the side of the contact it is easy to displace the pendulum one degree, making the arc of vibration two degrees, which is sufficiently great for testing the apparatus an hour.

As the tuning-fork is the standard instrument for measuring and recording short periods of time in physical and physiological experiments, it is very desirable that its exact rate of vibration should be ascertained under the conditions to which it is subjected. It is necessary to employ the graphic method to do this successfully, for the friction and weight of the writing point are liable to affect the rate. A record of considerable length should be taken to minimize the errors due to irregularities in the action of the electric contact. In my own work the smoked paper for the tracing envelops a light aluminium drum which is rapidly rotated by hand. The drum is mounted on a steel axis with a spiral groove cut in it. A pin projecting into the groove causes the drum to rotate in a spiral. As the spiral movement allows long records to be taken, the mean number of vibrations for a considerable period can be ascertained. The motion by hand is very satisfactory, as the rate of rotation can be varied as required. The time-marker in the circuit of the pendulum should write only a few millimeters from the tracing of the fork. In order to do this it is necessary that the axis of the marker should make an angle with that of the fork. I use a clamp for this purpose which holds the object in any position, and permits a delicate adjustment of the writing point. The records that have been obtained with the apparatus have been very regular; variations of small fractions of a vibration were easily detected in them.

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THE AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE

SECTION M, AGRICULTURE

THE second meeting of the Section of Agriculture was held in Townsend Hall, Ohio State University, Columbus, December 28, 1915. The sessions were presided over by the vice-president of the section, Dean E. Davenport, of Illinois. The two features of the meeting were the address of the retiring vice-president, Dr. L. H. Bailey, upon "The Forthcoming Situation in Agricultural Work," already published in SCIENCE,[1] and a symposium on "The Relation of Science to Meat Production." The latter was participated in by five speakers who presented various phases of the subject. These papers brought out clearly the complicated and many-sided nature of the problem of meat production and the part which science is playing in promoting, safeguarding and rationalizing the industry.

The symposium was led by President W. O. Thompson, of Ohio State University, who defined "The Nature of the Problem." The background of it lies in the fact that the people of this country have been a meat-eating people for many generations, and any limit to the supply or any excessive cost calls forth widespread protest. The problem of meat production was defined to be largely an economic one in farm management. It has been affected by the numerous changes in agricultural conditions over the country, the extension of farming in the west, the increase in the tenant system, and the development of the dairy industry, even in the vicinity of small towns, all of which have affected the raising and fattening of beef cattle.

The large risk sustained in live-stock keeping has contributed another angle, as has also the problem of advantageous marketing. The problem of maintaining the requisite meat supply is not a haphazard one, but includes very definite phases, such as its relations to systems of farming and to the maintenance of soil fertility, the maintenance of health of live stock to reduce the risk, provision of adequate marketing facilities and conditions, and the intelligent feeding and handling of meat animals. The point was emphasized that the taste for meat has been struggling for existence at the expense of the farmer, and that consideration of the problem of continued supply must be based on broad considerations, in the firm belief that the laborer shall receive his reward.

President H. J. Waters, of the Kansas Agricultural College, enumerated some of the ways in which science may help live-stock farming, as by showing the farmer how a surplus of feed may be carried over, in the silo for example, to equalize the feed supply from year to year; by the proper balancing of feeds, a knowledge of the values of

[1] 1916, SCIENCE, N. S., Vol. XLIII., p. 77.

protein from different sources and of the relation of mineral constituents to efficient nutrition, growth and reproduction. Breeding offers further opportunity for improvement, and science may also help the farmer to meet the changes in the demand of the market, as for example, for bacon and ham hogs in place of those furnishing a larger proportion of pork. Already there is a basis for a much better understanding of these matters as a result of recent investigation. Furthermore, a better understanding of factors of growth may assist in cheapening meat production. Investigations upon the stunting effect of deficient food supply has shown the practicability of allowing animals to grow when the farmer has feed for them, and maintaining them on a low basis of nutrition when feed is scarce. The retardation of growth was not found so serious as was formerly thought.

President Waters emphasized the fact that meat production must yield a larger net profit than grain and hay farming to induce farmers to follow it, since it involves more work, more risk, and keeps farmers employed the year round. Any increase in meat production, he prophesized, must come from home production, on the farm mainly and not on the western ranges.

The latter point was borne out by Professor H. W. Mumford, of the University of Illinois, who discussed "The Problem of Meat Production on the High-Priced Lands of the Middle West." He held the corn-surplus states to be the natural center of beef production in this country, since corn-fed cattle are the distinctive feature of the cattle industry and cattle raising in the corn belt provides a farm market for the crop and conserves the fertility of the soil. As a result of changed conditions, however, a large per cent. of the cattle fed in these states are raised in the great breeding grounds of the southwest. Consequently, the business of cattle feeding or finishing has gravitated into the hands of large feeders who deal in carload lots, the capital, risk and business skill involved and the distance from markets having deterred many farmers from going into this line.

In order that beef production in the corn belt may take its proper place it was deemed advisable that the business should be distributed more generally among farms of average size, and that an increasing proportion of the cattle fed in the corn belt be reared there. Further development of the industry was said to depend on a remunerative and reasonably stable market, and no prospect was held out of lower prices. It was prophesied that any considerable increase in the production of beef cattle in the United States will come from the establishment of small herds on many farms rather than of large herds on extensive areas.

"The Economic Aspects of Meat Production and Marketing" were treated by Professor L. D. Hall, of the U. S. Department of Agriculture. The marketing of live stock, particularly of hogs, is coming to be regarded as the limiting factor of their production. The problem of marketing was stated to relate in very large measure to the great central markets, at which more than half of the cattle, two thirds of the swine and approximately four fifths of the sheep of the country are slaughtered. Several conditions and practises which further complicate the problem and favor the buyer were enumerated.

The speaker explained that "every effort should be exerted to take up the slack in a system that contemplates raising a steer in Texas, grazing him in Montana, fattening him in Iowa, selling him in Chicago, slaughtering him at New York, and sending surplus fresh cuts in refrigerator cars as far west as the Missouri River." One feature of the problem was the supplementing of the large central slaughtering establishments with other facilities tending to make markets more accessible to producers, and a tendency in that direction was noted. Furthermore, the provision of more complete official information for growers and feeders as to the supply and distribution of meat animals, both fat stock and feeders, the movement of live stock, quotations at various markets based on standard classes and grades, and the stocks of fresh meat and meat products at principal points, it was maintained would contribute very materially to the stability of conditions and give the producer a truer understanding of the economics of his business.

Dr. A. R. Ward, of the Bureau of Animal Industry, discussed disease control as a factor in meat production, enforcing his remarks by data drawn from the federal inspection of meat and meat animals. He showed the enormity of the direct loss from animal diseases, estimated to amount to approximately $212,000,000 annually, a large proportion of which is from diseases demonstrated to be preventable and controllable. Nearly two per cent. of the animals slaughtered under federal inspection in 1914 were condemned in whole or in part on account of disease. The burden which these losses imposes upon the meat-producing industries of the country was emphasized.

Tuberculosis caused the largest number of condemnations and hog cholera the next. The blighting effect of Texas fever upon a large section of the country was referred to, and the success in the campaign for eradicating the tick causing the disease was pointed out. The results are already apparent in an extension and improvement of the cattle industry.

The importance of the control of animal diseases in relation to the production of meat and the live-stock industry was summed up in the statement: "The good judgment and knowledge possessed by the individual producer of animal-food products concerning the diseases of his animals will determine his success."

The officers elected for the coming year were as follows: Vice-president, Dr. W. H. Jordan, director of the State Agricultural Experiment Station, Geneva, N. Y.; Dean F. B. Mumford, of the University of Missouri, a member of the council, and Dean Alfred Vivian, of Ohio State University, a member of the sectional committee (for five years).

E. W. Allen,
Secretary
U. S. Department of Agriculture

THE AMERICAN SOCIETY OF NATURALISTS

The thirty-third annual meeting of the American Society of Naturalists was held at Ohio State University, Columbus, on December 30, 1915. In affiliation with the society this year were the American Society of Zoologists and the Botanical Society of America.

The report of the treasurer, stating a balance on hand of $676.14, was accepted.

The two following resolutions were adopted.

1. *Resolved*, That the American Society of Naturalists recognizes the urgent need in the United States of reform in the methods of securing evidence of expert opinion in judicial procedure; That the American Society of Naturalists approves the efforts of the American Association for the Advancement of Science in this behalf; and, That the executive committee is hereby authorized and directed to cooperate with the committee of the American Association for the Advancement of Science in the endeavor to bring about such reform.

2. *Resolved*, That the American Society of Naturalists, recognizing the centigrade scale of temperature measurement as based on better principles than that of the Fahrenheit, emphatically urges its adoption by the Senate and House of Representatives as the standard in government publications of the United States of America.

It was ordered that the executive committee of the Naturalists be instructed to appropriate $200 to the Concilium Bibliographicum, Zurich.

A motion that the Naturalists schedule no program at its annual meeting for Thursday forenoon was referred to the executive committee.

There were elected to membership the following: G. A. Baitsell, Yale University; John Belling, Florida Agricultural Experiment Station; G. N. Collins, U. S. Department of Agriculture; W. J. Crozier, Bermuda Biological Station; B. M. Duggar, Missouri Botanical Garden; R. R. Gates, University of California; C. H. Heuser, Wistar Institute; Julian Huxley, Rice Institute; I. J. Kligler, American Museum of Natural History; H. H. Laughlin, Eugenics Record Office; Orren Lloyd-Jones, Iowa State College; L. B. Nice, University of Oklahoma; Oscar Riddle, Carnegie Station for Experimental Evolution; J. W. Scott, University of Wyoming; Gaylord Swindle, Fairview, Mo.; P. F. Swindle, Fairview, Mo.; J. E. Wodsedalek, University of Idaho; S. G. Wright, Bureau of Animal Industries.

By a vote of thanks the society expressed its hearty appreciation of the facilities and courtesies extended by the social committee and by the Ohio State University.

The program of the morning session was as follows:

F. M. Surface, "On the Inheritance of Certain Grain Characters in Oats." (Read by title.)

G. H. Shull, "The Inheritance of Acidia in *Fraxinus americana*."

I. W. Bailey, "Botanical Evidence in Regard to Climate and Evolution."

A. F. Blakeslee, "Two Plants Adapted to Classwork in Genetics."

E. C. Jeffrey, "Hybridism and the Rate of Evolution in Angiosperms."

L. J. Cole, and W. H. Wright, "The Application of the Pure-line Concept to Bacteria."

Oscar Riddle (by invitation), "Sex Control and Known Correlations in Pigeons."

H. H. Love, "Variations in Daisies." (Read by title.)

C. B. Davenport, "Heredity of Stature."

A. M. Banta, "The Necessity of Sexual Reproduction in Certain *Cladocera*."

C. C. Little, and E. E. Tyzzer, "Inheritance of