learning capacity of: (1) the offspring of alcoholic grandparents; (2) the

offspring of alcoholic parents and alcoholic grandparents; (3) the controls of each set. The alcoholized rats themselves and their controls were also trained in one problem, Watson's maze. All the other rats were given this problem plus Yerkes's trial-and-error problem.

"Some work has been done, but not sufficient to be conclusive and no generalization is offered at this time. Table I gives a comparison of the abilities of alcoholics and normals to form a habit; it also shows that in the tests of memory and association the rats of unnarcotized parentage are almost uniformly superior to rats of alcoholic parentage. This is given only as a sample of three trained generations of rats. This family of alcoholic strain represents the best and not the poorest trained family of this strain. The alcoholized rats which were the ancestors of the second and third generations received light doses of alcohol for 3 weeks from the time of weaning (28 days) and then were given heavy doses until they were fully narcotized (dead drunk). The dose of the male was 61 days and that of the female was 83 days. Data of other experiments, where the parents received a longer period of treatment and where they received a shorter period of alcoholization, have not been sufficiently collated. All the rats of the first and second generation which were started this year were given the heavy dose from the time of weaning."

Growth and fertility of the second alcoholized generation—The administering of alcohol has been carried on to the second generation. The growth and fertility of the first-generation alcoholized rats was considered by Dr. MacDowell in last year's report. This report gives data upon the effect of large doses of inhaled alcohol on the growth and fertility of a series of albino rats whose parents received the alcohol treatment from the time of weaning and who themselves have been subjected to the alcohol fumes from the time of weaning. The alcohol was administered daily and the rats were left in the inhalation tanks till they were in a dead stupor or could move only very feebly. Like the rats of first generation, the time required to produce a drunk stupor was from 3 to 5 hours, according to the intensity of the alcohol vapor in the tanks, the age of the individual, and the sex. Females usually became influenced by the fumes of the same intensity quicker than the males. Rats of both sexes became influenced quicker if subjected to the alcohol vapor before their daily ration than after. As a rule they were put in the tanks early in the morning before they had their bread and milk for the day. Rat biscuit was always hanging in their cages. Normal activity was regained in from 3 to 5 hours.

"In selecting material for this generation rats were used as near alike in weight as possible at the beginning of the experiment; that is, a rat that was to be alcoholized and its control were selected of the same weight and, when this was not possible, as near alike as could be, but in every case possible the heavier rat of the two was selected for the alcoholic treatment. Except for the alcoholic treatment, all the rats were given the same attention as to food, number in a cage (always one pair), and sanitary conditions. Both sets were in similar cages and placed in adjacent rows.

"Weekly weighings were made of all the rats and individual growth-curves were plotted. From these curves the weights at the ages considered in the first generation were estimated. In making these estimations allowances were made for temporary losses in weight due to food conditions and to temporary minor illness. The controls were susceptible to skin disease much more than the alcoholics. The skin of the latter was sterilized by the alcohol vapor and hence it was not subjected to vermin. In order to reduce vermin

on the controls the rats showing a tendency to develop skin trouble were dipped every two weeks in warm 1 per cent kreso dip No. 1. Having made these allowances, the estimated weights of the two groups were plotted. The average size at stated ages was found for the two groups from these estimated weights. The results are given in table 3. The initial weight was taken of both sets at 28 days old and then alcoholization was begun for the alcoholics on the same day after the first weight-reading was taken, with the exception of two individuals which were started on the forty-third day. Males alone have been considered in this report.

"The table shows that the alcoholics were about 5 grams heavier than the controls before alcoholization and that they began to show a loss in weight between 40 to 60 days old and continued to remain below the normal weight until 243 days old.

"The fertility of the second alcoholized generation is shown in table 4. This generation, like the first, is less fertile than the normals. The average size of a litter of alcoholics does not seem to be much below the norm. The average number of litters, however, born to the alcoholics is scarcely half the number born to the normals during an equal period.

"Table 5 gives the results of the fertility record of the second generation offspring (from alcoholized parents). The number of young born to the offspring of alcoholics is greater than the controls; the average size of the litter of the former is, however, smaller than the controls.

"Table 6 gives the fertility record of the third generation (from alcoholized grandparents). The same thing is true here as for the second generation (from alcoholized parents).

TABLE 1.—Results of training. Maze problem.

Alcoholized rats and their normal sibs; parents of rats in experiment 15, first generation; 3 normal and 3 alcoholized rats.

	Normal.	Alcoholized.	Result.
Training (last 12 trials):			
1. Average time per trial in seconds.....	18.05	29.00	Normals faster.
2. Average No. of "perfect trials".....	4.00	1.00	Normals better.
3. Average No. of "errors".....	1.44	2.56	Normals better.

EXPERIMENT 15.

Non-alcoholized offspring of alcoholized parents and the controls, second generation; 6 normal and 6 alcoholic rats.

	Parents.		Result.
	Normal.	Alcoholic.	
Training (last 12 trials):			
Test 1.....	11.61	16.80	Normals aster.
Test 2.....	4.33	1.25	Normals better.
Test 3.....	1.01	2.47	Normals better.
Memory (12 trials):			
Test 1.....	11.51	15.24	Normals faster.
Test 2.....	5.66	2.75	Normals better.
Test 3.....	0.91	1.78	Normals better.

EXPERIMENT 20.

Grandchildren of alcoholics—offspring from a mating in experiment 15, third generation;
5 normal and 5 alcoholized rats.

	Grandparents.		Result.
	Normal.	Alcoholic.	
Training (last 12 trials):			
Test 1.....	9.64	19.05	Normals faster.
Test 2.....	5.50	0.41	Normals better.
Test 3.....	0.62	2.84	Normals better.
Memory (12 trials):			
Test 1.....	24.00	14.55	Alcoholic off- spring faster.
Test 2.....	5.41	2.16	Normals better.
Test 3.....	1.19	1.71	Normals better.

TABLE 1.—Results of training. Multiple-choice problem.

Problem.	Experiment 15.				More successful group.	Experiment 20.				More successful group.
	Parents normal.		Parents alcoholic.			Grandparents normal.		Grandparents alcoholic.		
	Cor-rect.	Wrong.	Cor-rect.	Wrong.		Cor-rect.	Wrong.	Cor-rect.	Wrong.	
Training:										
I.....	4.91	9.87	4.21	11.33	Normals.	6.12	7.65	3.88	12.45	Normals.
I test.....	6.05	6.65	5.75	7.98	Normals.	6.70	5.95	5.58	7.25	Normals.
II.....	3.43	15.53	3.26	17.32	Normals.	3.71	13.05	4.03	14.47	Normals. ¹
II (omitting 1st 3 days).....	3.83	12.03	3.13	14.06	Normals.	3.71	11.45	3.48	13.54	Normals.
II test.....	4.30	10.67	3.67	13.97	Normals.	3.75	13.00	3.33	13.58	Normals.
Memory (insuf- ficient data).....						4.91	9.87	3.12	15.83	Normals.

¹ The percentage of correct choices is very slightly higher in case of the normal rats.

“In problem I the right-hand door is the correct door and in problem II the left-hand door is the correct door. Problem I is immediately followed by problem II. Both problems are of the same nature and on the same apparatus. In order to form habit II, habit I must be undone. As the normals learn problem I better, they insist more than the alcoholic offspring on going to the correct door of problem I when the problem is changed. The more fixed the habit the harder it is to undo it, and this is what happens when the rats are switched off from problem I to problem II, the latter being the undoing of the former. In training a rat from one problem to a distinctly new problem, as from the maze to the trial-and-error problem, the habit is of a different nature and as a rule those that did better in the maze do better in the multiple-choice problem. For this reason the averages of problem II (omitting the first 3 days of training) are introduced.

TABLE 2.—Number of rats trained August 1917 to September 1918. Total.

First-generation offspring (alcoholized, 17; normal, 17).....	34
Second-generation offspring (alcoholized and from alcoholized parents, 37; from control parents, 33).....	70
Third-generation offspring (from alcoholized grandparents, 28; from control parents, 25)...	53
Third-generation offspring (from alcoholized parents and alcoholized grandparents, 9; from control parents, 10).....	19
Total.....	176

TABLE 3.—Average weights (in grams) of the second-generation alcoholized male rats compared with their normal double first cousins.

Age.	Alcoholics.		Normals.		Differences.
	No. of individuals.	Average body-weight.	No. of individuals.	Average body-weight.	Normals heavier by—
		<i>gm.</i>		<i>gm.</i>	<i>gm.</i>
30 days.....	15	57.20	16	52.65	— 4.55
40 days.....	15	83.37	16	81.72	— 1.65
60 days.....	15	129.20	16	132.94	+ 3.74
90 days.....	14	161.93	16	172.47	10.54
120 days.....	14	201.00	14	218.29	17.29
151 days.....	13	212.00	14	242.71	30.71
182 days.....	10	248.20	13	265.00	16.80
212 days.....	8	256.12	13	277.31	21.19
243 days.....	6	271.83	9	287.11	15.28

TABLE 4.—Fertility records of the second-generation alcoholized rats compared with the controls.

Matings of the alcoholics (A) and corresponding normals (N) were made at the same age and the records of births taken during equal periods.

Group.	No. of pairs.		No. of litters.		No. of young born.		Average No. in a litter.		No. weaned.		Sex ratio.	
	A	N	A	N	A	N	A	N	A	N	A	N
wss C.....	5	5	8	14	53	103	.....	.....	20	57	10/10	30/29
LHKC.....	5	4	5	7	28	45	.....	.....	8	12	6/ 2	10/ 2
Total.....	10	9	13	21	81	148	6.23	7.05	28	69	16/12	40/31

TABLE 5.—Second-generation offspring (from alcoholized parents).

Fertility record of non-alcoholic trained offspring (A) of alcoholic parents, compared with corresponding trained normals (N); matings of the two sets were made at the same age and the records of births taken during equal periods.

Group.	No. of pairs.		No. of litters.		No. of young born.		Average No. in a litter.		No. weaned.		Sex ratio.	
	A	N	A	N	A	N	A	N	A	N	A	N
WSS A.....	3	3	9	7	52	40	.....	.....	26	23	15/11	9/14
wss B.....	2	2	2	2	6	14	.....	.....	0	12	0	?
wss C.....	2	2	4	1	31	7	.....	.....	22	6	11/11	4/ 2
LHKC.....	3	3	9	5	43	32	.....	.....	25	21	13/12	13/ 8
Total.....	10	10	24	15	132	93	5.50	6.20	73	62	39/34	26/24

TABLE 6.—*Third-generation offspring, from alcoholized grandparents.*

Fertility records of non-alcoholic trained offspring (A)₂ of alcoholic grandparents compared with corresponding trained normals (N)₂. Matings of the two sets were made at the same age and records of births taken during equal periods.

Group.	No. of pairs.		No. of litters.		No. of young born.		Average No. in a litter.		No. weaned.		Sex ratio.	
	A ₂	N ₂	A ₂	N ₂	A ₂	N ₂	A ₂	N ₂	A ₂	N ₂	A ₂	N ₂
wss A.	1	1	0	3	0	20	.....	.....	0	8	0	3/ 5
wss C.	2	2	6	7	53	39	.....	.....	20	18	12/ 8	4/ 4
LHKC.	7	7	21	9	105	64	.....	.....	30	30	16/14	18/12
Total	10	10	27	19	158	123	5.85	6.47	50	56	28/22	25/21

Dr. Abert F. Blakeslee reports on his work in plant genesis at the station as follows:

"Most of my research has been devoted to breeding and selection work with the adzuki beans which we are carrying on under the auspices of the National Research Council. In addition to the lines which we have had in cultivation for several years, some 40 new lines have been secured from Dr. C. V. Piper, of the Bureau of Plant Industry of the U. S. Department of Agriculture, and have been grown under test conditions. We have about 8 acres of adzukis under cultivation at this station and in addition have distributed seed for trial to correspondents in 52 different localities. Most of these correspondents are in agricultural experiment stations. Professor Hartil, of the New York State School of Agriculture at Farmingdale, Long Island, is cooperating in the work and has grown in test plats representatives from 38 different pure lines. When the harvest records are in from our own plantings and from plantings away from the Station, we shall be in better position to judge of the adaptability of the species to cultural conditions in this country.

"Adzuki beans seem to be immune to anthracnose, a disease destructive of the navy bean; but unfortunately certain lines at least seem susceptible to bean 'mosaic,' which is common in New York State on various races of *Phaseolus vulgaris*. It is possible that immune races of the adzukis may be discovered. A disease, probably due to the fungus *Fusarium*, brought in perhaps by soya beans, with which we have surrounded our breeding-plats as a protection against rabbits, has caused trouble in parts of the garden.

"Disorganization of the gardening staff due to the war has somewhat handicapped the work of the department. Mr. Avery was called by the selective draft late last year. Mr. Farnum served as temporary gardener for about 3 months and Miss Minns has been acting gardener during the summer. While both have carried on their individual work satisfactorily, it has necessarily taken some time for each to become familiar with the special crop under cultivation. Mr. Welch, my laboratory assistant, was taken by the draft early in July and Miss Conover has been engaged to fill his place.

"In addition to the disorganization of the work due to the changes in assistants, difficulties in growing and hybridizing the adzuki beans under glass have been encountered and much time has been lost in consequence. It has been discovered that they will not thrive in the greenhouse during the

winter, apparently on account of lack of sufficient illumination. It is hoped that in the new greenhouse, which is considerably lighter than the old ones, it will be possible to get two generations a year by growing them under glass in early spring and autumn, when more sunlight is available than in midwinter.

"While the work on the adzuki beans has been primarily a practical problem with relatively little theoretical interest, some study is being made of the inheritance of seed-color characters that may be of genetic interest in connection with an attempt to obtain a strain that will not only be highly prolific but also satisfy the market requirements in respect to seed appearance.

"A mutation with unifoliolate leaves has appeared in one of our inbred lines. All the other varieties of adzuki investigated have exclusively trifoliolate leaves, and the character is so conspicuous that it could hardly have occurred in pedigree cultures without having been noticed.

"If the adzuki bean is to be of any great value as a human food it must not only be satisfactory from the cultural standpoint but must be palatable, readily prepared for the table, and of high nutritional value. Dr. Langworthy, of the Home Economics Office, United States Department of Agriculture, has kindly had investigated for us the cooking qualities of the adzuki beans and has prepared a series of recipes for them both in the form of bean meal and the whole bean. He reports that 'all preparations from adzuki beans have a nutty flavor and are very palatable.' He further writes that he thinks it will 'be well to continue the study of adzuki beans with reference to their more general use.' Miss Florence Willard, head of the domestic science department in the Washington Irving High School in New York City, has also tested the adzukis extensively and reports favorably upon them. They seem to cook up in about half the time necessary for the navy beans, though if cooked too long they tend to lose their individuality.

"Dr. C. O. Johns, of the United States Bureau of Chemistry, is carrying on feeding experiments with rats and will undertake an investigation of the proteins of the adzuki beans. Dr. E. V. McCollum has promised to investigate the fat and water soluble unknowns in the seeds. An economic plant-breeding problem may not be solved quickly. Consequently, it may be some years before it is possible to decide upon the value of the adzuki bean as a food crop for this country.

"On account of the work with the adzuki beans, no new problems have been undertaken. It has been possible, however, to keep under way some of the investigations already undertaken.

"Work on rudbeckias has been discontinued for the present, although seed obtained from last year's crosses are ready for planting.

"Planting this year of F_2 seed show that the dwarf portulaca reported last year is a simple Mendelian recessive; that the reversionary dominant branches which the dwarf plants occasionally produce are heterozygous and when selfed throw 3 normals to 1 dwarf; that cuttings from these reverting branches, when kept growing for a couple of years, show no increased tendency to throw normals. A large number of crosses of portulacas made last year in a study of the varied color characters of the flowers have not been planted.

"A peculiarity in the fragrance of two verbena plants has been discovered. The flowers of plant A are fragrant to me and to two-thirds of the members of the station tested, while the flowers of plant B are not fragrant to us. The reverse condition is true of my former assistant, Mr. Avery. To him and to about one-third of the members of the station the flowers of B are fragrant, while those of A are not. Obviously the phenomenon is caused by a difference in the sensory organs of the two groups of people tested.

"In the jimson weed (*Datura*) it has been possible to further test the inheritance of the 'globe' mutant, since the mutant can be recognized in the seed-pans. Over 5,000 seedlings have been grown this winter in the test, about equally distributed between selfs, globes \times normals, and normals \times globes. When the globes are selfed and the globes as females are crossed with normals about the same results are obtained in the offspring, *i. e.*, approximately 3 normals to 1 globe; while normals crossed with globes as male parents throw about 38 normals to 1 globe. The mutant complex therefore seems to be but slightly transmitted through the male parent. It is transmitted through the female parent either when selfed or when crossed with a normal, but appears in only about a quarter of the offspring. The mutant has been selfed for five generations, but as yet it seems impossible to obtain a pure race of globes. The mutants 'cocklebur,' 'poinsettia,' and others seem to be inherited in much the same manner, although extensive tests have not been made of other mutants than the globe.

"Last year a 'quercina' disease of the jimson weed was reported which causes a laceration of the leaves, splitting of lobes of the corolla, and a suppression of spines on the capsules. This disease was found to be transmitted by grafting, but not by contact nor by inoculation. Another disease somewhat similar in its effects has been discovered. It causes a more pronounced malformation of the leaves (often reducing them to mere midribs), induces a suppression of spines on the capsules and the production of distorted accessory carpels in the flowers. It is readily propagated by contact of diseased leaves with normal plants. It also differs from the 'quercina' disease in that it is not carried by the seed.

"Several years ago at Storrs, Connecticut, a study was begun upon the inheritance of the weeping habit of a number of trees. Last season a single tree from a cross between Tee's weeping mulberry and the common white mulberry came into flower and was back-crossed with the weeping variety. Some hundred seedlings from this cross are now growing in the garden and, while definite counts have not been made as yet, the erect individuals and those spreading prostrate like a vine over the ground are approximately in equal numbers. From the results of this back-cross the weeping habit in the mulberry would seem to be a simple Mendelian recessive. Seedlings from *inter se* crosses made between F_2 plants this spring are now growing in the greenhouse and may be expected to show 3:1 ratios in habit characters by next summer.

"In cooperation with Dr. Harris and with the Poultry Department of the Storrs Agricultural Experiment Station, we have published a bulletin on pigmentation and other criteria for the selection of laying hens, which embodies our results already reported, together with new data. Our results seem to be proving of practical value to poultrymen in their attempt to cull out the unproductive birds from their flocks and thus to reduce their feed bills."

Dr. J. Arthur Harris has continued his work in various lines and reports as follows:

"*Investigations of osmotic concentration of vegetable saps.*—These studies have been continued along lines indicated in previous reports. A memoir on the plants of the Jamaican coastal deserts has been published in cooperation with Mr. John V. Lawrence. The results show excellent agreement with conclusions already drawn from investigations of the Arizona deserts. The results of a first study of desert Loranthaceæ parasitic on various hosts have also appeared. The desert Loranthaceæ, like the desert host-trees, show a far higher osmotic concentration than those studied in the Jamaican montane

rain-forest. In general the tissue fluids of the parasite show a higher osmotic concentration than do those of the leaf-tissue of the host tree."

"*Miscellaneous studies of variation and correlation in plants.*—A study of the distribution of abnormalities in the inflorescence of *Spiraea* and an investigation of the relationship between the number of stamens and pistils in the flowers of *Ficaria* have been published."

"*Studies on variation, correlation, and selective death-rate in garden beans.*—These investigations have been continued along lines indicated in earlier reports. A general summary is now being prepared of studies on the influence of the depauperization of the ascendants, on the characteristics of the descendants, of the correlation between the weight of the seed planted and the characters of the plant produced, and of the correlation between the characters of the plant and the characters of the pods and seeds which it bears, and of some other problems.

"In the teratological phases of the work, a paper on the correlation of the characters of the second and third node has been published in cooperation with Mr. Avery. A detailed investigation of the green weight, dry weight, and tissue-water content of the leaves of the seedlings showing the slightest structural variation has been published. A similar investigation of seedlings which are trimerous at the first and second nodes has also been completed. These studies show that variations are not merely structural, but that physiological differences are associated with the structural variations. These results will eventually be considered in relation to the problems of the selective death-rate."

"*Miscellaneous studies in statistical theory.*—As in previous years, considerable attention has of necessity been given to statistical methods. A paper on the correlation between a component and between the sum of two or more components and the sum of the remaining components of a variable, and another paper on further applications of a coefficient measuring the correlation between a variable and the deviation of a dependent variable from its probable value have been published. The formulæ developed in both of these papers have had or are shortly to have application in the solution of problems of economic importance."

"*Variation, correlation, and probable errors of plot tests.*—If genetic work is to be of importance in practical agriculture it must not result merely in the formulation of the laws by which breeds of animals and plants showing new characters or new combinations of characters may be secured, but it must provide the means by which these strains, breeds, or varieties may be tested with respect to their economic performance. If such means of critically testing the various strains are not provided, the multiplication of forms can result only in confusion, and not in progress. The plot test has been in the past and is at present the chief method of determining the relative values of a series of strains. Notwithstanding the enormous economic importance of such work and the great annual financial outlay in the making of such tests, our knowledge of the theory of plot tests is far from satisfactory.

"During the past several years various problems of plot tests have been considered at this Station. At present the work is being continued with the cooperation of the Office of Western Irrigation Agriculture and the Office of Dry Land Farming of the United States Department of Agriculture."

"*Biometric studies on egg-production.*—The studies on egg-production outlined in earlier reports have been continued and extended on data furnished by the Poultry Department of the Connecticut Agricultural College and Agricultural Experimental Station at Storrs. In connection with Messrs. Blakeslee, Kirkpatrick, and Warner an experiment station bulletin has been

published giving more practical results of biometric studies on the methods of selecting laying hens by the use of pigmentation and other somatic characters. While the somatic criteria employed permit the selection of the birds which are laying or have recently been laying in the latter parts of the year with a rather high degree of accuracy, they have not as yet been shown to be suitable for the early prediction of future production. The foundation for such prediction was laid in a paper on the correlation between egg-production during various periods of the year, published in *Genetics* for January 1918. At present studies designed to make possible the more accurate prediction of the future production of birds from their earlier months records are under way. The solution of this problem seems to have considerable economic significance at a time when the conservation of grain feed (by the early elimination of birds which would if kept make the poorest records) is a matter of especial importance."

Cooperative work on human metabolism.—During the past two years a biometric study of the Nutrition Laboratory data on basal metabolism in normal men, women, and new-born infants has been under way in cooperation with Dr. Benedict. This is now completed and is to be issued as publication 279 of the Carnegie Institution of Washington."

EUGENICS RECORD OFFICE.

C. B. DAVENPORT, DIRECTOR.

This institution, which is located at Cold Spring Harbor, Long Island, New York, came into the control of the Carnegie Institution of Washington on January 1, 1918. It was organized by the present director October 1, 1910, with funds given him for this purpose by Mrs. E. H. Harriman. This report will present a brief review of the work of this office from its establishment to January 1, 1918, and will give a more detailed account of its activities from that date to October 1, 1918. Since its establishment the chief activities of this office have been:

1. *To serve eugenical interests in the capacity of repository and clearing, house.* In order to provide data adequate to making eugenical studies, it was found necessary to secure a wide interest on the part of the better families of the country in their own pedigrees, and on the part of custodial institutions in securing pedigrees of the socially inadequate strains. Efforts in this direction have been successful, until now many genealogists and biographers are not only seeking to give their family-history compilations a more biological aspect, but are anxious to have a copy of their studies in the archives of this office, while many superintendents of custodial institutions look upon the Eugenics Record Office as a very useful central bureau for depositing records and seeking eugenical data. As a clearing-house, the public may make inquiries and be informed concerning (a) the methods of making eugenical records, (b) what studies have been made upon certain families, (c) eugenical activities of a given institution or section of the country, (d) the nature of the method of inheritance of a given natural trait, so far as the knowledge of such exists, (e) the analysis of fact, and records with the view to determining their eugenical meanings (f) existing laws bearing upon eugenics, and (g) outlining and advising concerning special problems for eugenical study. The purpose of these activities is to coordinate the interests and investigations of this new science along lines which will yield records and analyses of the greatest eugenical value.

2. *To build up an analytical index of the inborn traits of American families.* The purpose of the archives department is to catalogue and index all records which come into the possession of the Eugenics Record Office. Up to January 1, 1918, there had been opened 534,625 cards (each card contains spaces for 40 entries), which index the individuals described in the records in the archives on the basis of surname, natural trait, and geographical locality. In this work human traits are classified on an indefinitely expansible system, the first synopsis of classification being: 0, general traits; 1, integumen-

tary system; 2, skeletal and muscular systems; 3, nervous system and psychopathic traits; 4, mental traits and movements; 5, sense organs; 6, nutritive system; 7, respiratory system; 8, excretory and reproductive systems. As these cards accumulate they furnish information concerning the location of data needed for studying the nature of the inheritance of specific traits, for tracing their descent and recombination in given pedigrees, and for demographic and statistical studies.

3. *To train field workers to gather data of eugenical import.* Cooperating with the Biological Laboratory of the Brooklyn Institute of Arts and Sciences, of which laboratory the Director of the Eugenics Record Office is also director, there has been given for six weeks, during July and August in each year, beginning in 1910, at the Eugenics Record Office, a training course for field workers in eugenics. This work has been under the direct supervision of the Director, assisted by Dr. Harry H. Laughlin, superintendent of the Eugenics Record Office. Enrollment in this course has been as follows: 14 in 1910, 25 in 1911, 21 in 1912, 28 in 1913, 20 in 1914, 13 in 1915, 20 in 1916, 13 in 1917; total 171.

The course of instruction comprises 25 lectures on human heredity and eugenics, with special reference to conduct; also daily laboratory work on the following topics: Charting family pedigrees; constructing and using mechanical, chemical, and statistical models for illustrating the principles of heredity; tracing the descent and recombination of human traits in actual pedigrees; analyzing such pedigrees in the light of the existing knowledge of heredity; analyzing statistics given in institutional and federal reports; statistical studies on variation in plants and animals; studies in the elements of biometry; physical and mental measurements in man, with special reference to the Binet and Yerkes-Bridges tests. Clinical studies are made at institutions for various types of the socially inadequate. Field trips are made for the purpose of securing family pedigree records at first hand.

The Eugenics Record Office keeps in close touch with all graduates of this course, most of whom subsequently are actively engaged professionally in eugenical work, many of them becoming field investigators for this office and for State institutions.

4. *To maintain a field force actually engaged in gathering eugenical data.* The special field studies which have been carried on by the Eugenics Record Office independently have included investigations of the "Ishmael" tribe of Indiana, the Amish sect of Pennsylvania, albino families of Massachusetts, the "Nam" family of New York, the "Jukes" of New York, skin-color studies in New Orleans and in the islands of Bermuda and Jamaica, Huntington's chorea in New York and Connecticut, pellagra in South Carolina, consanguinity in Outer Long Island, Maine, the "Hill Folk" in Connecticut, community studies in Woodbury (Connecticut), sterilized men in the Jeffersonville

(Indiana) Reformatory, Indian hybrids (Elbow Woods, North Dakota), and human stature and hare-lip studies in many localities.

5. *To cooperate with other institutions and with persons concerned with eugenical study.* Besides the field studies of the office, undertaken independently by the members of its staff, there is a second type of field investigation which has yielded rich returns, these latter studies being conducted jointly by this office and other institutions. The collaborating institutions have, for the most part, been hospitals for the insane and institutions for the delinquent and the feeble-minded. There have been 47 workers placed under the cooperative plan. Under this scheme the Eugenics Record Office trains the worker, pays the salary, provides the field worker's outfit, and criticizes the work; the collaborating institution provides the maintenance and traveling-expense money and has direct supervision over the work, indicating the individual cases in the institution whose family histories shall be worked out from the eugenical point of view by the field worker. The reports are made in duplicate, one copy being retained by the collaborating institution and the second filed with the Eugenics Record Office. These workers continue under the joint basis for one year, at the expiration of which time the collaborating institution, having learned the value of such work, is expected to, and as a matter of fact generally does, provide for such investigation as a part of its permanent work, independently of the support of the Eugenics Record Office. The work has proven of value because by it not only have new and permanent centers of eugenical study been opened, but the institutions which continue studies of family history independently have quite uniformly continued to deposit duplicate copies of their studies in the files of the Eugenics Record Office, thus greatly enriching our archives.

Before coming into the control of the Carnegie Institution of Washington, there had been accumulated 51,851 pages of first-hand manuscript data prepared by the workers of this office.

6. *To investigate the matter of the inheritance of specific human traits.* The field studies above referred to have a double purpose: (1) to provide a permanent record of the family distribution of traits, with the view to predicting their transmission in true pedigree fashion; (2) to provide data for statistical analyses and for further investigations into the manner of the hereditary transmission of given qualities. In order to advance the collection of pedigree records adequate to these studies the following schedules were prepared:

A. General biological pedigree investigations.

1. Record of family traits, a brief general record.
2. Index to germ-plasm, two sets of the record of family traits to be filled out for the families of persons contemplating marrying each other, in order to judge of the eugenical fitness of the proposed marriage.
3. Genealogical cards—the so-called plan I, for a loose-leaf, indefinitely expandible family analysis more detailed than is called for by the record of family traits.

A. General biological pedigree investigations—*Continued.*

4. Family distribution of personal traits, the so-called plan II; also an indefinitely expansible loose-leaf system, of which the individual analysis card is the unit. This is the most detailed and valuable and also the most difficult of all the schedules. It should not be asked for until the record of family traits has been successfully filled out.

B. Short schedules for special-trait pedigree records: (1) Musical talent; (2) mathematical ability; (3) tuberculosis; (4) hare-lip and cleft-palate; (5) hair form, hair and eye color, and complexion; (6) stature; (7) physical measurement record; (8) twins; (9) special trait card. These schedules are sent free in duplicate to such persons as will undertake to fill them out and, after retaining one copy for their own family archives, will file the other with the Eugenics Record Office.

The record of family traits is based upon Galton's original outline. Of these, 2,618 had been secured by the volunteer cooperation on the part of the families described. Of the schedules later prepared, 15 of the family distribution of personal traits were on hand; there were 54 of the records called "index to germ-plasm"; 46 individual analysis cards; 576 special schedules on stature; 646 eye, hair, and skin color schedules; and 303 other special-trait records, including musical, mathematical, tuberculosis, epilepsy, and deafness. There were 5,375 cards indexed in the hare-lip study.

A library of 3,093 books, besides numerous institution reports, has been accumulated.

7. *To investigate other eugenical factors, such as mate selection, differential fecundity, differential survival, and differential migration:* These studies are demographical and sociological in nature and their development will follow rather than precede those phases of eugenical investigation bearing more directly upon the phenomena of inheritance. A study of 1,054 unselected subnormal families, described by field workers, contrasted with a similar study of 701 families from our better American stock, showed that in the subnormal families the average number of children per family was 4.4, while in the normal families the average was 4.6; that the infant mortality (those dying under 3 years of age, including stillbirths) was 17.4 in the subnormal and 8.3 in the normal.

8. *To advise concerning the eugenical fitness of proposed marriages.* This is a service which is being used with continually growing frequency. Most inquiries grow out of two situations: first, contemplated cousin matings; second, the marriage of persons in one or both of whose families there is a neuropathic taint. Persons making request for advice along these lines are always required to prepare family-history studies in accordance with instructions given by the office. Eugenical advice is then rendered in accordance with the limitations set by the facts presented and the existing knowledge of the inheritance of traits. The pedigrees submitted are added to the archives of the office.

9. *To publish the result of researches.* Up to January 1, 1918, there had been published 18 bulletins, 2 memoirs, and 1 report, as follows:

BULLETINS.

1. Heredity of feeble-mindedness. Henry H. Goddard. April 1911, 140 p., 15 pedigree charts.
2. The study of human heredity. C. B. Davenport, H. H. Laughlin, D. F. Weeks, H. H. Goddard, E. R. Johnstone. May 1911, 17 pp., 6 plates.
3. Preliminary report of a study of heredity in insanity in the light of the Mendelian laws. Gertrude L. Cannon and A. J. Rosanoff. May 1911, 11 pp., 12 charts.
4. A first study of inheritance in epilepsy. Charles B. Davenport and David F. Weeks. Nov. 1911, 30 pp., 33 charts, 11 tables.
5. A study of heredity of insanity in the light of the Mendelian theory. A. J. Rosanoff and Florence I. Orr. Oct. 1911, 43 pp., 73 charts, 2 tables.
6. The trait book. Charles B. Davenport. Feb. 1912, 52 pp., 1 colored plate, 1 figure.
7. The family-history book. Charles B. Davenport and others. Sept. 1912, 101 pp., 16 figures, and 5 plates.
8. Some problems in the study of heredity in mental diseases. Henry A. Cotton. Aug. 1913, 59 pp., 9 figures, 5 folded charts.
9. State laws limiting marriage selection examined in the light of eugenics. Charles B. Davenport. June 1913. 66 pp., 2 charts, and 3 tables.
10. Studies of the committee on sterilization, Harry H. Laughlin, secretary.
 - (a) The scope of the committee's work. 64 pp., charts and tables.
 - (b) The legal, legislative, and administrative aspects of sterilization. 150 pp., 4 charts, 13 tables, 1 map.
11. Reply to criticism of recent American work by Dr. Heron, of the Galton laboratory. C. B. Davenport and A. J. Rosanoff. Feb. 1914, 43 pp.
12. The feebly inhibited: Violent temper and its inheritance. Charles B. Davenport. Sept. 1915, 36 pp., 11 charts, and 8 tables.
13. How to make a eugenical family study. Charles B. Davenport and Harry H. Laughlin. June 1915, 35 pp., 4 charts, and 2 tables.
14. Hereditary fragility of bone (*fragilitas osseus*, osteopsathyrosis). H. S. Conrad and C. B. Davenport. Nov. 1915, 31 pp., 35 figures, 8 pp. bibliography.
15. Dack family. Mrs. Anna Wendt Finlayson. May 1916, 42 pp., 1 chart.
16. The hereditary factor of pellagra. C. B. Davenport. A study of the heredity of pellagra in Spartanburg County, South Carolina, Dr. E. B. Muncey. July 1916, 75 pp., 28 figures, and 8 tables.
17. Huntington's chorea in relation to heredity and eugenics. C. B. Davenport, based on field-notes made by Dr. E. B. Muncey. Oct. 1916, 29 pp., 3 tables, and 1 map.
18. Inheritance of stature. C. B. Davenport. July 1917, 77 pp., 19 text figures, and 33 tables.
19. Report of the first twenty-seven months' work of the eugenics record office. Harry H. Laughlin. July 1913, 32 pp., 9 figures, 1 map, and 1 chart.

MEMOIRS.

1. The Hill folk. Report on a rural community of hereditary defectives. Florence H. Danielson and C. B. Davenport. Aug. 1913, 3 folded charts and 4 text figures, 56 pp. quarto.
2. The Nam family. A study in cacogenics. Arthur H. Estabrook and Charles B. Davenport. Aug. 1912, 4 charts, 4 text figures, 85 pp. quarto.

Besides the above, the following books published elsewhere were based largely upon data furnished by the Eugenics Record Office:

1. Eugenics. Charles B. Davenport. 35 pp., 4 plates. Pub. by Y. M. C. A. Health League.
2. Heredity in relation to eugenics. Charles B. Davenport. Octavo, 298 pp., 175 illustrations and diagrams and plates. Pub. by Henry Holt & Company.
3. Heredity of skin-color in negro-white crosses. Charles B. Davenport. Octavo, 106 pp., 4 plates. Carnegie Inst. Wash. Pub. No. 188.
4. The feebly inhibited: II. Nomadism, or the wandering impulse with special reference to heredity. III. Inheritance of temperament. Charles B. Davenport. Octavo, 158 pp., 89 figs. Carnegie Inst. Wash. Pub. No. 236.
5. The Jukes in 1915. Arthur H. Estabrook. Quarto, 85 pp., 28 charts, 18 tables. Carnegie Inst. Wash. Pub. No. 240.
6. Naval officers: Heredity and development, Charles B. Davenport and Mary T. Scudder. Octavo. Carnegie Inst. Wash. Pub. No. 259.

WAR SERVICE.

From a period antedating our declaration of war with Germany until the present time, Dr. H. H. Laughlin, superintendent, who had

had previous military training, gave military drill, not only to members of the Eugenics Record Office and the Station for Experimental Evolution, but also to men in the nearby village of Cold Spring Harbor. He has served as captain of the company and is commissioned by the State, which soon recognized his company as part of the State defense. In consequence of the training received, those who have gone into the service of the United States Army or Navy have been of especial value in that service and have soon become officers.

During the year Dr. Arthur H. Estabrook, field investigator, was commissioned as first lieutenant and detailed on the staff of Major R. M. Yerkes, at Fort Oglethorpe, Georgia, engaged in weeding out mental defectives from the army. Mr. Tracy E. Tuthill, archivist, has been commissioned first lieutenant in the Infantry Reserve Corps, Plattsburg Barracks. Mr. Leslie E. Peckham, clerk in the administrative department, has joined the colors as private in the training camp at Yaphank, New York.

EUGENICS RESEARCH ASSOCIATION.

On June 21 and 22 the sixth annual meeting of the Eugenics Research Association was held at the Eugenics Record Office. This society, now affiliated with the American Association for the Advancement of Science, is the outgrowth of the field studies of this office, in collaboration with the growing body of independent investigators. There are approximately 250 persons in the United States now intimately enough acquainted with the purpose of eugenical studies, or engaging professionally in them, who are eligible to membership in this society. Of this number 115 are actually associated with it. The president for the year 1918-19 is Mr. Madison Grant.

TRAINING COURSE FOR FIELD WORKERS.

The training course for field workers began July 3 and ended August 13. It was composed of 8 students, thus bringing the total number of persons trained in the course up to 179.

THE EUGENICAL NEWS

The Eugenic News is published monthly (octavo, 8 pp.) by the Eugenics Record Office. Its first number appeared January 1916. At present 1,000 copies of each issue are printed. This periodical serves a number of purposes: first, to keep the newly organized body of eugenical workers in touch with each other; second, to review matters of eugenical interest which appear currently in the scientific magazines; and third, to review and analyze current biographies in the light of the relation between natural traits and juvenile promise on the one hand, and adult performance on the other.

Summary of material added to the archives during the current nine months.

Index cards.....	75,290	Manuscript material— <i>continued.</i>	
Persons-index.....	350	Genealogical data cards.....	146
Manuscript material:		Biographies.....	44
Field reports.....	1,326 pp.	Collective biographies.....	5
Musical schedules.....	300 pp.	Biographical pamphlets.....	2
Special traits.....	322 pp.	Genealogies.....	8
Records of family traits.....	200	Genealogical pamphlets.....	2
Family distribution of personal traits.....	5	Town histories.....	3
Individual analysis cards.....	34	Church histories.....	3
		Vital records.....	9

FIELD STUDIES—COOPERATIVE PLAN.

Miss Bertha Pfister was employed as field worker with the Eastern Pennsylvania State Institution for the Feeble-Minded and Epileptic, Spring City, Pennsylvania.

Miss Clara P. Pond conducted the field investigations for the psychiatric clinic in collaboration with Sing Sing Prison, Ossining, New York, until this clinic was closed for the duration of the war, July 15.

Miss Ethel H. Thayer continued her work at Letchworth Village, Thiells, New York.

Miss Mildred S. Covert carried out cooperative field studies with the State Mental Hospital, Provo, Utah, until April 30.

For the forthcoming year negotiations have been completed whereby this cooperative work will be carried on at (1) Foxborough State Hospital for Inebriates, Foxborough, Massachusetts; (2) Central Islip State Hospital, Central Islip, New York.

INDEPENDENT FIELD INVESTIGATIONS.

Dr. A. H. Estabrook, until called to the colors, continued his investigations on the Tribe of Ishmael in Indiana. Since this time the work has been kept alive through the activities of Mrs. Estabrook, who is able to give a considerable part of her time to the study.

Dr. Howard J. Banker continued his special family-history studies in the Genealogical Library, New York City.

Dr. Elizabeth B. Muncey continued special pedigree studies at Cold Spring Harbor and at Washington, D. C.

On October 1, 1917, Miss Louise A. Nelson succeeded Lieut. Tracy E. Tuthill as archivist of the manuscript records.

On November 15, 1917, the Director organized a department of printed archives and placed Dr. Wilhelmine E. Key in charge. She has indexed 68 genealogies and town histories.

CLIPPINGS.

Clippings bearing on eugenics, with special reference to biographical and family-history data, are accumulated and indexed by this office. The 5 by 8 inch manila cards on which these clippings are pasted are duly indexed in the files of the office.

STERILIZATION STUDIES.

The designation "committee to study and investigate the best practical means for cutting off the defective germ-plasm in the human population" of the old American Breeders Association, which prepared Bulletins Nos. 10a and 10b of the Eugenics Record Office, has been

changed to "committee on cacogenic control" of the Eugenics Research Association. Mr. Bleecker Van Wagenen remains as chairman and Dr. H. H. Laughlin as secretary. During the year the society secured and abstracted the case histories of 777 persons who were sterilized under the several eugenical sterilization State statutes, these being a practically complete record of such operations legally performed. Records of the new sterilization laws of Iowa, Nebraska, California Oregon, Kansas, and South Dakota were secured and annotated for publication. Similarly, accounts of the litigation growing out of the sterilization laws of Iowa, New Jersey, Michigan, New York, Washington, and Nevada were compiled.

PUBLICATIONS.

- Davenport, Charles B., and Samuel A. Preiser. Neurofibromatosis, *Amer. Jour. of Med. Sci.* (Sept. 1918).
- , and Mary T. Scudder, *Naval officers: Their heredity and development*, Carnegie Inst. Wash. Pub. No. 259.
- Laughlin, Harry H. The modification of the 9:3:3:1 ratio, *Amer. Nat.*, 12 pp., 11 diag. (June, July, 1918).
- . Durations of the several mitotic stages in the root-tip of the onion, Carnegie Inst. Wash. Pub. No. 265.

to an Atlantic home port by way of the Panama Canal, as circumstances might require. In the meantime, Commander J. P. Ault, who had traversed 63,401 miles of cruise IV, as originally planned, had been called home and assigned to other duties. He was succeeded by Dr. H. M. W. Edmonds, who had long served as surgeon and as a member of the navigating staff of the vessel. Rounding Cape Horn again, she reached Talcahuano, Chile, a distance of 3,863 miles, in 38 days, or on January 11, 1918. Leaving Talcahuano January 23, she made a loop to the westward of the Juan Fernandez Islands and returned to Callao, Peru, February 22, 1918. Thence she sailed March 29, making a detour south of the Galapagos Islands, arriving at the Pacific port of Balboa on April 24, and passing through the Panama Canal on May 2. Since there appeared at that time to be no dangers in the way of a return to an Atlantic port, she proceeded from Cristobal on May 11 by the shortest route to Newport News, arriving there June 4, having eluded the submarine then off the Virginia Capes by a margin of about 20 miles. Six days later she was laid up at a wharf at the port of Washington, D. C., and is now out of commission, awaiting a return of conditions which will permit a resumption of her international mission in aid of navigation and in extension of our knowledge of the magnetic properties of the earth. Since this vessel was launched, in June 1909, she has traversed in her surveys an aggregate of 189,176 nautical miles, or somewhat more than eight times the circumference of the earth. Of this aggregate, 102,429 miles were traversed under the command of W. J. Peters, 72,961 under J. P. Ault, and 13,786 under H. M. W. Edmonds.

The following historical statement is taken from the printed but unpublished minutes of the Executive Committee of the Institution, for the meeting of January 11, 1918. Upon motion, this memorandum and the accompanying resolutions were approved and ordered to be spread upon the minutes of the meeting:

Gift of Eugenics
Record Office.

“Definite recognition of the science of life, now designated by the term biology, dates essentially from the publication of Darwin’s Origin

of Species in 1859. The foundations for this culminating work were laid by not less than twenty centuries of discontinuous and unorganized efforts by the devotees to anatomy, pathology, botany, geology, and more recently, physiology, zoology, and paleontology; but it was reserved for Darwin, Wallace, Spencer, and their coadjutors to discover and to establish the principles which unify all these collateral sciences in the generalization called the doctrine of evolution. The term biology was popularized by Spencer in 1865; and in the brief interval which has since elapsed demonstrable biological knowledge has grown with astonishing rapidity to an aggregate which constitutes one of the most important advances made in the progress of our race.

“It was a natural and logical sequence, therefore, in alignment with this progress, that the Carnegie Institution of Washington should have established three departments of research devoted severally to investigations in different fields of the rapidly enlarging domain of biological science. And it is similarly consonant with the spirit of the age and with the aims of the Institution that the Eugenics Record Office should have developed in close affiliation with the Department of Experimental Evolution and with the Biological Laboratory of the Brooklyn Institute of Arts and Sciences at Cold Spring Harbor, Long Island. The stimulus for progress brought to both these organizations by the Director of the Department of Experimental Evolution, the formation of a eugenics section under his secretaryship in the American Breeder’s Association, and the sympathetic interest in all these enterprises shown by Mrs. E. H. Harriman, are among the earlier favoring influences which led to the establishment of the Eugenics Record Office in 1910. In April of that year Mrs. Harriman purchased for the purposes of the project a tract of land of about eighty acres, near Cold Spring Harbor, and in October following the Office was installed in a dwelling house on this land.

“In accordance with Mrs. Harriman’s preference it was determined at the outset that the work of the Eugenics Record Office should be work of research. It was recognized that the first need is for knowledge and that when this is gained applications will follow in due course. The principal objects of the Office are the following:

- “a. To serve eugenical interests in the capacity of a repository and a clearing house.
- “b. To build up an analytical index of the inborn traits of American families.
- “c. To train field workers to gather data of eugenical import.
- “d. To maintain a field staff actually engaged in gathering such data.
- “e. To cooperate with other institutions and with persons concerned with eugenical study.
- “f. To investigate the manner of inheritance of specific human traits.
- “g. To publish the results of researches.

"In December 1912 the valuable adjunct of a board of expert directors of the Office was organized, consisting of Alexander Graham Bell (chairman), William H. Welch (vice-chairman), Irving Fisher, Lewellys F. Barker, and E. E. Southard, with Charles B. Davenport as secretary. A year later T. H. Morgan was added to this board. Dr. Davenport has served continuously as resident director and H. H. Laughlin as superintendent of the Office. In the meantime, many investigations have been made, extensive records have been collected and classified, and many publications have been issued, among the more noteworthy of which latter are three volumes published by the Carnegie Institution of Washington. The permanent staff of the Office now includes 14 persons and its annual budget amounts to \$25,000. There are 6 buildings on the land, namely, a dwelling house, a fire-proof office, a stable, a garage, a pumping plant, and a water tower.

"Although Mrs. Harriman has furnished the main financial support of the Office from its foundation and the sole support in recent years, other friends of the enterprise have generously given aid for maintenance and for certain special purposes.*

"Since October 1915 Mrs. Harriman has expressed a desire to place the Eugenics Record Office on a more permanent basis and has offered the real estate and the records of the establishment, along with a gift of \$300,000 in securities, to the Carnegie Institution of Washington. The acceptance of this offer was recommended to the Board of Trustees of the Institution by resolution of the Executive Committee adopted at its meeting of November 19, 1917. This recommendation was unanimously approved by the Board of Trustees at their meeting of December 14, 1917, and the President was authorized to arrange for formal receipt of the securities and a deed for the real estate involved. Accordingly, the Chairman of the Finance Committee and the President of the Institution received from Mrs. Harriman at her residence, 1 East 69th Street, New York, N. Y., on Friday, Decem-

*When the Eugenics Record Office was turned over to the Carnegie Institution of Washington an inventory showed property of the estimated value of \$140,062.61, distributed as follows: real estate, \$80,680; furniture and equipment, \$7,488.82; archives, \$45,209.98; library, \$1,606.85; supplies, \$5,076.96.

The records also showed that the total amount spent by Mrs. E. H. Harriman on the Eugenics Record Office, including cost of property, new buildings, improvements, and maintenance, from October 1, 1910, to December 31, 1917 (data supplied by Robert R. Dunnett, auditor of the estate of E. H. Harriman), was \$246,832.82. Other sources and items of income received prior to December 31, 1917, are the following: John D. Rockefeller, for field work, \$21,650; Bleecker Van Wagenen, for publications, \$1,737.32; W. E. D. Stokes, for field work, \$200; Mrs. Lucy W. James, for field lecturer, \$2,500.

The total cost of the enterprise up to December 31, 1917, is therefore \$272,920.14. Deducting the amount of the inventory of January 1, 1918, it is seen that the entire cost of the researches of the Eugenics Record Office from its establishment on October 1, 1910, to December 31, 1917, a period of seven years and three months, is \$132,857.53.

ber 27, 1917, the securities in question and the data essential for a draft of a deed conveying the real estate.

“Resolved, That in accepting from Mrs. E. H. Harriman her gift of the Eugenics Record Office and the accompanying provision for its maintenance, the Executive Committee of the Carnegie Institution of Washington desire to record their admiration for the philanthropic discernment and the enlightened liberality which have led her to found this altruistic enterprise, and to express their sense of obligation to maintain and to pursue its researches under the auspices of the Institution for the benefit alike of our contemporaries and of our successors.

“Resolved, That a fund to be called the Harriman Fund be and hereby is established and that the United States Trust Company of New York be requested to set apart in this fund the securities (aggregating \$300,000, par value) recently presented to the Institution by Mrs. E. H. Harriman as a part of her gift of the Eugenics Record Office.”

Near the beginning of the present fiscal year, namely, November 17, 1917, Dr. Franklin Paine Mall, Director of the Department of Embryology, died at Baltimore, Maryland, in the fifty-fifth year of his age.

Death Losses
of the Year.

Mall was born at Belle Plaine, Iowa, September 28, 1862. His preparatory education was had in public and private schools and his first academic degree was obtained in the school of medicine of the University of Michigan at the early age of 21 years. He later pursued special courses of study at Heidelberg, Leipzig, and Johns Hopkins Universities. After serving as instructor in pathology at Johns Hopkins University and as professor of anatomy successively in Clark University and in the University of Chicago, he became professor of anatomy of the Johns Hopkins Medical School in 1893. He held this position actively until the end of 1912 and in an advisory capacity up to the time of his death.

In response to proposals submitted by Dr. Mall during the year 1912, he was appointed Research Associate of the Institution March 15, 1913; and by resolution of the Trustees December 11, 1914, the Department of Embryology, under his direction, was formally established. To this work he brought the resources not only of a highly original and productive mind, but also his remarkable collection of human embryos. Under the exacting professional standards of his administration the work of this department immediately assumed advanced rank, while the