blooded forms. All other things being equal, this minimum size will vary with the external temperature, and in colder climates the smallest warm-blooded animals would freeze. This is undoubtedly correlated with *Bergmann's Rule* which states that races living in cooler climates are larger in body size than races of the same species in warmer climates. Local temperature loss may cause discomfort, and even freezing, in relatively small parts which have a proportionally large surface. Thus fingers, toes and ears are usually the first body part to suffer cold. This is undoubtedly correlated with *Allen's Rule,* which states that the races of mammals living in cooler regions have relatively shorter tails, legs and ears than races of the sames species in warmer regions. It also applies to birds, with respect to relative lengths of beaks, legs and wings.

To Cut or Not to Cut!

DONALD S. LACROIX
Amherst High School, Amherst, Massachusetts

There seem to be several "schools of thought" in the matter of dissecting preserved specimens in the high school biology course. There are some secondary school biology teachers who require minute and careful studies of anatomy in worms, frogs, crayfish and what-not—who require the memorizing of bone names, muscle pieces and sundry other portions. Again, there are those teachers who suggest little or no dissecting—simply leaning on the text-book drawings. I suspect that between these extremes we find on the one hand the teacher who has taken several college courses in comparative anatomy and who is steeped in the tradition of memorizing a lot of "part" names; and on the other hand the teacher who never had much actual laboratory work with a dissecting kit, and is therefore afraid to tackle any "dismembering" with a bunch of high school pupils.

From the average high school (if such exists!) only a few pupils go on to college. Of these, still fewer will undertake any courses of a biological nature. Most of the boys and girls in the high school biology course will join the ranks now occupied by Mr. and Mrs. Average Citizen. Hence it would seem to be a waste of time to require these students to make detailed studies of the anatomy of preserved specimens. The logical procedure is to give the youngsters a chance to do some dissection—enough "opening up" of several types to observe the development of digestive systems, respiratory apparatus, reproductive organs, skeletal structures and so on—but without having to study and memorize many parts and minute pieces. Those students who enter institutions of higher learning to pursue medicine, surgery, nursing or other biological courses will get enough of that type of study when the time comes. Those who, upon graduating from high school are to become secretaries, clerks, machinists or ditch-diggers will have gained little from learning the names of all the bones in a cat's skeleton—but they should get a fairly good mental picture of how they themselves "tick" if they have had the opportunity to see the insides of several types of animals.

The usual preserved specimens mentioned above have been used from early times in school biology and certainly have a place in the sun. Greater interest

can be aroused by bringing in to the laboratory local animals or parts from slaughter houses. One of the most exciting experiences I have witnessed came about when a boy brought in the eye of a pig which his father had slaughtered. We had been studying eye-sight, vision and the usual models of the human eye, so that the pupils were familiar with the general terminology involved. A dissecting kit was placed in the hands of the boy who brought in the pig's eye, and with many suggestions from the surrounding "assistant surgeons" he went at it. Without any direction from the teacher, these boys took apart and identified with enthusiasm and much satisfaction the important parts about which they had been studying.

When the dissection of specimens is first introduced in the high school biology course, there are usually several pupils who throw up their hands and say they can't do it, or can't look at such things. In such situations, it is only necessary to collect the more hardy souls around a bench and start them off. In a few minutes their interest and pointed exclamations arouse the curiosity of the others to such an extent that the latter will come over. Before the laboratory period has ended, most of them will be clamoring for an active part in the work. If the teacher tries to force everyone to do the work, he may kill the latent interest which can better be aroused by allowing natural curiosity to take its course.

Youngsters will gladly bring in fish-heads and can be directed in examining gills, brain, mouth, and eyes. Parts of home-slaughtered animals can be procured by boys living on farms or can be gotten at local abattoirs. Chicken lungs with a piece of glass tubing inserted in the trachea make excellent demonstrations. Chicken feet can be dissected to show the action of tendons and the special perching adaptations of birds feet. One of the most interesting studies can be made by killing a snapping turtle (Chelydra) and removing the plastron. Leaving the turtle on its back, carefully cut away enough tissue to expose the heart. This organ will continue to pulsate for several hours after death and presents a beautiful study of heart action. If the outer skin is removed from a leg and an electric current from one or two dry cells applied intermittently to the muscles, another interesting series of observations is possible.

Leg bones with joints intact can be obtained from butchers and meat markets. By sawing them open longitudinally pupils can observe bone structure, joint formation, cartilage, marrow and ligaments. This is especially helpful in connection with the study of the skeleton in human physiology.

The student who intends to go to college and take up biology in some form or other, be it medicine, agriculture, zoology or any other course in this field, can be interested to such an extent that he will come in after school or during a free period.

INTERNATIONAL UNDERSTANDING

Education for international understanding is a fundamental responsibility of all levels from elementary to adult education. More than sixty national organizations cooperated in a conference held at Estes park during the past summer, the work of which centered about four main points: 1. coordination between campus and off-campus agencies, 2. specialized training, 3. general education, 4. a framework for international cooperation among colleges and universities.

The complete report of the Conference is being published by the *American Council on Education* and will be available very shortly.

Annual Convention of the NATIONAL ASSOCIATION OF BIOLOGY TEACHERS

in conjunction with

The American Nature Study Society and The National Science Teachers Association New York City, N. Y.

December 27–30, 1949

TUESDAY, DECEMBER 27

10:00 A.M. Joint Session—Grand Ballroom, Hotel New Yorker. *New Scientific Trends.*

2:00 P.M. National Association of Biology Teachers—North Ballroom, Hotel New Yorker. TEACHING AIDS FOR BIOLOGY—FROM WITHIN THE CLASSROOM AND LABORATORY. Chairman: Dr. P. H. Betty Lockwood, President Elect, National Association of Biology Teachers.

"Teacher-Pupil Planning for Biology." Mr. Jesse Miller, Manhasset High School, Manhasset, N. Y.

"Student Activity as an Aid to Learning in the Biological Sciences." Rev. Francis E. Williams, C.S.V., M.S., Archbishop Stepinac High School, White Plains, New York.

"Enriching the Biology Program through Audio-Visual Aids." Brother Thomas Edward, S.M.S., M.S., Bishop Dubois High School, New York, N. Y.

"The Use of 2 × 2" Photomicrographs in Teaching Biology." Abraham M. Weckstein, Ph.D., Barringer High School, Newark, N. J.

"Preparation and Use of Color Slides in the Classroom." Brother Charles, F.S.C., Saint Mary's College, Winona, Minn.

"Horticultural Biology." Miss Lydia Elzey, State College, State College, Pa.

"Techniques in Photosynthesis and the CO_2–O_2 Cycle." Paul Brandwein, Ph.D., Forest Hills High School, Forest Hills, N. Y.

"A High School Science Service." Mr. James Harlow, University of Oklahoma, Norman, Oklahoma

"An Outdoor Laboratory—A Science Weekend Camp." Mr. Zachariah Subarsky, Bronx High School of Science, New York, N. Y.

"A Demonstration Activity in Human Physiology." Miss Dorothy Tryon, Redford High School, Detroit, Michigan

"Suggestions for Teaching the Human Eye." Charles E. Hadley, Ph.D., Montclair State Teachers College, Montclair, N. J.

"Accent on Man." Mr. Harold Nagler, James Madison High School, Brooklyn, N. Y.

WEDNESDAY, DECEMBER 28

10:00 A.M. Joint Session—Grand Ballroom, Hotel New Yorker. *New Scientific Trends*

2:00 P.M. National Association of Biology Teachers, Parlors F and G, Hotel New Yorker.

TEACHING AIDS FOR BIOLOGY—FROM OUTSIDE THE CLASSROOM AND LABORATORY.

"Aids for Teaching Personal Hygiene." Mrs. Marion Morris Hinse, Director, Educational Service Dept., Bristol Myers, Co., New York, N. Y.

"Aids for a Dental Health Program." Harry Strusser, D.D.S., Director, Bureau of Dentistry, Department of Health, New York, N. Y.

"Health Education Services from the National Tuberculosis Association." Miss Charlotte Leach, Consultant in Health Education, National Tuberculosis Association, New York, N. Y.

"Visual Aids for Teaching Green Plants and Photosynthesis." Mr. H. L. Bogart, Public Relations Director, Sugar Research Foundation, Inc., New York, N. Y.

"How a Botanical Garden Can Assist a Biology Program." Mr. G. L. Wittrock, Ass't. Curator Education, The New York Botanical Garden, New York, N. Y.

Other Aids for Conservation, Health, Disease, Plant and Animal Study will be presented and discussed briefly, and materials distributed.

(*Continued on next page*)

THURSDAY, DECEMBER 29

10:00 A.M. General Session—Grand Ballroom, Hotel New Yorker
Program arranged by The New York Federation of Science Teachers

2:00 P.M. General Meeting of the Cooperative Committee, AAAS

6:30 P.M. Joint Dinner of the three societies, Hotel New Yorker

FRIDAY, DECEMBER 30

Former all-day field trips with our affiliate, The American Nature Study Association, have proven so popular, that another trip is planned for this year. Several shorter trips to local points of interest are also planned by the New York Federation of Science Teachers.

Editorial Comment

Learning Facts

In all the present-day discussion about relation-determining, curiosity-arousing, judgment-exercising and other goals of science education we are apt to forget one of the other fundamental and essential goals, fact-learning. Facts always have been and probably always will be the basis of science and the scientific method. The importance of science in society rests on exactly the same foundation—facts.

Few if any teachers will argue that the student gets much good out of memorizing a group of unrelated facts, or even related facts that he does not understand. Few if any biology teachers believe that forcing a student to memorize lists of technical names of plants and animals does much to give him either real knowledge or real appreciation of the living world (though a few act as if they believed it). But this is not the point at all. Many science teachers and educators talk as if we must decide *between* facts and principles; as if emphasizing one of these must be at the expense of the other. They deride "fact learning" and glorify principles, relationships, or what-not. This is a short sighted view. We must make sure that we emphasize *both* facts *and* principles, since neither means much without the other.

The job is to get the student to see a principle as a unified expression of a lot of facts. He must come to realize that relationships do not exist in vacua. They only exist between something and something else. In science these "somethings" are facts.

In our own courses a few students after each final exam ask: "Why didn't you make the tests general like the final? Why did you ask such specific points on the tests?" The majority of them of course have by the time of the final come to see that only after a period of fact learning is the student in a position to deal with broad generalizations. Actually each successive test includes more generalizations and few specific points that its predecessors, but many students do not catch on to this until the end of the semester.

Whatever the goals or aims of a general biology course—economic use, interrelationships with other sciences, importance in modern civilization, appreciation of nature, general culture, understanding the scientific method, health and hygiene, development of hobbies and leisure-time interests, many others—the foundation stones and instruments for their attainment are facts.