its surface, the water already at the freezing point.

The most remarkable feature of the climatic conditions of Adelie Land are the violence and constancy of the winds. They are hurricane in force and, from the data in these volumes, appear to have come invariably from the south-south-east. Their regularity was most remarkable, and the direction so constant that field parties traveled during blizzards and in semi-darkness by shaping their course relative to the wind. Indeed the wind—and the sastrugi formed by it—was a far better direction-guide than was the compass, affected by their proximity to the magnetic pole. The average hourly velocity of the wind for the first year—determined by a registering Robinson anemometer, was fifty miles. The average for March, 1912, was 49; April, 51.5, and May, 60.7 miles. Hourly velocities of 90 miles were not uncommon, and in a number of cases the rate exceeded 100 miles. The most remarkable winds—which from the snow carried by them assumed the character of blizzards—are as follows: 1912 (for the 24 hours), May 11, 80 miles; May 15, 90; May 22 (gust approximating 200 miles per hour, with temperature of —28°); 1913, May, 17 (24 hours), 83 miles; May 18, 93.7 (between 6 and 7 P.M. of the 18th the instrument recorded 103 miles); July 5, 116 miles in one hour, and an average of 107 miles for eight consecutive hours; July 11, 298 miles in three hours; August 16, 105 miles in an hour. Gusts were determined from time to time by an instrument called a puffometer, by which winds in gust were noted of an extreme velocity of about 220 miles, though necessarily such record could not be considered as absolutely accurate.

Meteorologists have usually associated whirlwinds with heated or desert regions. Mawson related:

> Whirlwinds of a few yards to a hundred yards or more in diameter which were peculiar to the country. The velocity of the wind in the rotating column being very great, a corresponding lifting power was imparted to it. The lid of a case, weighing more than 300 pounds, was whisked into the air and dropped fifty yards away. An hour afterwards the lid was picked up again, and struck against the rocks with such force that part of it was shivered to pieces.

Regions of calms sometimes obtained in a sheltered locality immediately under hurricane winds. One man working in a fifty mile gale at the Hut, on the upper cliffs, walked down to the harbor ice and suddenly found himself in an area of calm. As compared with the force of winds of the *Discovery*, 77° 51′ S., 167° E., 10.3 miles per hour, the winds of Adelie Land are nearly six times as violent. As to direction the *Discovery* winds as determined from the lower clouds showed 18 per cent. S., 15 S.W. and 15 S.E. At Cape Adare, with 10 per cent. calms, there were 20.4 per cent. winds from the S.E. and 13.9 from the S. These data seem to bring the S.S.E. winds of Adelie Land in harmony with those a few hundred miles to the southeast. The *Gauss*, 66° S., 90° E., was frozen-in a long distance from land so that its winds, 47.8 per cent. from the E., are not directly comparable with those 1,700 to 2,000 miles to the eastward.

It is evident that Mawson is justified in calling Adelie Land the *Home of the Blizzard*, and in claiming that it is the windiest region on the earth at the level of the sea. Meteorologists will look forward with interest to the publication of the full observations with their scientific discussion.

A. W. GREELY

REPORT OF THE COMMITTEE OF THE AMERICAN ASSOCIATION OF ANATOMISTS ON PREMEDICAL WORK IN BIOLOGY

AT the meeting of the American Association of Anatomists in Philadelphia, December, 1913, a committee was named by the president of the association to confer with the zoologists on the subject of work in biology preliminary to the study of medicine.

In accordance with the original motion of the chairman, which led to the appointment of this committee, the following report was submitted to the association December 29, 1914, at the St. Louis meeting:

Your committee was appointed to confer with the zoologists to ascertain what coopera-

tion may be expected toward standardizing work in biology required of students looking forward to the study of medicine; and to formulate the considerations which would seem practical to incorporate in plans for such courses.

The Zoological Society promptly appointed a committee for this conference, and the following questions were discussed, not only with this committee, but with a number of representative members of the Zoological Society. Besides this, published statements of courses and of discussions on this subject were examined.

The following questions seemed to be most important.

Question 1. Is the work given in different colleges in the elementary, general course in biology adapted to satisfy the requirements of premedical training in this subject?

Question 2. Is it possible to so select and standardize the work of the first year in biology in different colleges as to make it uniform, and to include, here, all needed to make it an adequate course?

Question 3. If an ideal course, including sufficient preliminary work, can not be secured within the one-year period advocated, what principles should be urged to govern the planning of the biological work of students looking forward to the study of medicine, so that they will profit most by the training of the first year, and be best prepared to follow this up in special departments of biology more directly related to medicine.

Question 4. What additional work is to be advised, which is not to be obtained in the first year's general course?

Both committees agree that it is of the first importance to urge the selection of only thoroughly trained scientific men as teachers for this work. Such men can be trusted to insist on real scientific methods and to select the best material and treatment to give the beginner a practical introduction and basis for further work.

Beyond this point, however, the committees were unable to proceed. The zoologists suggested that the anatomists should draw up a statement of what they desire the zoologists to do, in preparing students for anatomy. After this has been done, the zoologists are ready to consider how far it is practicable to meet these needs. Several attempts have been made in this direction, and your committee submits the following statement to the association for its approval, and transmission to the zoologists.

At the present time a one-year's course in biology is generally required as a preparation for the work of the medical school. This study of biology must serve as a preparation for medical work in physiology, pathology, bacteriology and parasitology, as well as anatomy, and it may fairly be questioned whether a single college course is adequate for this purpose. The study of botany alone is obviously insufficient, and the domain of zoology is so vast that much care should be exercised in the choice of those phases of the science to be presented to young students. Courses which are primarily experimental and deal with the functions and reactions of animals, although excellent in preparation for the physiological work of the medical school, are not the proper basis for the study of human anatomy. It is the purpose of this report to point out only those features of the college preparation which experience has shown to be desirable, and in fact essential, for the successful study of gross and microscopic anatomy.

No uniform or stereotyped preparatory course is recommended, for it is recognized that every teacher should give special attention to those subjects and groups in which he is particularly interested, and to the knowledge of which he has contributed by his own researches. Success depends in large part upon the ability of the teacher, but the following purposes of instruction should not be forgotten if the preparatory work is to satisfy the requirements of anatomy.

1. Students frequently begin the study of human anatomy with an insufficient knowledge of the lower forms of animal life. The broad knowledge of the various classes of animals and of invertebrate and lower-vertebrate morphology, which was the inspiration of the

great anatomists of the past, is now too often replaced by vague considerations of the method of science and ideals of observation. A return to the study of animals, as objects of interest in themselves, apart from theoretical considerations and possible relations to human society, is therefore recommended. The student should obtain a synoptic knowledge of the animal kingdom, and should be able to classify, in a general way, and to describe the life histories of the common forms of animals, aquatic and terrestrial, which may be collected in his locality. A beginning in such work may well be made by the student independently or perhaps in high-school courses, but such fragmentary and elementary studies should be supplemented by a thorough college course. The first-hand familiarity with animals should serve as the basis for all further work.

2. As a result of the knowledge of genera and species which the student should have obtained directly for himself by studying some group of animals or plants, questions of the origin of species and of the relation of the great classes of animals to one another are inevitably before him as philosophical problems. Collateral reading then becomes as necessary for the biologist as for the man of learning in any other branch of knowledge. Selected works of Lamarck, Darwin, Huxley, Mendel and others should be freely consulted. This literature, which in its influence upon human thought has far outspread the bounds of biology, should not be neglected by the student of zoology, whose particular heritage it is. Since the idea that science can not be read, and that there is no knowledge in books, is often taught as a cardinal principle, it has come about that students of zoology have little knowledge of, or respect for, the writings of the makers of their science.

3. Before beginning the study of human histology, every student may reasonably be expected to be familiar with the use of the microscope and with the simpler methods of preparing specimens for microscopic examination. This technique can be learned in connection with various courses, perhaps the most useful of which is a general study of the cell with a comparative study of the elementary tissues. The maturation of the germ cells and the processes of fertilization and segmentation can not be properly presented in the medical curriculum, and these fundamental biological phenomena should therefore be observed in college courses. The development of the chick, which was studied primarily by physicians to explain the growth of the human embryo, can likewise receive little attention in the medical school. These subjects are all very desirable in themselves, and if studied by laboratory methods, will supply the requisite skill in the use of the microscope.

4. In preparing for human dissection, comparative anatomy should be studied with the same standards of thoroughness which obtain in the dissecting room. The student should learn to dissect rapidly and well, and to record with careful drawings and brief descriptions the forms and relations of the structures which he has disclosed. But such studies are not useful merely for their methods. A knowledge of comparative anatomy, including especially the anatomy of the lower vertebrates, is indispensable for understanding the structure of the human body. For other reasons also, human anatomy must be treated as an advanced study. The state does not provide bodies for dissection in order that untrained students may learn from them those elementary facts, which may be understood equally well by dissecting cats or rabbits. "It is absurd," says President Eliot, "to begin with the human body the practise of dissection." And the value of dissection is so great in relation to both medicine and surgery, that an adequate preparation should be required. For the study of anatomy, in the words of Lord Macauley, "is not a mere question of science; it is not the unprofitable exercise of an ingenious mind; it is a question between health and sickness, between ease and torment, between life and death."

5. Finally, these recommendations may be summarized as a plea for a more thorough study of zoology on the part of those planning

to enter the medical schools. The zoological courses should not be abridged and popularized in order that time may be saved for other pursuits, or that the science may seem more attractive to college youth. Courses in anatomy and physiology which duplicate the work of the medical school, and courses in "medical zoology," ought not to be substituted for the strictly zoological university courses. The science of zoology is of such great service to students of medicine that it deserves a large place in their undergraduate studies. With medical anatomy, it constitutes "a subject essentially one and indivisible"; and the penalty for its neglect is inadequate preparation for medical practise.

Committee: H. McE. Knower, *Chairman,*
F. T. Lewis,
W. H. Lewis

St. Louis, Missouri,
December 29, 1914

In the following summary, the chairman of the committee has rearranged the main points of the above report in groups, to correspond to the four questions proposed at the beginning; so that a more definite idea may be secured of the manner in which these are answered. In assembling the answers to the different questions the exact sense of the report itself has been retained. In answering questions 3 and 4 an effort has been made to indicate what we may reasonably expect to include in the first year, and what should be advised in addition.

I and II. The first two questions formulated by the committee are answered in the negative; that is, a one-year's course is not regarded as sufficient, and a uniform, standardized course seems undesirable. An introduction to the subject through special courses in selected "medical zoology" is also disapproved.

III. (*a*) In regard to the third question; it has seemed necessary to urge a more thorough knowledge of the morphology of lower forms of animals and their life histories. While the anatomists in adopting this statement as given in the report, undoubtedly expect the physiological aspects of these mechanisms to be considered as necessary accompaniments of such first-hand familiarity with animals, it is urged in the report that the introductory college course shall not be "primarily physiological." It is earnestly desired that the work shall involve a rigorous grounding in comparative morphology, especially of lower forms, which furnishes not only the best basis for human anatomy, but is a very essential preliminary for comparative and human physiology.

(*b*) It is urged that the theoretical and philosophical considerations which accompany the course shall follow a practical acquaintance with animals, rather than that special animal structures shall serve chiefly as illustrative material for lectures on general biological theories, with a neglect of a thorough study of a series of animal forms.

(*c*) The additional principles which should govern the planning of the introductory courses, beyond those just stated, are:

The selection of suitable teachers.

The undesirability of attempting to establish a uniform preparatory course, or courses especially limited to applications to medicine.

The acquirement of skill in the use of the microscope, and of correct scientific method of work in connection with the work of the course.

The beginnings of embryology and cytology.

IV. As to the last question, number 4, the report does not attempt to decide what proportion of the recommended preparation for anatomy can be obtained by a student in the first year's course. This must be indicated by the zoologists. It seems evident to a student of present conditions, however, that most of the work desired in cytology and comparative, general histology; comparative anatomy of vertebrates; or systematic zoology will have to be elected by students looking forward to medicine, after they have taken the introductory course. It is to be hoped that the elements of vertebrate embryology will be included in that course. Some of this work may well be done in one of the excellent summer laboratories.

V. Finally, the importance of collateral reading in the masterpieces of biological literature is strongly emphasized.

At the St. Louis meeting of the American Association of Anatomists, December 29, 1914, the report of the committee on premedical work in biology was approved by the association; and the committee was continued with instructions to submit the approved report to the zoologists, and to secure their cooperation in carrying the work further.

H. McE. KNOWER, *Chairman*

SPECIAL ARTICLES

SEX DETERMINATION AND SEX CONTROL IN GUINEA-PIGS

THE observations, a short exposition of which is given here, were made on guinea-pigs, being used by Professor Stockard in heredity experiments. He very kindly placed the material at my disposal for this study, and I wish to express my appreciation of this favor.

These observations show that the sex of a guinea-pig is determined sometimes by two and sometimes by three factors, depending upon whether the mother has previously born young.

The first factor "A" is the sex tendency of the father. If the father has a male sex tendency, his sons will have a female tendency and his daughters a male tendency. If, on the contrary, the father possesses a female tendency, his sons will have male tendencies and his daughters female tendencies. In other words, sons exhibit the opposite and the daughters the same tendency as the father.

The second factor "B" is the sex tendency of the mother. A mother with a male tendency gives her daughters a female and her sons a male tendency. The mother with a female tendency gives her daughters a male and her sons a female tendency. Thus the transmission of the sex tendency from the female is also criss-cross in the same fashion as that of the male. The females inherit like tendencies from their father and the males like tendencies from their mother, whereas the males inherit the reverse tendency of their father and the females the reverse tendency of their mother.

The third factor "C" is confined to the female and is a change of sex tendency from litter to litter. This change in tendency manifests itself in the following way:

If the first litter contains only males, the mother acquires a female tendency for the next litter and vice-versa. This new tendency varies in strength, depending upon the number of young of one sex contained in a litter. The greater the number of males in a litter, the stronger the female tendency will be for the next litter. This tendency is still more emphasized if the mother is successively mated with males of a definite tendency, and therefore forced to produce more and more young of one sex.

The tendency of the various animals of a certain stock must first be ascertained in an experimental manner; given a number of undetermined males and females, each male must be mated with all the females and each female with all the males. After all the animals have been tested in this way, the results will show more males from some animals and more females from others. If, now, the offspring from these matings be grouped so as to take those animals which have come from more male producing fathers and their tendency be tested, it will be found that from the males more females will be produced and from the females more males. Provided the determination of the sex tendency for the first set of animals was absolutely correct, and if there was no other factor in action, the proportion of males to females should be as 75:25 from male producing males mated with females having different tendencies, and from female producing males the proportion is reversed. It is, however, very difficult to determine absolutely the sex tendency of an animal after only a few matings, and for this reason, some animals supposed to have a male tendency will probably have a weak female tendency, and *vice versa*.

In order to find with reasonable definiteness