most of them will be printed. The general lectures will appear in the first part. Summaries of most of the section papers were distributed to members of the congress, but with numerous omissions, the manuscripts not reaching Zurich in time to be included.

The social features were well arranged. They included a reception on September 4, a concert on September 5, an excursion on the lake on September 6, a social gathering at the Municipal Theater on September 10, and a tea on September 11. The ladies of Zurich made a great effort to provide entertainment for the women guests in the way of teas, visits to the town and its museums, and a motorcar excursion to the Castle of Wildegg. There were also excursions at a moderate price to Klausenpass, the Rigi, Pilatus, the Lake of the Four Cantons and the Jungfraujoch. For the official delegates there was a special tea-party given at the beautiful château of Herr and Frau von Schulthess-Bodmer at Au.

There was a small exhibition of books and mathematical instruments in the Polytechnic School, generally of recent material, but in one case, by L'Art Ancien, of old books and manuscripts.

In spite of the general world depression, the attendance was satisfactory, although not as large as at some of the other congresses. It is expected that the next meeting will be held in 1936 at Oslo.

DAVID EUGENE SMITH

# THE AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE

## GENERAL LECTURES AT ATLANTIC CITY

FOR each meeting the association endeavors to arrange a series of general lectures to be delivered in non-technical language. These lectures are given in a semi-popular style, so that they can be easily understood by scientists who are not specialists in the field of work treated in the lecture and by the general educated public. Many of the points of the speakers are brought out by illustrations. Some speakers use lantern slides, some use motion pictures, and some even use research apparatus to demonstrate their points. On the other hand, many of the general addresses are of such a nature that they do not require illustration.

The association has been extremely fortunate in being able to secure an unusually representative series of lectures for the Atlantic City meetings. Eminent speakers have promised to discuss subjects in anthropology, mathematics, chemistry, physics, botany, zoology, meteorology, astronomy, sociology, dentistry and engineering. Some of the lectures will be held in the evenings, but most of them will be scheduled for 4:30 or 5:00 P. M. after the technical sessions of the societies.

Dr. Franz Boas, retiring president of the association, will give the first general evening lecture on Tuesday, December 27, at 8:45 P. M. in the Ballroom of the Municipal Auditorium, on "Anthropology and Its Aims." Following Dr. Boas' lecture, members of the association and friends will gather in the Rutland Room of Haddon Hall, the association's general headquarters hotel, for the general reception, which will begin at 10:15 P. M.

The second evening lecture will be given under the auspices of the Society of the Sigma Xi at a joint session of the association in the Ballroom of the Municipal Auditorium.

Dean Dexter S. Kimball, of the Engineering College of Cornell University, will deliver the third evening lecture on Thursday, December 29, in the Ballroom of the Municipal Auditorium. Dean Kimball has announced his title as "The Social Effects of Mass Production." This subject, which ought to be of interest to every one and especially to engineers and sociologists, is one to which Dean Kimball has for several years devoted serious thought.

A new general lecture has been established in memory of the late Hector Maiben, of Lincoln, Nebraska. The lecture will deal authoritatively with a topic of active scientific interest upon which the speaker possesses the right to an opinion in virtue of his own work. It will, however, be addressed to a general scientific audience rather than to specialists. The first Maiben Lecture will be given in the Ballroom of the Municipal Auditorium by Dr. Henry Norris Russell, of Princeton University, on "The Constitution of the Stars." Dr. Russell will review the recent work of Eddington, Jeans, Vogt, Milne and others, and will report on the present status of the problem.

The first of the afternoon general lectures will be given by Dr. O. H. Caldwell, editor of *Electronics* and formerly U. S. Radio Commissioner, on Tuesday, December 27, at 4:30 P. M. in Committee Room 12 of the Municipal Auditorium. Dr. Caldwell has chosen the subject "Electrons at Work."

On Wednesday afternoon at 4:30 P. M. in Committee Room 13, Municipal Auditorium, Dr. Carl Caskey Speidel, of the University of Virginia, will deliver a general address on "Nerve Growth and Repair." Dr. Speidel plans to illustrate his address with lantern slides and a motion-picture film, giving a record of nerve activities. It will be recalled that Dr. Speidel was awarded the association's prize of $1,000 at New

Orleans for his work on nerve growth and repair. An account of Dr. Speidel's prize paper is given in SCIENCE, for February 5, 1932.

A second general session will be held on Wednesday afternoon in the Smoking Room, Municipal Auditorium, for an address by Dr. Dayton C. Miller, of the Case School of Applied Science. In speaking on "The Physics of the Flute," Dr. Miller will describe the air currents producing musical sounds and will play a flute to illustrate his lecture.

The tenth Josiah Willard Gibbs Lecture will be delivered by Dr. Richard C. Tolman, of the California Institute of Technology, at a general session of the association and the American Mathematical Society on Thursday afternoon at 4:30 P. M. in the Vernon Room of Haddon Hall. Dr. Tolman, who is well known as a physicist, chemist and mathematician, has chosen the subject "Thermodynamics and Relativity."

A second lecture on Thursday afternoon at 4:45 P. M. in the Belvidere Room, Traymore Hotel, will be given by Dr. Mel T. Cook, director of the Insular Experiment Station at Rio Piedras, Puerto Rico, on the subject, "Personal Experiences in West Indian Hurricanes." Dr. Cook will give a botanical background to this lecture and will exhibit some lantern slides, showing the paths of cyclones in recent years. In addition, Dr. Cook will propose a theory to explain the origin and cause of hurricanes.

On Friday afternoon at 4:45 in the Benjamin West Room, Haddon Hall, Dr. Russell W. Bunting, professor of oral pathology at the University of Michigan and director of dental caries research under the Children's Fund of Michigan, will deliver a general address on "Recent Developments in the Study of Dental Caries." Every one interested in the present status of our knowledge of tooth decay will be interested in Dr. Bunting's lecture.

In addition to the above general addresses, many of the retiring vice-presidents and chairmen of the various sections of the association will deliver addresses of general interest. The titles of these as now known are as follows:

(1) "The Spontaneous Heating and Ignition of Hay and Other Agricultural Products," by Dr. C. A. Browne, Bureau of Chemistry and Soils, U. S. Department of Agriculture.

(2) "The Rôle of Analysis in Scientific Investigation," by Dr. Douglas W. Johnson, Columbia University.

(3) "Genetics and Embryology," by Dr. Charles Zeleny, University of Illinois.

(4) "Crops and Civilization," by Dr. E. D. Merrill, New York Botanical Garden.

(5) "Photographic Records of Changes in Vegetation," by Dr. G. E. Nichols, Yale University.

(6) "The New Anthropology: Twenty-five Stages of Vertebrate Evolution from Silurian Chordate to Man," by Dr. W. K. Gregory, American Museum of Natural History.

(7) "The Historical Development of Response Psychology," by Dr. Herbert S. Langfeld, Princeton University.

(8) "Mediaeval Guilds of Medical Interest," by Dr. Howard T. Karsner, Western Reserve University.

(9) "Science and the Problem of Value," by Dr. Ernest Horn, University of Iowa.

(10) "Tendencies in the Logic of Mathematics," by Dr. Earle R. Hedrick, University of California at Los Angeles.

CHARLES F. ROOS,
*Permanent Secretary*

# SCIENTIFIC APPARATUS AND LABORATORY METHODS

## A LEAST-SQUARES CURVE-FITTING MACHINE, USING SPRINGS

THE machine described herewith has been developed to meet a special need. Some features may be of enough general interest, however, to warrant an account of the problem and solution.

Breeders of dairy cattle are accumulating a large body of yearly records of production based on the milk yield and fat test of individual cows by calendar months. The problem is to measure the *rate* of milk secretion for each cow by fitting the data of the first eleven full months of lactation with the equation $y = Ae^{-kx}$, in which $y$ is milk-energy yield per day, and $x$ is time in months with origin at one month after calving.[1] The observed $y$'s are computed by use of a special slide rule,[2] wherein the stops of the machine sketched in Fig. 1 replace the runner of the slide rule. When the eleven stops, representing the observed $y$'s, are set the machine immediately indicates the fitted $A$ and $k$ constants, as explained in Fig. 1.

The present machine has been worked out by a sort of "cut and try" process,[3] without knowledge of any previous device along the same line. We have since learned that the spring principle of fitting a straight line to irregular observations was demonstrated some years ago by M. D. Hersey.[4]

[1] The use of this type of equation in the study of lactation was introduced by S. Brody and coworkers, *Jour. Gen. Physiol.*, 5, 441–443, 1923.

[2] *Jour. Agric. Res.*, 34, 373–383, 1927.

[3] The first model was constructed by the Hayes Machine Company, Urbana, Illinois. This was revised in the shops of the Department of Physics, University of Illinois, in which connection we wish to acknowledge the assistance of C. W. Fieg, shop mechanician.

[4] *Jour. Wash. Acad. Sci.*, 296, 1913.