SPECIAL ISSUE CONTAINING REPORTS OF THE FIRST PASADENA MEETING OF THE AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE AND ASSOCIATED SOCIETIES. EDITED BY DR. CHARLES F. ROOS, PERMANENT SECRETARY.

SCIENCE

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THE AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE

GENERAL REPORTS OF THE FIRST PASADENA MEETING OF THE AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE AND ASSOCIATED SOCIETIES

GENERAL FEATURES

THE eighty-eighth meeting of the American Association and associated societies at Pasadena, California, from June 15 to 20, 1931, inaugurated a new series of national summer meetings and set many precedents which will undoubtedly make all future meetings of the association more interesting and enjoyable. Too much credit can not be given the local committee for its wealth of ideas and its endeavors to make this meeting interesting. Much emphasis was placed on important symposia by distinguished scientists who came from twenty-eight states and nine foreign countries. A preliminary announcement for this meeting was mailed out to all members of the association about four weeks in advance of the meeting and a more condensed announcement containing some additional information appeared in SCIENCE for May 15, 1931.

The sessions of the association and associated societies were very satisfactorily accommodated in the buildings of the California Institute of Technology, the Mount Wilson Observatory, the Southwest Museum and the Huntington Hotel.

The president for this summer meeting of the association was Professor Franz Boas, of Columbia University. Professor Boas is known throughout the world for his important contributions to anthropology and is frequently called the dean of American Anthropologists. The association is greatly indebted to him for his loyalty and willingness to postpone his summer trip so that he could be present at the meeting.

The retiring president for the Pasadena meeting was Professor Thomas Hunt Morgan, of the California Institute of Technology, eminent leader in zoological research and teaching and a pioneer in genetics research. Dr. Morgan introduced the new president, Dr. Boas, at the first of the evening sessions.

ATTENDANCE, SESSIONS AND PAPERS

Fourteen of the fifteen sections of the association were officially represented on the program, and twenty-two independent organizations of scientific workers joined with the association on this occasion. Altogether about 110 scientific sessions were held, and about 580 papers and addresses were delivered by about 525 individuals.

Eleven hundred and ninety-three persons were actually registered at the association's registration offices as in attendance. Many present did not register, and it is therefore impossible to tell how many attended the scientific sessions. It is certain, however, that between fifteen hundred and two thousand attended one or more technical sessions of the association or associated societies. Each of the evening sessions at the Greek Theater in Los Angeles was attended by about one thousand persons, about half of whom were registered. All the audiences at the Greek Theater were attentive and seemed much interested in the scientific discussions.

The residence distribution of those who registered at the association's offices is shown by the following table:

State	Total	State	Total
Arizona	31	New Mexico	5
California	922	Ohio	5
Colorado	9	Oregon	22
Connecticut	4	Pennsylvania	5
District of Columbia	11	Rhode Island	2
Florida	1	Texas	4
Hawaii	10	Utah	21
Idaho	5	Washington	15
Illinois	12	Wisconsin	6
Iowa	5		
Kansas	4	Canada	8
Maryland	1	Foreign Countries:	
Massachusetts	13	Australia	1
Michigan	2	England	2
Minnesota	8	Germany	5
Missouri	9	Japan	2
Nebraska	4	Palestine	1
Nevada	2	Russia	1
New Jersey	2		
New York	31		1,193

THE LOCAL COMMITTEE AND REPRESENTATIVES OF SECTIONS

The general local committee for the Pasadena meeting was made up as follows:

P. W. Merrill, general chairman.

H. B. Babcock, general secretary.

L. H. Gilmore, executive secretary.

D. S. Mulvin, treasurer.

I. S. Bowen, chairman of the subcommittee on exhibits.

J. P. Buwalda, chairman of the subcommittee on public lectures.

R. L. Daugherty, chairman of the subcommittee on local service.

R. A. Millikan, chairman of the subcommittee on finance.

L. C. Pauling, chairman of the subcommittee on meeting places.

R. O. Schad, chairman of the subcommittee on registration.

R. W. Sorensen, chairman of the subcommittee on excursions.

Franklin Thomas, chairman of the subcommittee on entertainment.

E. C. Watson, chairman of the subcommittee on program and publicity.

Subcommittee on Finance: R. A. Millikan, Chairman; W. S. Adams, A. G. Arnoll, Max Farrand, P. W. Merrill, R. O. Schad, E. C. Watson.

Subcommittee on Public Lectures: J. P. Buwalda, Chairman; H. D. Babcock, Harry H. Main, R. A. Millikan, L. C. Pauling.

Subcommittee on Program and Publicity: E. C. Watson, Chairman; A. H. Joy, Editor of General Program; B. M. Allen, H. D. Babcock, E. C. Barrett, E. T. Bell, J. P. Buwalda, Roy E. Campbell, R. L. Daugherty, Wm. Dunkerley, H. de Forest, M. R. Harrington, E. R. Hedrick, Harry H. Main, T. H. Morgan, W. B. Munro, Seeley G. Mudd, L. C. Pauling, G. Ross Robertson, A. H. Sturtevant, T. Wayland Vaughan.

Subcommittee on Excursions: R. W. Sorensen, chairman; B. M. Allen, E. G. Anderson, H. W. Clapp, Wm. Hertrich, H. de Forest, A. L. Klein, W. N. Lacey, Harry H. Main, R. R. Martel, F. G. Pease, F. L. Ransome, Raymond M. Selle.

Subcommittee on Exhibits: I. S. Bowen, Chairman; A. O. Beckmann, L. E. Bliss, S. B. Nicholson, Raymond M. Selle, R. W. Sorensen, Chester Stock, A. H. Sturtevant, R. M. Sutton, H. O. Wood.

Subcommittee on Local Service: R. L. Daugherty, Chairman; J. E. Bell, H. W. Clapp, Wm. Dunkerley, Harry H. Main, Sinclair Smith, W. R. Smythe, L. E. Wear.

Subcommittee on Meeting Places: L. C. Pauling, Chairman; S. J. Bates, H. Borsook, B. W. Howard, A. H. Joy, R. T. Knapp, S. S. Mackeown.

Subcommittee on Registration: R. O. Schad, Chairman, Harry H. Main, F. H. Seares, H. C. van Buskirk.

Subcommittee on Entertainment: Franklin Thomas,

Chairman; J. W. Du Mond, W. V. Houston, E. P. Hubble, Morgan Ward.

Ladies' Entertainment Committee: Mrs. R. A. Millikan, Chairman; Mrs. Walter S. Adams, Mrs. Harry Bateman, Mrs. Stuart J. Bates, Mrs. Leslie E. Bliss, Mrs. I. S. Bowen, Mrs. John P. Buwalda, Mrs. Roscoe G. Dickenson, Mrs. Jesse Du Mond, Mrs. Max Farrand, Mrs. George E. Hale, Mrs. F. W. Hinrichs, Jr., Mrs. E. P. Hubble, Mrs. William N. Lacey, Mrs. P. W. Merrill, Mrs. Thomas H. Morgan, Mrs. William B. Munro, Mrs. Linus C. Pauling, Mrs. Frederick L. Ransome, Mrs. Robert O. Schad, Mrs. R. W. Sorensen, Mrs. Chester Stock, Mrs. Franklin Thomas, Mrs. Richard C. Tolman, Mrs. Morgan Ward.

LOCAL REPRESENTATIVES FOR THE SECTIONS

Section A (Mathematics), E. R. Hedrick, University of California at Los Angeles.

Section B (Physics), E. C. Watson, California Institute of Technology.

Section C (Chemistry), G. Ross Robertson, University of California at Los Angeles.

Section D (Astronomy), S. B. Nicholson, Mount Wilson Observatory.

Section E (Geology and Geography), J. P. Buwalda, California Institute of Technology.

Section F (Zoological Sciences), B. M. Allen, University of California at Los Angeles.

Section G (Botanical Sciences), H. de Forest, University of Southern California.

Section H (Anthropology), M. R. Harrington, Southwest Museum.

Section I (Psychology), S. I. Franz, University of California at Los Angeles.

Section K (Social and Economic Sciences), W. B. Munro, California Institute of Technology.

Section L (Historical and Philological Sciences), W. B. Munro, California Institute of Technology.

Section M (Engineering), R. L. Daugherty, California Institute of Technology.

Section N (Medical Sciences), Seeley G. Mudd, California Institute of Technology.

Section O (Agriculture), W. P. Kelley, University of California at Riverside.

Section Q (Education), W. H. Hughes, Pasadena, California.

OFFICERS OF THE ASSOCIATION FOR THE CALENDAR YEAR 1931[1]

President, Franz Boas, Columbia University.

Retiring President, Thomas Hunt Morgan, California Institute of Technology.

Permanent Secretary, Charles F. Roos (1932).

General Secretary, Burton E. Livingston (1932), Johns Hopkins University.

Treasurer, John L. Wirt (1932), Carnegie Institution of Washington.

Secretary of the Council, Charles A. Shull, University of Chicago.

Executive Assistant, Sam Woodley.

Auditor, A. G. McCall, U. S. Department of Agriculture.

Director of the A. A. A. S. Press Service, Austin H. Clark, U. S. National Museum.

Director of Exhibition, H. S. Kimberly.

Members of the Executive Committee of the Council:

J. McKeen Cattell (1934), *Chairman;* Franz Boas (1931), *President of the Association;* Karl T. Compton (1933), Massachusetts Institute of Technology; David R. Curtiss (1931), Northwestern University; Joel H. Hildebrand (1931), University of California; Vernon Kellogg (1932), National Research Council; Burton E. Livingston (1932), *General Secretary*, Johns Hopkins University; Robert A. Millikan (1933), California Institute of Technology; Charles F. Roos (1932), *Permanent Secretary;* Henry B. Ward (1934), University of Illinois; Edwin B. Wilson (1932), Harvard School of Public Health.

[1] The number in parenthesis denotes the calendar year at the end of which the member's term of office is to expire.

The general local committee and its subcommittees have rendered invaluable service in working out plans and precedents for this first summer meeting of the new series and in caring for the innumerable details of arrangements that constitute the preliminary preparations for a great scientific meeting. As general chairman of the local committees, Dr. Paul W. Merrill, of the Mount Wilson Observatory, has given freely of his time and energy. He was ably assisted by Mr. Harold D. Babcock as secretary of the local committee, in coordinating and carrying out the work of the several subcommittees. Professor E. C. Watson, of the California Institute of Technology, devoted almost all of four months of his time as chairman of a General Program Committee whose object has been to synchronize, coordinate and enlarge the programs of the various societies and sections meeting with the association at Pasadena. As a result of the efforts of Professor Watson and his program committee many interesting symposia and joint sessions have developed. The council voted to ask the permanent secretary to find some one to do the same important service for the New Orleans meeting. The chairman of every subcommittee has worked faithfully and well and to all of them—Dr. Robert A. Millikan, Dr. I. S. Bowen, Dr. Linus C. Pauling, Professor Franklin Thomas, Professor R. L. Daugherty and Mr. R. O. Schad, and all their committeemen—are due the grateful and lasting thanks of the association.

The Pacific Division of the association, desiring to cooperate in every way to make this first summer meeting really national in character, withdrew the meeting which it regularly holds in June, and its officers and executive committee have given valuable assistance in planning and arranging the program. Dr. J. Murray Luck, secretary of the Pacific Divi-

sion, made most of the program arrangements with the associated societies, and prepared much of that material for both the preliminary and general program, as well as cooperated in many other ways.

Mr. A. H. Joy, of the Mount Wilson Observatory, in the absence of a permanent editor, took up the responsibility of the editing of the general program at a comparatively late date, and very generously gave several weeks of his time to this task.

GENERAL RECEPTION AND ENTERTAINMENT

Through the courtesy of the director and the trustees of the Huntington Library and Art Gallery a reception in the gardens of the Huntington estate officially opened the meeting on the afternoon of Monday, June 15. Dr. Max Farrand, director of research at the library, presided at the reception and welcomed the association in behalf of the host institutions. The chair was then taken by Dr. Thomas Hunt Morgan, the retiring president of the association, who introduced Dr. Franz Boas, the new president. Following a short response by Dr. Boas, the gardens, library and art galleries were opened to the members. Refreshments were served continuously in the palm garden amid the soft melodies of two harps.

The grounds of the Huntington estate comprise a little over two hundred acres and are largely devoted to a beautifully landscaped garden. Luxuriant tree ferns, cycads and palms give it a subtropical effect of unusual charm. Other special features are the cactus collections containing over 18,000 specimens and a Japanese garden.

Tea was served at the Athenaeum on the afternoons of Tuesday, Wednesday, Thursday and Friday, from 4:00 to 5:00 P.M. The members of the ladies' entertainment committee served admirably as hostesses at these delightful receptions.

EXCURSIONS

Interesting excursions were arranged for every afternoon to nearby places of special interest under the leadership of competent guides. On Tuesday afternoon four or five hundred members availed themselves of an opportunity to visit the Busch Gardens, which are not regularly open to visitors. A Spanish orchestra and singer entertained with Spanish melodies and songs during the luncheon served on the grounds.

About three hundred members took advantage of the Wednesday afternoon tour of Hollywood, Beverly Hills, the Beaches, Fox Film Studios and the University of California. This tour was complimentary to the visiting members by the Los Angeles Chamber of Commerce. An excellent box lunch was furnished delegates to eat on the bus.

The excursion to Mount Wilson on Wednesday afternoon for members of Section D and the Astronomical Society of the Pacific was taken advantage of by about 125 members who were given an opportunity to see the instruments of the observatory in operation.

On Thursday afternoon many members took the electric cars for Mount Lowe and lunched on top of the mountain. About twenty or thirty of these walked six miles over a mountain trail to Mount Wilson for dinner at six o'clock.

There was also a second group of eighteen excursions by arrangements. These included trips to the Huntington Library and Art Gallery, to Dr. Michelson's light equipment at Irving Ranch, to the San Gabriel Mission, founded in 1771, to the Chaparral and Conifer Forest of the mountains, to the Colorado Desert, and so forth.

A gasoline launch, the *Anton Dohm,* built for dredging and trawling operations, was graciously provided by the University of Southern California for those biologists who wished to take advantage of a marine dredging trip.

The fact that there was sufficient demand to hold every one except one (beginning at 3:00 A.M.) of the twenty-three excursions announced in the general program is a sure indication that Professor Sorensen and his excursion committee knew exactly what association delegates wished to see.

MEETINGS OF THE COUNCIL

The council of the association held three meetings in Pasadena. The first session was called to order at 9:04 A.M., Tuesday morning, with President Boas presiding. The following items of business were transacted:

(1) The executive committee reported to the council that the Society of Rheology and the Acoustical Society of America were affiliated with the association at the April meeting of the executive committee of the council. These societies have one representative each on the council.

(2) The American College Personnel Association and the American College of Dentists were associated with the association.

(3) The executive committee reported to the council that the Northwest Scientific Association was affiliated with the American Association for the Advancement of Science as an academy of science at the April meeting of the executive committee. No financial arrangements were made with the Northwest Scientific Association.

(4) The council voted approval of the application of the Midwestern Psychological Association for affiliation. The membership of this association is

322, of whom 63 are fellows of the American Association, and 61 members.

(5) The council voted that the general programs of the American Association for the Advancement of Science be edited by the permanent secretary's office.

(6) After extensive discussion of the problems connected with the publication of the general programs, the council voted that eight-point type should be used wherever it seemed desirable, in printing the general program of the New Orleans meeting.

(7) The council voted approval of the application of the Union of Biological Societies for a grant of $400 of the treasurer's funds for use in obtaining additional subscriptions for *Biological Abstracts*.

(8) The council adjourned at 9:56 A.M., to meet June 17 at 9:00 A.M.

SECOND SESSION

Wednesday, June 17, 1931

(1) The council was called to order at 9:03 A.M., with President Boas in the chair.

(2) The minutes of the first session of the council on June 16 were read and approved.

(3) The council approved the recommendation of the committee on foreign guests of the association that the 1933 meeting in connection with the Chicago World's Fair centennial celebration be held the last week in June.

(4) The council confirmed the action of the executive committee in selecting Syracuse for the 1932 summer meeting, and Atlantic City for the 1932 winter meeting. The date of the Syracuse meeting was fixed as the week beginning June 20, 1932.

(5) The council voted that it looks with favor upon holding the winter meeting of 1933 at Boston, the summer meeting of 1934 at San Francisco and the winter meeting of 1934 at Rochester.

(6) The council voted that the permanent secretary be instructed to submit annually a list of proposed meeting places, including those mentioned in the previous section of the minutes, to the secretaries of all affiliated societies and to all members of the council, for comment and suggestion to serve as a basis for selection of meeting places.

(7) The permanent secretary presented to the council a report of the local committee on finance for the Cleveland meeting. This was followed by a full discussion of the methods of financing the meetings of the association, after which the council voted that the arrangements for financing the New Orleans meeting be referred to the executive committee, with power to make such arrangements as they might deem wise.

(8) The council adjourned at 9:50 A.M., to meet at 9:00 A.M., June 18.

THIRD SESSION

Thursday, June 18, 1931

(1) The council was called to order at 9:05 A.M., with President Boas presiding.

(2) The minutes of the meeting on June 17 were read, amended and approved as amended.

(3) On recommendation of the executive committee, the council voted that the memorandum of the Societa Generale Italiana Di Ellettricita be referred to the American Physical Society, and that of the International Congress of Prehistoric Archeology be referred to the American Anthropological Association.

(4) On recommendation of the executive committee, the council voted that a committee, consisting of Dr. J. McK. Cattell and Dr. Burton E. Livingston, be asked to confer with Mr. Austin H. Clark concerning the directorship of the Press Service of the association.

(5) The council voted that a preregistration plan be tried for the New Orleans meeting in December, 1931, if arrangements for financing the plan could be made.

(6) A resolution expressing appreciation of the association to all committees and institutions whose cooperation contributed to the success of the Pasadena meeting was adopted.

(7) An informal discussion of plans for unifying and coordinating the meetings of sections and affiliated societies was held, and it was the consensus of opinion that the permanent secretary should consult with the secretaries of such societies, and take whatever steps seemed feasible to secure a unification of programs at the meetings.

(8) Dr. William B. Reid appeared before the council as the representative of Chancellor Charles W. Flint, of Syracuse University, and discussed the plans for the summer meeting at Syracuse in 1932.

(9) The council adjourned at 9:52 A.M., to meet at New Orleans in December, 1931.

THE SCIENTIFIC EXHIBITION

Many interesting scientific and research exhibits were opened to the general public. An actual demonstration of the utilization of light by the green plant to form oxygen and starch was shown. Since the pigments chlorophyll and the carotinoids of the leaf are the agents active in this light absorption, they were exhibited and their light-absorbing ability demonstrated.

On two different nights Mount Wilson Observatory was thrown open to the delegates and Dr. Hubble and others explained the operation of the 100-inch telescope and other instruments at the observatory. Delegates were allowed to use the 100-inch telescope

to see distant nebulae. An exhibit of photographs and diagrams illustrated and explained the methods used in determining the distance and distribution of nebulae, and showed the results which have been obtained in such explorations of space.

The California Institute of Technology and the Southwest Museum cooperated in exhibiting remains found in Gypsum Cave in Nevada. Materials of the ground sloth were especially noteworthy because of their remarkable preservation. The collection included skeletal remains with dried tendonal strands adhering to the external surfaces of the bones, claws with horny sheaths, hair, small bits of hide and dung. The circumstances of the finding of these remains and remains of man in Gypsum Cave are such as to suggest that man was contemporary with the sloth.

The Los Angeles Museum displayed some of the more striking fossil material removed from the Pleistocene asphalt deposits of the Rancho La Brea. This museum also exhibited some of the specimens found at Gila Valley, Arizona, in 1930–31. These latter specimens were obtained from a thirty-acre site one mile east of Casa Grande National Monument, upon which the expedition located and excavated three crematory areas, fifty houses, offertory area and several large trash mounds. The cremation-pit burials yielded a wealth of pottery, carved bone, stone and shell artifacts, indicating the existence of an early culture. Most interesting were the badly calcined bases of mirrors, the reflecting surfaces of which were mosaics of iron pyrite crystal fragments.

One of the most interesting of all the exhibits was a representative collection of living reptiles from the Southwestern states. The American Society of Ichthyologists and Herpetologists was responsible for this excellent exhibit.

Numerous other less spectacular exhibits were opened to the public. Special mention should be made of the exhibit of the Scripps Institution of Oceanography of the University of California, showing subsurface movements of the waters in the Gulf of Alaska, a cabinet of vials containing the relative amounts of the different more important constituents of sea water, and among other things an exhibit of apparatus used in the study of oxygen consumption of certain marine fishes. Those responsible for this exhibit were Doctors George F. McEwen, E. G. Moberg, Burt Richardson, W. E. Allen, N. A. Wells and F. B. Sumner.

Dr. R. A. Millikan exhibited electroscopes used in various phases of cosmic ray investigations. Dr. Sinclair Smith, of the Mount Wilson Observatory, showed some extremely sensitive energy measuring devices developed for the measurement of radiation from astronomical bodies. Dr. Hawley Cartwright demonstrated some extremely sensitive thermocouples. Maps and charts showing the various aspects of the Colorado River development, prepared with the aid of the Metropolitan Water District of Los Angeles, were also exhibited.

The association maintains a committee on the Science Research Exhibition, of which Dr. F. C. Brown, of the Museum of Science and Industry, New York City, is chairman, and Mr. Owen Cattell, of The Science Press, Grand Central Terminal, New York City, is secretary. This committee asked Dr. I. S. Bowen, of the California Institute of Technology, to act for it in securing and arranging exhibits for the Pasadena meeting. The association is grateful to Dr. Bowen for giving so much of his time in securing and arranging this large, excellent scientific exhibition.

GENERAL SESSIONS

The general sessions encourage the cultivation of the broader aspects of scientific thought and the interchange of ideas between the several groups of men and women of science. At Pasadena they were freely open to all who wished to attend, to the general public as well as to scientific workers, but seats were reserved for those who had registered.

The association was unusually fortunate this year in the arrangement of its general sessions, a very important task to which Dr. J. P. Buwalda, of the California Institute of Technology, and his committee on public addresses gave much attention. Dr. Robert A. Millikan was an important member of this committee and as a member of the executive committee of the association acted for it in issuing invitations to association speakers. Men of the highest scientific eminence presented these addresses in nontechnical language in such a way that they would be of maximum benefit to laymen and scientists in other fields of work. The following brief reports of these sessions are based on the general program and on notes made by the permanent secretary.

Dr. Franz Boas, the president of the association, gave the first of the evening lectures on Monday evening at the Greek Theater in Los Angeles. Dr. Thomas Hunt Morgan, the retiring president of the association, introduced Dr. Boas, who chose the subject "Race and Progress." Declaring his firm adherence to the theory that infusion of new blood in a race stimulates progress, Dr. Boas said: "The high nobility of all parts of Europe is of mixed origin, but it would be difficult to show that degeneracy has resulted from such interbreeding." He declared that America's melting pot is performing a great work for Caucasian civilization. "What is happening in America now is the repetition on a larger scale and in a shorter space of time of what happened

in Europe during the centuries when the peoples of northern Europe were not firmly attached to the soil." Dr. Boas' complete address may be found in SCIENCE for July 3, 1931.

On Tuesday evening Dr. H. D. Arnold, director of the Bell Telephone Laboratories, gave the second of the series of evening lectures at the Greek Theater. Dr. Arnold's address was an illustrated one on the subject, "Science Listens." Speech waves danced across a projection screen while the audience heard their counterparts through loud speakers. One of the most dramatic of Dr. Arnold's demonstrations was that in which the audience heard electrons in a solid iron bar turning over under the influence of a magnetic force. Dr. Arnold gave a companion demonstration in which he made it possible for the audience to hear noise-currents set up inside a wire. When the wire was heated the noise increased as the dance of the electrons was speeded up. Under the chill of liquid air the electrons slowed up and their noise was almost inaudible. This effect known as the Johnson effect is of great importance as it fixes a lower limit of sound currents which can be amplified without excessive noise interference.

Dr. Arthur L. Day, director of the Geophysical Laboratory of the Carnegie Institution, delivered the third of the lectures at the Greek Theater on the subject, "The Present Status of Seismology." According to Dr. Day, earthquakes are not chance phenomena and should not be regarded superstitiously. They are the results of definite causes which are gradually being recognized and understood. Although earthquakes occur everywhere over the earth's surface, they occur more frequently in "young areas" in which mountains are still growing. Dr. Day praised geological researches which are being done and said: "One of the recent discoveries is that the earth is made up of concentric shells. These shells are tens of hundreds of miles thick, and transmit earthquake waves differently and at different speeds." Nearly everything so far known about the earth's deep interior has been learned from studies of earthquake waves.

In the fourth of the evening lectures Dr. Charles A. Beard, noted historian, spoke on the subject, "Scientists and History." According to Dr. Beard, scientists' ideas, equipment and personality are the product of history. "The scientist himself is a product of history—congealed, so to speak." A single scientist may be indifferent to his environment, may refuse to consider the relation of his special work to society, but consciously or not he is influenced in his interests and his thinking by the society and climate of opinion in which he labors. Dr. Beard challenged scientists to remedy the present economic situation. He said: "Science has demonstrated that there is for practical purposes no limit to the possibilities of goods production, but millions are hungry. What has science to say? Is it possible that mankind has conquered the physical universe but cannot make wise and efficient use of its discoveries?"

Dr. Edward Hubble, of the Mount Wilson Observatory, and one of the world's foremost explorers of outer space, gave the fifth and concluding lecture at the Greek Theater on the subject, "The Realm of Nebulae." He declared that finding out what the physical universe is made of is one of the ultimate problems of science and modern astrophysics is leading nearer and nearer to a solution of the problem. In former days the available sample of the universe consisted first of a portion of the earth's surface, then of the sun and its family of planets, and later of a portion of the stellar system. The observable region at present is defined with the 100-inch reflector and hence that telescope has been used for a first survey of the region as a whole. Two very general characteristics have been determined. In the first place, as far as the telescope can reach, the distribution of the nebulae is approximately uniform. "The nebulae are scattered more or less at random at intervals averaging something over 1,500,000 light years." The second general characteristic is a strange relation between distance and certain displacements in the spectra of nebulae (red-shifts) which are sometimes interpreted as indicating velocities away from the earth. It is as though the universe were expanding from the earth as a center and the outer regions were expanding the more rapidly according to their distances. "The authorities are not yet agreed as to whether the red-shifts represent actual motion (as they clearly do on a very small scale for the stars in our own system) or some hitherto unrecognized effect whether physical or arising from the structure of space itself."

THE PRESS SERVICE

(By Austin H. Clark, director of the Press Service)

Thanks to the promptness with which the members of the association responded to the request for copies of the papers which they were to deliver, and to the excellent way in which the papers and abstracts were prepared, the amount of press notice given the Pasadena meeting was considerably in excess of what had been anticipated.

One copy of each of the papers was retained in Washington and the other was sent to Pasadena so that press representatives in both cities were able to use the same material at the same time.

Professor E. C. Watson, of the California Institute of Technology, was responsible for all press ar-

rangements and contacts at Pasadena, and the excellent and extensive notice accorded the meeting by the press was in no small measure the result of his conscientious and efficient work.

The association is again under deep obligation to Science Service for cordial and most unselfish cooperation. The staff of Science Service did everything possible to insure the success of the meeting from the press standpoint, even going so far as to volunteer assistance which it would have been quite unreasonable to have requested of them.

SCIENTIFIC SESSIONS

SECTION A (MATHEMATICS)

(Report from A. D. Michal)

Section A held two sessions for the reading of three invited papers. Attendance at the sessions averaged about fifty. Chairman E. R. Hedrick prefaced the reading of the papers in the morning session by calling the attention of those present to a tentative list of foreign mathematicians to be invited to give lectures at the Chicago, 1933, meeting of the A. A. A. S.

Professor Curtiss gave an indication of various diophantine problems treated by him in a paper published in the *Bulletin* of the American Mathematical Society in 1929. He pointed out some applications connected with the conformal mapping of a plane on a triangle and the covering of a plane with regular polygons and then went on to illustrate the method of exhaustions. Professor Curtiss commented on some unsolved problems and in particular on an asymptotic formula for the number of integer solutions of an algebraic equation with integer coefficients subject to auxiliary conditions.

Professor O. D. Kellogg, of Harvard University, gave the second paper of the morning session. He prefaced the main part of his talk with a historical introduction to the Dirichlet problem. He pointed out that it was not until 1913 that Zaremba showed that the Dirichlet problem with continuous boundary values is not possible for every region. After introducing the method of sequences, a generalization of Poincaré's balayage method, Professor Kellogg went on with the enunciation of an unsolved uniqueness problem, the solution of which is equivalent to showing that every bounded set of points of positive capacity contains a regular point. This point set theorem holds good in two dimensions and the question is whether it continues to hold in three dimensions. Dr. Kellogg discussed the capacities of Cantor sets and in conclusion raised the question whether the positive capacity of a point set is a topological property. On Tuesday afternoon, J. V. Uspensky, of Stanford University, spoke on integration in finite form. He gave an ordered account of some classical researches of Abel and Liouville on elliptic integrals. Professor Uspensky discussed some of the arithmetic problems that arise in connection with Weierstrass' practical solution of the problem of finite integration by throwing it into a transcendental form with elliptic functions. He spoke of the periodicity of triads of integers and referred to Tchebysheff's criterion of periodicity (1860). In conclusion Professor Uspensky mentioned Zolotareff's remarkable criterion involving algebraic numbers (1874) and pointed out that Zolotareff devised his theory of ideal numbers as a by-product.

SECTION B (PHYSICS) AND RELATED ORGANIZATIONS

(Report from Leo Loeb, J. A. Van den Akker and Floyd D. Young)

Section B met with its associated societies, the American Physical Society and the American Meteorological Society. Three very interesting symposia were arranged for the joint meeting with the American Physical Society. These proved to be the best attended and most valuable part of the meetings. The first symposium, on "The Physics of Crystals," was opened by Dr. F. Zwicky, who presented a paper on "The Secondary Structure of Crystals." Other papers were presented by Dr. P. W. Bridgman, Dr. C. J. Davisson and Dr. Alexander Goetz. Dr. Zwicky showed that the reasons which make for a secondary structure in crystals are of a very general nature, and that they even may provide a solution of the very fundamental problem: why do crystals exist (in contradistinction to amorphous solids, liquids and gases)? Dr. Bridgman reported he has found in his work with metal single crystals that in many cases the electric anisotropy in a crystal is not the same as the crystallographic anisotropy. The work of Davisson and Germer, G. P. Thomson and others has shown quite definitely that electron beams possess a wave nature. Electron beams, like x-rays, may now be used for the study of crystals, and, in certain cases, the method of electron diffraction may prove to be superior to that of x-rays. The surface conditions of crystals may be studied quite satisfactorily by electron diffraction, and, where electron beams of effective short wave-length are required, it is not necessary to go to high potentials. Dr. Davisson concluded his paper with a description of recent work carried out in his laboratory on electron diffraction from tungsten. Dr. Goetz and his associates have been searching in the past few years for evidence for a substructure in metal crystals. New methods for etching crystal surfaces were described, and very fine reproductions of microphotographs of etched surfaces were shown. It is now possible to etch with controlled potentials

and it is thus possible to locate and measure the potential hills and valleys normal to the etched crystal surface. The magnitudes of the potentials are functions of the degree of impurity in the bismuth single crystals. It was shown that the bismuth single crystal becomes *paramagnetic* in the direction of the principal axis under certain conditions of low temperature and composition.

Dr. W. F. G. Swann, who presided at these meetings, opened the second symposium, on "The Present Status of the Problem of Nuclear Structure," with a talk on a possible mode of solution of the general problem. Dr. Swann reviewed the difficulties encountered by the old electromagnetic theory in explaining the close packing of electric charges in the nucleus, and emphasized that the most significant relation which we should bear in mind is the simple one which states the equivalence of mass and energy. Dr. Swann showed that it may prove possible to explain the upward rise in Aston's mass defect curve by the coming together of electrons and protons. Professor R. H. Fowler, of Cambridge, England, reviewed the experimental knowledge of the nucleus and some of the theoretical work. Alpha particles apparently come from definite energy levels in the nucleus, since a study of the ranges of alpha particles in air reveals the important fact that only discrete ranges exist. On the other hand, there appears to be no evidence for the existence of electronic states in the nucleus, while one can find connections between the gamma-ray energy levels and the stationary states of alpha particles. In Bothe's experiment, which was mentioned, alpha particles were shot on to a very thin foil of aluminum, and it was found that the bombardment caused the ejection of H-rays on the emergent side of the foil. The absorption of an alpha particle accompanied by the ejection of a proton from a nucleus would mean a change in atomic weight of three, and thus it may prove possible to relate the isotopes of two elements by this type of transformation. Dr. W. Pauli, of Zurich, Switzerland, pointed out that the two chief difficulties in nuclear theory are the breakdown of the alternation rule and the existence of a continuous beta-ray spectrum. A number of elements such as nitrogen do not obey this rule. Dr. Pauli attempted to overcome this difficulty and at the same time provide for the possibility of a continuous beta-ray spectrum by the introduction of a third kind of particle called the neutron. If the neutron can be assumed to have a spin angular momentum of one half quantum, and a mass less than one one-hundredth the mass of a proton, all known experimental results can be explained. Dr. S. A. Goudsmit reviewed recent successes and failures of theories of hyperfine structure. The theory met with success at first, but recently cases have been met where it fails entirely to explain the fine structure. While the theory of hyperfine structure is at present in an unsettled state, there can be little doubt that future investigations in hyperfine structure will tell us a great deal about the nucleus. Professor W. M. Latimer applied the methods of the chemist to the problem of the nucleus. He has constructed very ingenious models (which resemble crystal models) of the nuclei of the lighter elements. While the modern tendency in atomic structure investigation is to avoid models or physical pictures, it was felt by the majority of those who attended this symposium that a model of the sort which Professor Latimer proposes for the nucleus may aid materially in the development of the proper kind of analysis.

The third symposium, on "The Production of High Energy Electrical Particles," was opened by Dr. W. D. Coolidge, of the General Electric Company, who discussed a number of practical details concerning x-ray tubes. From a practical point of view thorough degassing of the target and all metal parts is necessary, and it has been found that, in general, nitrogen is the most troublesome gas. Cold cathode effects limit the voltage at which a tube can be operated, and field currents to the glass walls of a tube cause fluorescence where, microscopic examination shows, tiny canals are cut into the surface of the glass. Thorough degassing reduces this destructive effect, while the use of hollow anodes cuts down the number of reflected electrons and offers x-ray protection. Dr. Coolidge described the new 900 kv x-ray tube which is in use at the Memorial Hospital, a new type of high tension induction coil for the operation of high voltage tubes, a new cascade transformer, and an oil immersion x-ray outfit. Dr. M. A. Tuve, of the Carnegie Institution, presented a paper in which he reviewed the work which he and his associates have done with oil-immersed x-ray tubes and Tesla coils. It will be recalled that Dr. Tuve and his associates, L. R. Hafstad and O. Dahl, received this year's association prize for their very fine work in this field. Using the J. J. Thomson parabola method, the velocities of the electrical particles produced in the high voltage vacuum tubes have been checked, and the x-rays have been compared with gamma-rays. By means of a Geiger-Mueller tube and absorbing screens, it has been possible to show that the absorption coefficient of the x-rays was about the same as that of the gamma-rays from radium. More recently a Wilson cloud-expansion chamber has been utilized in order that experiments on nuclear disintegration may be performed. The third paper in this symposium was presented by Professor E. O. Lawrence. The two methods for the production of high velocity

canal rays developed by Professor Lawrence and his associates, one for the production of high velocity heavy ions and the other for light ions, both involve resonance between the electric particle along its path and a high frequency oscillation. Mercury ions possessing 1,050,000 electron volts equivalent energy can be produced by only 35,000 volts applied at a frequency of 8,535 kilocycles. Electric and magnetic deflection tests have confirmed the velocities. These methods are particularly valuable because they can be used by investigators whose funds for research are "modest," and because relatively little space is necessary. Dr. C. C. Lauritsen spoke on "High Voltage X-Ray Tubes with Short Electron Path." The essential features of this type of tube are its short electron path (about 4 cm), its inner electrode which runs along practically the whole length of the tube, and its cylindrical sheaths which are coaxial with the inner electrode and are used to protect the glass walls of the tube from electron bombardment. The more recent tubes are equipped with filaments in both electrodes, a target in the upper electrode, and a hole covered with tin foil in the lower (external) electrode, in order that cathode rays may be brought out of the tube. These tubes are normally operated at 600 to 700 kv. The last paper in this symposium, by Dr. A. Brasch and Dr. F. Lange, was read by Dr. Alexander Goetz. Due to low funds, these men could not build high tension equipment on a large scale, so they climbed Monte Generose, where they established a small laboratory on a saddle between two peaks. There they harnessed lightning and drew eighteen meter sparks. Preliminary experiments gave them valuable clues to the solution of the problem of insulation. Breakdown seems to be due to gliding of charges on the surfaces of dielectrics. When the time of discharge in a tube is very short, of the order of 10^{-4} sec., the insulation need not be perfect, and the vacuum in a tube need not be particularly good. The tube which withstood the exceedingly short shocks most satisfactorily was built out of rings of paper, aluminum and rubber; the rings were not cemented together; the length of the tube was only 84 cm; and the tube was immersed in oil (oil of good quality was not necessary). The high voltage shocks were furnished by an ingenious system of condensers which were charged in parallel, then switched into series connection, producing voltages up to 2400 kv. (A new surge generator under construction will produce voltages up to seven million.) The source of electrons in their vacuum tube was not a filament, but a short porcelain tube of small bore, while protons were generated in a very fine jet of water which was forced into the tube by means of a steam boiler. The half-value thickness of the rays from the tube was found to be 8 mm in lead, while protons generated in a tube at 900 kv would penetrate 0.008 mm aluminum foil.

The last symposium was appropriately followed by one arranged by Section N (Medical Sciences), on "High Voltage X-Ray Tubes and Their Medical and Biological Possibilities," an account of which is given in the report for Section N. A number of the members of the Physical Society attended the Wednesday morning session of the Astronomical Society of the Pacific in cooperation with Section D, while some physicists attended the symposium arranged by Section E on "Major Problems of Modern Oceanographic Research."

On Friday evening, June 19, a joint dinner was held at the Huntington Hotel for physicists, astronomers and mathematicians. About one hundred guests attended and adjourned thereafter to attend the lecture by Dr. Hubble, an astronomer of the Mount Wilson Observatory.

The Pasadena meeting of the American Physical Society was unquestionably the most successful meeting ever held on the Pacific Coast and in the opinion of several prominent physicists was the most successful ever held in America. Attendance during the symposia was well above two hundred and the attendance at the regular meetings was above a hundred.

The 1931 meeting of the Pacific Coast Branch of the American Meteorological Society opened on the morning of June 17, with Major Edward H. Bowie, vice-president of the society, presiding. From the standpoint of attendance and the character of the papers presented the meeting was the most successful ever held by the Pacific Coast Branch. The character of air drainage and its influence on local temperatures at points with varying topographical surroundings was discussed by Mr. E. S. Ellison. He pointed out that "frost pockets" of relatively small area are colder than larger ones and gave advice on considerations to be kept in mind in locating an orchard to minimize the frost hazard. Dr. Seth B. Nicholson, in an address on the relation of weather to variations in solar activity, pointed out that while sun-spot cycles are fairly well understood, no method of predicting them exactly has yet been found. Curves have been developed by mathematical analysis which have coincided with past data almost exactly, yet failed utterly when projected into the future.

Mr. John L. Bacon, in a paper on the Boulder Canyon-Colorado River development, said that the enormous amount of concrete to be used in the construction of the Hoover Dam introduces problems in cooling never before encountered. Chemical changes which take place during the hardening of concrete

are accompanied by the release of heat. Owing to the unusual thickness of the dam, averaging 500 feet, approximately one hundred years would be required for normal cooling and contracting so that the contraction joints could be filled and the dam made monolithic and water tight. In order to take care of this problem the cooling of the dam will be hastened by the installation of a mechanical cooling plant, large enough to care for the needs of a city of approximately 200,000 people, and the circularization of brine through a network of pipes placed permanently in the concrete.

Dr. Carl L. Alsberg largely attributed the tendency toward alternating large and small wheat crops to weather conditions at the time the buds are formed. Mr. Floyd D. Young gave the results of studies to determine the effectiveness of wind-breaks in protecting orchards from wind damage. Mechanical injury to fruit is caused by strong winds, whatever their direction or moisture content, but foliage burn takes place only when the relative humidity is ten per cent. or less.

Dr. Charles C. Conroy gave an account of the methods he has used to extend the annual rainfall record at Los Angeles through the period from 1850 to 1877. Recent investigations on the structure of the stratosphere have caused a radical change of view. Observations of meteors, the spectra of the aurora polaris observed in layers of the atmosphere in the shadow of the earth and in sunlight, respectively, and observations of the passage of sound waves through the stratosphere indicate an increasing temperature beginning at a height between 30 and 40 kilometers, no change in composition up to a height of at least 150 kilometers, no hydrogen at any height, a slowly decreasing amount of oxygen at heights of several hundred kilometers, and probably a small amount of helium, water vapor and neon at very great heights, with nitrogen predominating at all heights.

SECTION C (CHEMISTRY) AND RELATED ORGANIZATIONS

(Report from Mark Walker and Linus Pauling)

Section C met with its affiliated society, the American Chemical Society, Pacific Intersectional Division, for the reading of sixty-one papers, including those given at joint symposia with Sections B, E and F and Sections F and G. All meetings were well attended and discussion was lively. In the symposium, "Quantum Mechanics and the Chemical Bond," the scientists who have contributed most to the subject were present. Dr. W. Heitler, of Göttingen, showed that the quantum mechanics leads to the result that in general the normal electronic state of a molecule is not accurately represented by a single electronic formula of the Lewis type, but corresponds instead to a combination of two or more. Often one of these Lewis formulas alone is a very good approximation to the normal state. Professors Slater and Pauling discussed the latest developments in the theory of directed valence bonds. The theoretical treatment for a simplified model of the water molecule was carried through by Professor Slater, who showed that the stable configuration has an angle of about 90° between the two valence bonds. Professor Pauling gave a simple method for predicting the angles expected between valence bonds in complex ions and molecules, leading to a theory of the tetrahedral carbon atom and of square, octahedral and prismatic complexes of the transition elements. A number of chemists and physicists, including Professors N. V. Sidgwick, W. Pauli, Frenckel, S. A. Goudsmit, and E. H. Kennard, participated in the discussion.

In the symposium on "Reaction Mechanism," Professor W. C. Bray gave an interesting review of the large amount of work which has been done on oxygen reactions, pointing out the surprising action of certain reducing agents in being rapidly oxidized by oxygen of the air only when some other oxidizing agent is also present. This phenomenon was discovered and carefully investigated seventy-five years ago; despite continued investigation it has not yet been given a satisfactory explanation. A recent careful study of such an induced oxidation was then reported by Dr. J. B. Ramsey. Papers on other phases of the symposium subject were presented by Professors D. M. Yost and H. C. Ramsperger.

The symposium on "Photosynthesis and photochemistry," with Sections F and G, was opened by the introductory reviews of Dr. H. H. Strain and Dr. J. H. C. Smith. Many new experimental results regarding photosynthetic processes of purple bacteria were reported by Dr. C. B. Van Niel, Dr. F. M. Muller, and Dr. Hans Gaffron, and their suggested interpretations were keenly discussed. Dr. F. S. Brackett reported results obtained by a new and accurate quantitative method of measuring phototropism. The photochemical papers presented in the afternoon session covered a wide field and provoked much interest and general discussion.

The Friday morning session devoted to unrelated papers on unrelated subjects was perhaps of the greatest interest to the non-specialist attendants. Papers were given by J. B. Ramsey, J. B. Watson, Adolf Kunz, J. R. Lewis, F. Seegmiller, G. R. Robertson and others.

SECTION D (ASTRONOMY)

(Report from Philip Fox)

The astronomical activities may be divided into three classes: The sessions of invited papers at-

tended jointly by Sections B and D and affiliated societies; the usual program of volunteer papers, and inspections of exhibits, observatories and other installations.

The first of the joint sessions, a symposium on "The Present Status of the Problem of Nuclear Structure," is reported under Section B. The second dealt with some large aspects of astronomy in papers on "The Internal Structure of Stars," by R. H. Fowler; "Composite Polytropic Gas Spheres," by H. N. Russell; "Space Absorption," by F. H. Seares; "Relativistic Thermodynamics and Problem of Entropy of the Universe as a Whole," by R. C. Tolman; and the "Distribution of Extra-Galactic Nebulae," by Edwin Hubble. These papers emphasized forcibly the changing nature of concepts of the astronomer. He sets up models to satisfy the observed phenomena of stellar radiation, the transition through spectral types and at the same time, a comprehensive model which provides an expanding universe which will not "run down." In the paper on "The Contour of Emission Bands in the Spectra of Novae and Wolf-Rayet Stars," Beals finds good agreement between observed contours and theoretical curves calculated on the basis of continuous emission from the surfaces of the stars. Seares' investigations of star clusters, extra-galactic nebulae, and obscuring clouds indicate extensive absorption in the Milky Way and high transparency elsewhere. The absorption coefficient has large local variations, probably dependent on both direction and distance from the sun. Current mean values of the coefficient lead to an improbable space density of stars except in the direction of the center of the system. Plaskett and Pearce have dealt with the motions of diffuse gaseous matter in the galaxy in two ways. Using the radial velocities of the diffuse matter indicated by the calcium H and K lines in the spectra of 313 stars of O and B types, they find solar motion identical with that from the naked-eye stars and the direction of the galactic center to be in longitude 331°. Pearce, in discussing the "Remarkable Stellar System HD 698," finds it of extraordinary mass, the components being respectively 134 and 50 times the sun's mass. Further, he finds the interstellar K line in the primary, though its spectrum is B9. This is the first star with spectrum later than B5, in which this line has been observed. One may conclude that this interstellar line is present in all spectral types, requiring only that the star be sufficiently remote for the requisite absorption and if stellar calcium be present, that there be high stellar velocity to resolve the fixed calcium line. Hubble's paper, based on long exposure photographs well scattered and aggregating about two per cent. of the sky, indicated random distribution with a few definite nebular clusters. Carpenter, who is conducting a somewhat similar survey, reported on "A Cluster of Extra-Galactic Nebulae in Cancer." He detected about sixty members: the distance was calculated at 40,000,000 light years. Hubble, who found it independently, noted 150 members, with distance about thirty per cent. smaller. From the uniformity of structure shown by the distribution of nebulae in seven clusters of nebulae, Carpenter concludes that they are built on a general cosmic plan. In the field of stellar spectroscopy Harper compared the Victoria radial velocities with other extensive series. The negative value of difference may be ascribed to difference in the systems of wavelengths employed or perhaps in part to a possible small error in curvature correction.

Nicholson, van Maanen and Willis outlined a method for determining the mass of Neptune's satellite, comparing the object with Mars, the Moon, the satellites of Jupiter and Titan. The masses of those objects and their sizes are known, their magnitudes at Neptune's distance easily found, their albedoes probably bracket that of Neptune's satellite and therefore an approximation to its mass is ascertainable.

Lampland has continued his fine series of photographic observations of Pluto. The comparison of the 1930–31 observations with the orbit of Bower and Whipple shows excellent agreement. The final paper to be noted is that of Bower on the orbit and mass of Pluto. The orbit includes the separate actions of the four major planets. As noted above, it fits available observations closely. A final correction may be made if a possible prediscovery position of 1903 becomes available. The mass of Pluto might be determined from its gravitational action on Uranus and Neptune, from its magnitude with assumption of albedo, from diameter and assumed density. All lead to small values, ranging from eleven times that of the earth to not greater than that of the earth. The smaller figure seems more likely.

SECTION E (GEOLOGY AND GEOGRAPHY) AND RELATED ORGANIZATIONS

(Reports from J. P. Buwalda, C. H. Danforth, and Perry Byerly)

On Wednesday morning Section E held a joint symposium with Sections B, C and F on "Major Problems of Modern Oceanographic Research" with Dr. T. Wayland Vaughan, Scripps Institution of Oceanography, Dr. Thomas G. Thompson, University of Washington, E. G. Moberg, Scripps Institution of Oceanography, P. S. Galtsoff, U. S. Bureau of Fisheries, Washington, D. C., and Dr. W. H. Twenhofel, University of Wisconsin, as the speakers.

On Thursday morning Section E joined with the

Seismological Society of America and Section M (Engineering) in a Seismology-Engineering Symposium, an account of which is given in the report for Section M. On the same morning other members of Section E joined with Section H (Anthropology) in the symposium, "The Antiquity of Man." Among other contributions to the discussion, a paper by Philip S. Smith emphasized the close relations between Alaska and Northeast Asia. The relatively shallow platform between the two continents shows many features diagnostic of submergence, and it is quite possible that there have been repeated periods of continuity between Asia and North America. In the Pleistocene, when the northern United States and Canada were ice-bound, Alaska had a genial climate with abundant vegetation, and this region might well have proved attractive to man and other animals. At no subsequent time has the passage between the two continents offered a serious barrier to man. Dr. Boas, president of the association, stressed the probability that man in America was of North Asiatic origin. There is a remote similarity in the languages of America and of Siberia, but within the Americas such diversity that several thousand years would seem necessary for differentiations. It is still uncertain whether there was one main migration followed by subsequent differentiations in America, or successive waves of previously evolved types. Either one implies a long period of time, but whether this extends back as far as the last glaciation is largely a geological problem. A further account of this symposium will be found in the report for Section H (Anthropology).

The Seismological Society of America held three sessions on the morning and afternoon of Wednesday, June 17, and the morning of Thursday, June 18.

The morning session on Wednesday was devoted to general seismic problems, including papers on possible tidal causes of earthquakes, the structure of the earth and depth of focus. In the afternoon new types of seismometers were discussed.

On Wednesday evening most of the members attended the lecture given by Dr. Arthur L. Day.

On Thursday evening many of the members attended the meeting of the Branner Club in Los Angeles.

SECTION F (ZOOLOGICAL SCIENCES) AND RELATED ORGANIZATIONS

(Reports from B. M. Allen and H. A. Scullen)

Section F devoted four mornings to symposia. On June 15 it joined with Section G in a symposium on "Genetic Problems." F. B. Sumner gave conclusions drawn from his outstanding studies on the subspecies of *Peromyscus,* to the effect that the numerous features of these local types are not necessarily correlated with environmental conditions. R. E. Clausen strongly urged the importance of hybridization in the origin of species. T. Dobzhansky showed that crossing over is less frequent in cases where there had been a rearrangement or inversion of chromosome parts than in cases where the chromosomes have the normal makeup. H. B. Frost gave an account of "Trisomic Inheritance of Red and Double in *Matthiola incana.*"

On June 16 Section F joined with the American Association of Economic Entomologists in a symposium upon "The Biology of Termites and Scale Insects." A motion picture film of a termite colony formed a very illuminating feature of this meeting. Six papers dealt with the termite investigations being carried on by S. F. Light and his students at the University of California. Other papers presented the studies on scale insects being carried on at the Citrus Experiment Station of the University of California. H. J. Quayle showed that certain strains of scale insects have recently developed a marked resistance to cyanide control measures which had previously been successful.

An account of the joint symposium with Sections B, C and E on "Major Problems of Modern Oceanographic Research" is given in the report for Section E (Geology and Geography). Likewise an account of the symposium with Sections C (Chemistry) and G (Botany) on "Photosynthesis and Photochemistry" is given in the report for Section C.

The attendance at the 1931 meeting of the Pacific Slope Branch of the American Association of Economic Entomologists was the largest in the history of the organization, nearly 200 entomologists and their friends being in attendance. Many of the papers presented had a bearing on citrus insects. The mealybugs and the scale insects attacking citrus trees received most attention in this connection. Harry S. Smith and F. R. Cole presented papers on the biological control of the mealybugs. C. H. Martin presented the results of constant temperature studies on the *Citrophilus* mealybug. Biological control, which has played so important a part in insect control work in California, came in for considerable discussion. Several interesting miscellaneous papers were presented. Otto W. Swezy gave a paper on "Some Recent Parasites Introduced into Hawaii." Don C. Mote, Howard Stearns and R. E. Dimick presented a series of three papers relating to the introduction of parasites in the control of the European earwig at Portland, Oregon. Another group of papers gave the results of studies which have been made with chemical controls. E. R. de Ong, Ralph H. Smith and Warren G. Marshall spoke on oil sprays. Harold

R. Hagan and W. M. Hoskins presented papers on vacuum fumigation.

The Entomologists elected the following officers for the coming year: *President,* G. M. List; *Vice-President,* A. M. Boyze, and *Secretary-Treasurer,* H. A. Scullen.

The American Society of Parasitologists and the Society of American Bacteriologists arranged a joint program. Their meetings opened with a joint session with the California State Veterinary Medical Association on Wednesday morning. Infections and diseases of animals received special attention at this meeting, which is reported under Section N. Miscellaneous papers were presented at the Thursday morning session.

The American Society of Ichthyologists and Herpetologists, Western Division, held a session for miscellaneous papers on Tuesday afternoon. Papers were presented by George S. Myers, Rolf Bolin, Berry Campbell, J. O. Snyder, L. M. Klauber, W. L. Scofield and Frances N. Clark. In connection with the meeting there was exhibited a collection of living reptiles of the Southwest.

SECTION G (BOTANICAL SCIENCES) AND RELATED ORGANIZATIONS

(*Reports from L. R. Abrams and B. A. Rudolph*)

For botanists the general meetings of the association began most auspiciously with the opening reception at the Huntington Library and Art Gallery. (See "General Reception.") For the most part Section G met jointly with its associated societies, but two joint symposia with other sections were held. On Monday morning Section G joined with Section F (Zoological Sciences) in a symposium on "Genetic Problems," an account of which is given under the report for Section F. Thursday morning and afternoon Section G joined with Section C (Chemistry) and the American Chemical Society in a symposium on "Photosynthesis and Photochemistry." An account of this symposium is given under the report for Section C. Well over one hundred delegates attended each of these symposia.

On Friday a symposium on botanic gardens was held at the Rancho Santa Ana Botanic Garden, in which all the societies associated with Section G participated. Mrs. Susanna Bixby Bryant, founder of the garden, opened the symposium with a short address of welcome. W. T. Swingle spoke on botanic gardens and their significance to biological research; D. H. Campbell, on foreign botanic gardens, and H. J. Webber, on the need of botanic gardens on the Pacific Coast. After the symposium the 165 attending members were guests of Mrs. Bryant at a delightful barbecue luncheon.

The Botanical Society held a meeting Tuesday morning, the Plant Physiologists Wednesday, and the two societies combined in a joint meeting Thursday. The program for the meetings was planned with the cooperation of the American Society of Plant Physiologists. Twenty-four papers were presented at the meetings in addition to those given at the symposium. The dinner for the botanists was held on Thursday evening and about 70 attended. G. J. Peirce, vice-president of the Physiological Section, presided. W. T. Swingle, H. de Forest and President C. J. Chamberlain gave short addresses. Officers for the Pacific Division of the society elected for the ensuing year are: *Chairman,* G. B. Rigg, University of Washington; *secretary,* F. D. Heald, Washington State College.

Thirty-five members were present and twelve papers were presented at the fifteenth annual meeting of the Pacific Division of the American Phytopathological Society. L. J. Klotz and H. S. Fawcett reported a disease of date palms due to *Thielaviopsis sp.* and referred to as "black scorch." It is of considerable economic importance in California, Arizona and North Africa, where the crop at times is greatly reduced by it. M. B. Linford demonstrated that the "yellow-spot" disease of pineapples is of virus origin, and that *Thrips tabaci* Lind. is a vector. Both larvae and adults may transmit the disease, but adults can not become infective unless they have fed on diseased plants during their larval stage. *Emilia sagittata* (Vahl.) DC., a weed, also harbors the virus. Linford also found that "streak," a virus disease of canners' peas (*Pisum sativum* L.) could be produced artificially by permitting infective thrips (*T. tabaci* Lind.) from infected *Emilia sagittata* to feed on healthy peas. M. Shapovalov showed that healthy tomato plants may be infected with the "yellows" virus by grafting them to infected plants by the approach method. The percentage of graft transmitted cases of the disease was merely equal to that of cases induced by direct insect transmission. W. W. Mackie and K. Esau have found a number of fixed resistant hybrids in both pink and white beans as the result of a cross between Robust, a white pea resistant to mosaic, and California Pink, which is resistant to the virus which produces curly-top in beets. Mackie also reported a new disease of maize and beans due to *Rhizoctonia bataticola* (Taub.) Butler, which brings about a premature ripening and wilt as well as a reduction in the size of the plant and seed. J. H. Crenshaw and J. S. Cooley, in their studies of perennial canker, investigated the possible relationship between fertilizer treatment and freezing injury in apple orchards. Injuries due to freezing are known to favor the disease. No posi-

tive correlation between fertilized treatment and freezing injury was noted. C. E. Scott and G. L. Stout have succeeded in infecting leaves of almond, apricot, cherry, nectarine, peach, plum and prune in petri dishes by dusting them with the aeciospores of *Tranzschelia punctata* from anemone plants growing near San Jose, California. The aecial stage has never been reported before in the literature as occurring on the Pacific Coast. J. S. Cooley and E. V. Shear have found that there exists a definite correlation between the severity of the infection of the perennial apple canker disease and winter precipitation only in areas where the temperature is sufficiently low. Winter injured callus tissue is the main seat of infection, and the presence of woolly aphis on callus tissue renders it more susceptible to winter injury. Harold E. Thomas reported experiments which would indicate the susceptibility of the strawberry to *Verticillium* hadromycosis. The disease usually stunts the plants and may kill them. Thomas also has found injection of copper sulphate, acetate or chloride to be very effective in the control of exanthema of deciduous fruit trees. The amount of salt required varies considerably under various conditions. Copper tartrate, phosphate and carbonate failed to give satisfactory results. G. H. Godfrey and J. Oliveira showed with excellent slides and photographs the life cycle of *Heterodera radicicola* in the roots of pineapple and cowpea. The life cycle of this nematode is much longer in pineapple roots.

ORGANIZATIONS RELATED TO BOTH SECTIONS F AND G

(Reports from B. M. Allen and H. de Forest)

Meetings for the reading of papers were held on June 19 and 20 jointly by Section F and the Western Society of Naturalists. J. H. Wiedemann pointed out that animals which feed upon sterile food, as for instance *Hirudo medicinalis,* have a portion of their alimentary tract specialized as a culture chamber for bacteria which aid in the breaking up of food. This structure is absent in those forms which ingest bacteria that perform this function. J. R. Slonaker showed that optimum weight, spontaneous activity, fertility, length of productive span and length of life of rats is attained by 14 per cent. protein diet, lower and higher percentages being far less favorable. F. B. Sumner found that the well-known loss of melanin pigment in the skin of fishes in darkness and increase of pigment in light is due to corresponding changes in the amount of pigment and the number of pigment cells. Apparent expansion and contraction of pigment cells was found to be due to diffusion or concentration of melanin granules within the cell.

The Western Society of Naturalists met jointly with the Ecological Society of America on Saturday morning. G. H. Abbott pointed out that the alternative to the theory of evolution does not necessarily involve a theological controversy—that, in other words, it is possible to conceive of the spontaneous separate origin of diverse forms of life. C. A. Bothamley and F. M. Baldwin gave quantitative determinations of the intensity of ultra-violet light in the sunshine of southern California at different elevations from sea level to 5,000 feet. They demonstrated that the intensity varies directly with the altitude and inversely with the humidity. A. L. Herrera, of Mexico City, presented two papers upon the production by methylic nitrated sulfoaldehyde of forms simulating living forms.

The Ecological Society of America met on Wednesday and Thursday with an attendance varying from fifty to seventy-five. On Tuesday a number of entomological papers were given by Hawaiian members. On Thursday morning an informal discussion was held on "Ecological Problems of the Pacific Coast Region." Communications from B. E. Livingston, Frederic E. Clements and William S. Cooper were read at this meeting.

The various field trips arranged by the Ecological Society proved an enjoyable adjunct of the meeting. The Mount Lowe-Mount Wilson trip filled a special train and a sufficient number braved the high temperatures of the Colorado Desert of California to necessitate an automobile bus and several cars. The excursion to the Rancho Santa Ana Botanic Garden, with the barbecue luncheon so courteously provided by the owner, Mrs. Susanna Bixby Bryant, proved a delightful event. On Friday evening the Ecological Society, the Western Society of Naturalists and Section F held a dinner at the Hotel Constance in Pasadena.

SECTION H (ANTHROPOLOGY) AND RELATED ORGANIZATIONS

(Report from C. H. Danforth)

Section H, meeting jointly with the Pacific Division of the American Anthropological Association, held sessions from Tuesday to Saturday, inclusive, with an average attendance of about 80. On Thursday and Friday there was a joint symposium in which members of Section E participated. All meetings were under the auspices of the Southwest Museum, where a dinner for attending anthropologists was held on Friday.

The symposium, and many of the contributed papers, centered on the question of early man in America. It may be said that on the whole the prevailing view would seem to be that there is no convincing evidence for great antiquity of man on this

continent. That man was contemporaneous here with certain mammalian species now extinct was rather generally admitted, but with a disposition to attribute this association not so much to the early appearance of man as to the recent disappearance of some of the lost mammals. For example, the Rancho la Brea deposits are considered by some as much more modern than formerly supposed. In Shelter Cave the dung of extinct mammals has been reported to contain remains of plants identified with those of the present local fauna. Various evidence of this sort supports the view that there is little indication that man was present in America earlier than the beginning of the Modern Period or the end of the late Pleistocene.

A trenchant survey of the Pleistocene fauna with reference to early man in America was presented by A. S. Romer, who discussed mammalian sequences and entered into a brief analysis of the views of Cope, Osborne and Hay. Evidence was presented to show that many of the forms which were supposed to have become extinct in the early Pleistocene were still present in late Pleistocene, if not actually in the present era. What disturbing feature caused the sudden extinction of many of these forms at a relatively late date is unknown. There is a remote possibility that the appearance of man may have contributed to this end. As yet there is no evidence that man was on this continent earlier than the end of the Wisconsin glaciation and beginning of modern time. Chester Stock dealt more specifically with the vertebrate series in the southwest, emphasizing the relatively recent date of Rancho la Brea and other deposits. He placed the Gypsum Cave finds at a period between Upper Pleistocene and Lower Recent. Douglas Johnson commented on the difficulties geologists as well as anthropologists encounter in dating formations and called attention to various sources of error. He agreed with the preceding speakers that finds involving human remains and artifacts are all relatively recent—at most, less than ten to twenty thousand years. A further account of this symposium is given under the report for Section E.

Especially interesting accounts of the discoveries and progressive investigations in the Gypsum Caves and Folsom region were presented by M. R. Harrington and Barnum Brown. The former called attention, among other matters of interest, to some painted darts which probably are the oldest examples of the decorative art from this continent.

Other papers dealt with early man in Southern California and in Texas, burial mounds in Oregon, pottery and changing cultures in Northwestern United States, and cultural links between North and Central America. H. B. Alexander spoke on the sense of antiquity in Indian mythology. Cultural traits found along the West Coast were discussed by E. M. Loeb. J. H. Seward and Albert B. Reagan dealt with the archeology of Utah. In an extended study of pictographs the latter found evidence of early Basket Maker and Pueblo cultures which were superseded on the invasion of an aggressive Head Hunting group. Later superimposed drawings suggest that the invaders were akin to Indians found in the region by white men.

SECTION I (PSYCHOLOGY) AND RELATED ORGANIZATIONS

(Reports from John E. Anderson, Wayne L. Morse, and Robert H. Seashore)

Section I held no sessions of its own since it was the judgment of individuals on the coast that the Pasadena meeting was too close in time to the Oregon meeting of the Western Psychological Association to warrant holding a session. Members of Section I met with the Social Science Research Council, Pacific Regional Committee. Of particular interest to psychologists were the round table discussions on "Law Enforcement and the Prevention of Crime" and "The Description and Measurement of Personality Traits."

Approximately ninety persons attended the round table on "Law Enforcement and the Prevention of Crime." Discussions during the round table session for the most part centered around the contributions of psychology to scientific explanations of criminal behavior, the contributions and values of the several crime surveys, the investigation of American penal methodology as compared with English and Continental, and legal aspects of criminology. It was emphasized that, to date, psychology has taught us very little about the forces which produce so-called criminal conduct and that much research remains to be done in the field of abnormal psychology. It was urged that social scientists, especially sociologists and psychologists, have much to do in the way of studying scientifically the many complex problems connected with penal treatment. Specific suggestions, such as more liberal parole and probation systems, industrialization of prisons and the elimination of the punitive theory in the treatment of criminals, were discussed. It was very clear that those in attendance were not in agreement as to these issues.

The discussions at the round table on "The Description and Measurement of Personality Traits" were opened by brief reports and suggestions from Dr. E. R. Guthrie, Dr. R. H. Seashore, Dr. H. C. Conrad, Dr. Kate Gordon and Dr. H. Merrill. The sampling of behavior was suggested as the principal approach for measurement and description of individual differences. Advantages cited were the direct empirical basis of

description and the practical value as shown in basing credit ratings, for instance, upon a report of the individual's previous conduct of his financial affairs. Descriptions of "inner" personality as inferred from behavior were considered open to criticism and less verifiable. Fallacies underlying loose terminology in this relatively new field include especially terms such as "general abilities" and "capacities" where experimental evidence indicates a high degree of specificity of different activities.

Difficulties underlying physiological interpretations of observed behavior were illustrated by recent experiments on sensory and motor activities in which hypothetical constants of nerve and muscle speeds did not seem warranted. The bearings of these findings upon verbal tests were also considered.

Practical aspects of individual differences should include the improvement of training methods and the adaptation of tools and working conditions to the individual as well as personnel methods which now receive the major emphasis. The stability of individual differences need not imply a hereditary basis although it is an evidence of their practical importance.

SECTION K (SOCIAL AND ECONOMIC SCIENCES) AND RELATED ORGANIZATIONS

(Reports from C. F. Roos, E. B. Price, Erna Gunther, H. E. Erdman, E. G. Mears, E. B. Price, H. F. Angus, C. L. Alsberg and John Parke Young)

Section K met with the Pacific Coast Regional Committee of the Social Science Research Council in its first conference held on the Pacific Coast. The joint committee responsible for the excellent well-balanced program consisted of Dr. William B. Munro, *chairman,* Dr. F. J. Teggart, Dr. C. L. Alsberg, Dr. E. S. Bogardus, Dr. T. H. Boggs, Dr. H. S. Grady, Dr. A. B. Hall, Dr. J. P. Harris and Dr. G. S. Watkins. The membership of the conference was selected with considerable care, particularly in the matter of leaders of round tables, to include those actively engaged, or having an effective interest in actual research in the social sciences. Two morning sessions were given over to round tables, attendance at which was by invitation only.

Gathered at the round table conference on "Quantitative Methods in the Social Sciences" were representatives from economics, agricultural economics, engineering, political science and anthropology. Dr. Tolley stressed the fact that a wider knowledge of mathematics was essential to the social scientist who would use quantitative methods. Dr. Titus called attention to the great gap at present between some of the conclusions in the social sciences and the practical applications of these conclusions. In perfecting a highly involved technique for the solution of problems that concern modern life are we losing sight of ways and means to apply that newly gained knowledge for the benefit of our society? Dr. Charles A. Beard pointed out that even the engineer can profit immensely by exact data that the social scientists can furnish. Exact and quantitative methods can often be used to check conclusions subjectively derived, and through such a check to establish greater faith in the subjective method which must be used more frequently. The conclusions reached were that quantitative methods may aid in accurate thinking but they should not be regarded as substitutes for it.

At the round table on "American Foreign Policy and Foreign Trade" the chairman, Dr. Eliot G. Mears, outlined the main trends in American foreign trade in the calendar year 1930 contrasted with 1929. Exports suffered a decline of 19 per cent. in quantity and 27 per cent. in value, while imports dropped 15 per cent. in quantity and 30 per cent. in value, thus reflecting clearly the world-wide depression aggravated by a greatly depressed price level. Of important buyers of American goods only Soviet Russia made heavier purchases in 1930 than in 1929, advancing from sixteenth to eighth place among export customers. The rapid growth since 1920 of the number of American industrial plants established abroad was actuated by both public and private economy resulting from increased nationalism everywhere reflected in governmental barriers and domestic sentiment against foreign-made goods. The strong pressure exerted in each country by private interests favored local production and local markets.

At the round table on "Problems of Urban-Rural Relationships" it was pointed out that a number of problems arise out of the flow of population from farm to city. There appears in the offing a substantial body of farmers who may have to revert to a self-sufficient type of agriculture because they lack ability or capital to adopt modern methods. Decentralization of industry may offer many of these industrial jobs. Good roads about all industrial centers tend to induce many industrial workers to devote part of their time to small-scale agricultural pursuits in suburban regions. Another group of problems arises out of taxation and spending for such purposes as schools and roads in sparsely settled sections. In the case of roads the urban residents are often more interested than the rural residents. Agencies for the solution of urban-rural problems have not developed. It would be better for existing urban and rural agencies to work together rather than to suggest additional agencies.

Another phase of sociology received attention at the round table on "Immigration Problems on the Pacific Coast Mexican, Filipino and Second Generation Japanese." Professor E. A. Ross spoke of the general aspects of the immigration problem. He argued that the falling death rate due to scientific advances in Asiatic countries would give rise to a rapid expansion of their population, which would in turn tend to lower the standard of living. He contended that the greatest service which the United States could render to humanity would consist in maintaining its high standards of individual welfare by whatever exclusion might be necessary, and thereby force the Asiatic countries to reduce the pressure of population by birth control.

The session on "The Problem of Tax Reform," was opened by Dr. Milbank Johnson, but the chair was soon taken by Mr. R. A. Vandergrift. Discussion began with agreement that the general burden of taxation was becoming unduly heavy, largely because the costs of government administration were going up, but largely also because in much of the country there have been too heavy permanent investments, such as roads, schoolhouses, etc. This led to a discussion concerning the need for more direct taxation, so as to bring the tax burden home to each individual. The earmarking of tax money, as in the gasoline tax, for a specific purpose was criticized and defended. In that connection, the taxation of motorbus and truck lines was touched upon.

Other round tables of particular interest to members of Section K were held on the subjects: "Prevention of Business Depressions" and "Social Sciences in Relation to Legal Education." Still other round tables are described in the reports for Section I (Psychology) and Section L (Historical Sciences).

At the first noon luncheon meeting, the speaker was Dr. Charles A. Beard, President Arnold Bennett Hall, of the University of Oregon, presiding. One of the most interesting of all the meetings was the second luncheon meeting at which a symposium on "The Relation of the Natural and Social Sciences" was held. The speakers on this occasion were Dr. E. A. Ross, Dr. A. Goldenweiser and Dr. C. L. Alsberg.

A feature of the second afternoon was a general meeting of those attending the conferences, where it was decided to continue the conference another year and to entrust to the Pacific Coast Regional Committee of the Social Science Research Council the task of preparing a program for the next meeting, drawing up a provisional constitution and selecting officers and members. This meeting was followed by a reception given by Professor and Mrs. William Munro in Dabney Hall Gardens.

SECTION L (HISTORICAL AND PHILOLOGICAL SCIENCES) AND RELATED ORGANIZATIONS

(Reports from D. E. Clark, John C. Parish, R. G. Gettell and H. B. Alexander)

Section L met jointly with the Pacific Coast Regional Committee of the Social Science Research Council as did Sections K and I. Attendance at sessions was by invitation and all sessions were crowded.

Professor R. G. Cleland, of Occidental College, presided at the round table discussion on "Geographic Factors in Pacific Coast History." The other participants whose names appeared on the program were Professor J. M. Vincent, of Johns Hopkins University, Dr. G. M. McBride, of the University of California at Los Angeles, and Professor D. E. Clark, of the University of Oregon. It was pointed out that the discovery of rich gold fields and the harbor facilities of San Francisco aided materially in the development of California. Special note was made of the fact that Southern California is one of the best illustrations of man's conquest of geographical handicaps such as isolation, aridity and lack of ready-made harbors. The determining influence of the Columbia River in the Pacific Northwest in early exploration, fur trade and settlement was pointed out, as were also the differences in development caused by geographic conditions east and west of the Cascade mountains. A point of some interest was the fact that natural boundaries have been ignored in the location of political boundaries in the region known as the Inland Empire.

At the round table on "The Conservation of Historical Materials on the Pacific Coast" it was said that the greatest conservation need is cooperation. The libraries of the coast are highly developed as an instrumentality for the conservation of books and pamphlets, but much progress can be made by agreements under which selective buying in special fields may be carried on so as to avoid unnecessary duplication especially with reference to expensive sets and sources. To preserve newspapers there should first be made a wise selection of files and these housed in repositories which can give adequate physical care and general availability. There should be a calendar giving the location and general description of the various files which have been preserved. Historical museum materials are of great value, but it is obvious that cooperative discussion and study of the principles involved and the purposes to be achieved would result in a much more adequate fulfilment of the function of such illustrative material.

Chief attention at the round table on "The Formation of Public Opinion and the Reorganization of Political Parties" was given to the nature of the party system, especially in the United States, to the

functions performed by parties, the issues upon which they are based and the possibilities of reorganization and improvement. It was said that the present party alignment makes it impossible to get an expression of public opinion on any single issue because of the cross-currents and cleavages in the present parties. The majority of those present were doubtful of the desirability and possibility of forming an effective third party, but believed that progress could be made in improving the organization and methods of existing parties. The causes of the political indifference of many intelligent people were said to be the difficulties of the long ballot and of numerous referendums.

After opening the conference on "The Philosophic Implications of Recent Advances in the Natural Sciences" the chairman, Professor H. B. Alexander, of Scripps College, called upon Professor A. Goldenweiser to begin the discussion.

Professor Goldenweiser stressed the fact that certain philosophical concepts defining the general nature of structure are receiving significant demonstration in the very effort of physical science to define its phenomena. The concepts upon which he dwelt were level, system and pattern, and he indicated the analogues for each of these which the science of physics has been compelled to assume in its discriminations of the atomic levels, the subatomic and the more recent efforts to describe the stellar universe in the concepts of relativity. On each of these levels he pointed out that distinct and valid systems emerge. The Newtonian system for example being unaffected by more recent discoveries when taken on its own level, while at the same time there are remarkable conformities in the general pattern of these systems. Professor Joseph Mayer, of Tufts College, dwelt upon the great interest to philosophy which issues from the importance given to the function of the observer in recent theories, qualifying that of course he understood by the observer merely one of the elements of description and not at all an external agent. He also laid stress upon the fact that physical method is in the last analysis statistical and by nature is therefore unable to give any final detailing of fact. Professor Hugh Miller, of the University of California at Los Angeles, felt that the epistemological problems of philosophy had not been essentially advanced by the new order of physical concepts, while Professor T. G. Soares, of the California Institute, pointed out that the doctrine of values had been already introduced by the other speakers in their concession of the concept of importance as governing all scientific methodology. The conference was closed by Charles S. Beard who, raising the question, "What is Philosophy?" expressed the opinion that all philosophy is an especial if somewhat adventitious flourish of the historical consciousness.

SECTION M (ENGINEERING)

(Report from R. L. Daugherty)

Section M held three sessions at Pasadena. On Thursday morning it joined with Section E (Geology and Geography) in a seismology engineering symposium. Progress in the recording of strong earthquake motions was reported by N. H. Heck, who stated that the greatest development along this line has been made in Japan. Mr. S. B. Morris, chief engineer of the Pasadena Water Department, told what his department has done to offset possible effects of earthquakes on the dam in San Gabriel Canyon. Dr. R. R. Martel gave a technical address devoted to the development of equations necessary for the solution of certain problems of static stresses in connection with buildings designed to withstand earthquakes. Other papers were given by Perry Byerly, Walter T. Steilberg, J. A. Anderson, J. P. Buwalda and Bailey Willis.

The symposium on the Colorado River dam and aqueduct was opened by Ruth E. Baugh who gave a comprehensive review of Los Angeles' efforts to obtain an adequate water supply. E. F. Scattergood, of Los Angeles, continued with an address on the economic significance of the Boulder Canyon project power. He predicted that within ten years after the completion of the Hoover Dam California's property and industrial wealth will have multiplied seven times. W. S. Peterson, also of Los Angeles, told of transmission problems that would have to be faced in the Colorado River project. Julian Hinds outlined engineering studies for the aqueduct.

On Friday morning Maurice Holland, director of the division of engineering and industrial research of the National Research Council, gave an address, "Industrial Research—A Gilt-edge Security." He declared that in the highly competitive struggle for industrial supremacy the march of science, discovery and invention has so speeded up the advance of technology that a laboratory discovery may mean the creation of a new industry, or expansion of one and losses for another. Stress was laid on the fact that large industries must keep ahead or abreast of the scientific trend or be lost, and that research has become one of the major securities of the permanence of an organization.

SECTION N (MEDICAL SCIENCES) AND RELATED ORGANIZATIONS

(Reports from S. G. Mudd, John F. Kessel and T. D. Beckwith)

For the most part Section N met with its associated societies, the Society of American Bacteriologists, the American Society of Parasitologists and the Society for Experimental Biology and Medicine. By invitation the California Veterinary Medical Association

met with Section N. On Thursday forenoon Section N attended the symposium arranged by Section B (Physics) on "The Production of High Energy Electrical Particles." The following morning the program consisted of a symposium with Section B on "High Voltage X-ray Tubes and Their Medical and Biological Possibilities." Dr. Curtis F. Burnam reviewed the present situation concerning ray treatment of malignancies and commented on what might be hoped for with high voltage methods. Of unusual interest and importance was the report of Dr. Arthur Desjardins, of Mayo Clinic, who discussed the radio-sensitiveness of cells and tissues. Papers of clinical value were read by Dr. R. R. Newell, Dr. Harry Ullmann and Dr. Henry Schmitz. Preliminary data on depth dose measurements of very hard x-rays were presented by John Blackburn. The differential biological effects produced by x-rays and gamma-rays were reported by P. S. Henshaw. The papers were discussed by Dr. Robert A. Millikan.

The Society of American Bacteriologists and the American Society of Parasitologists arranged joint programs for the Pasadena meeting. Two morning meetings, 9:00 to 12:15, were devoted to papers and discussions at which nineteen titles were presented. One session was held as a joint meeting with the California State Veterinary Medical Association, at which time papers of special interest to animal diseases were given.

Among the papers given were two motion picture studies; one by Karl F. Meyer, describing the recent epidemic of horses in the San Joaquin Valley caused by a filterable virus; the other a "Motion Picture Study of Amoebiasis," by John V. Barrow. A paper by J. Traum, Department of Veterinary Science, University of California, on "Studies Bearing on the Modes and Sources of Brucella Infections in Man and Animals," with a discussion by R. V. Stone, of the Los Angeles Public Health Department, was of special significance.

Two papers on coccidial infections were given, one by Dora P. Henry, of the University of California, and one by R. L. Rutherford, of the University of Southern California. Protozoology was further represented by E. W. Dennis, who presented a number of new facts concerning the life cycle of *Babesia bigemina;* by Charles A. Kofoid and Ethel McNeil "On the Nature and Structure of the Wall of the Cysts of Amoebae of the Human Digestive Tract," and by A. J. Salle on "Studies on the Metabolism of Leishmania." A paper of special importance in California was one by Dorothy Beck on "Epidemiological Studies with Coccidoides." "The Incidence of *Streptococcus epidemicus* in Southern California" was discussed by C. W. Bonynge. Lyman L. Daines reported a study on "The Bacteriology of Skin Lesions in Tuberculin-reacting Cattle," in which the isolation of a pleomorphic organism, similar to the actinomycete isolated by Walker from cases of leprosy, was recorded. An outbreak of infectious myxomatosis in rabbits in Southern California, the first outside of Brazil, together with immunological studies on myxomatosis, was reported by John F. Kessel and Roy T. Fisk. T. D. Beckwith discussed the rôle of bacteria in the reduction of sulphur compounds in the paper and pulp industry. Two papers of immunological interest were by W. H. Manwaring, on "Post-Ehrlich Immunology," and by R. W. Lamson, on "Typhoid Agglutinins in Man Following Vaccine Injections."

The sessions of the Society for Experimental Biology and Medicine, held in connection with the summer meeting of the American Association for the Advancement of Science at Pasadena, were characterized by programs of high order. Attendance was both large and enthusiastic. The society convened for two sessions and for these there were offered thirty papers, presented mainly by members residing upon the Pacific Coast. The fields covered by the various essayists included the different branches of science within the scope of the society. Ten might be classed as physiology, fourteen were biochemical and pharmacologic and six dealt with matters of bacteriology and viruses.

SECTION O (AGRICULTURE)

(Report from E. E. Thomas)

Members of Section O of the association attended the sessions of the Western Society of Soil Science, which held its annual meeting on June 15, 16 and 17. The sessions were well attended, with representatives from all the Western states and from Hawaii. With twenty papers on the program it was necessary to hold four sessions in order to allow time for discussion. One whole session was devoted to a discussion of phosphorus, especially with reference to methods of determining small amounts in soil and the availability of phosphate in different soil types.

Officers elected for the coming year are: *President,* S. C. Vandecaveye; *Vice-president,* Willard Gardner; *Secretary-treasurer,* E. E. Thomas, Citrus Experiment Station, Riverside, Calif.

SECTION Q (EDUCATION)

(Report from W. L. Uhl)

Section Q held three sessions for the reading of papers on Monday and Tuesday. Dr. Edna W. Bailey reported upon the value of the objective study of children in the training of prospective teachers. A program of such study has been in operation for several years at the University of California. The

psychology of sharing among preschool children was presented, together with experimental data by Richard C. Currier. Mr. Currier presented the scores made by young children when they face situations in which desired objects may or may not be shared according to the inclinations of the children. Frank K. Foster presented evidence which indicated that differences in methods may produce greater differences in the effectiveness of learning than differences in subject-matter. The data dealt with a controlled experiment in which pupils memorized English-nonsense combinations both with and without pictures. Learning without pictures was slightly more effective than with pictures. C. C. Crawford set up criteria for the evaluation of training students for research work. Ernest W. Tiegs presented the results of his investigation of teachers' attitudes toward scientific method. In spite of the fact that many of the teachers had been trained in courses dealing with scientific method, nearly half of them assumed traditional attitudes toward the educational problems with which they were confronted. The relation between problems of cerebral dominance and speaking and reading defects was presented with experimental data by Milton Metfessel. The application of nomograms to problems in educational statistics was described by Raymond C. Perry, who presented numerous slides which showed the use of the nomograms that he has developed. M. E. Broom presented a paper on the relation of general information and mental ability to silent reading at the college level. His data indicate that although information is very important in case of the upper half of the readers, still greater differences among the entire group of readers were found to be due to differences in intelligence. Three papers were presented upon the general problem of scholastic marks in secondary schools and the reliability of such marks as bases for predicting scholastic success. W. H. Hughes presented data which showed closer agreement among the personal attitudes which teachers ascribed to their pupils than among the academic grades achieved by the same pupils. W. L. Uhl presented closely related data which have been found under the general direction of August Dvorak. These data enable one to employ regression coefficients in the predicting of college success. By using these coefficients upon students of high-school grades the amount of error is reduced about 50 per cent. as compared with the error when raw grades are used. John W. Harbeson presented a large amount of similar corroborative data drawn from high-school and junior college studies which he has made. Charles C. Weidemann presented the results of the study of a scoring key for true-false and indeterminate examinations in the history of education. Instructors in this subject were asked to pass judgments upon the truth or falsity or doubtful character of 160 statements in the history of education. By obtaining judgments upon a point scale some of the objections to the use of true-false examinations seem to have been obviated. The present status of elementary business training in the public junior high schools of the United States was presented by Benjamin R. Haynes. One of the chief points in his findings is that many of the commercial subjects are moving upward rapidly into the senior high school. Grace M. Fernald gave the results of special remedial reading technique. She included demonstrations of her varied procedures by having two non-reading pupils perform before the group. Betty Trier Berry presented somewhat closely related data upon the improvement of reading at the college freshman level. The practical application of methods of recording the observations of classroom instruction was presented by means of charts and tables by John Waage, who has modified the Morrison and Barr technique so that he can use this technique in his own supervisory activities.

OBITUARY

EDWARD HART, 1854–1931

DR. EDWARD HART, professor emeritus of chemistry of Lafayette College and member of the faculty since 1874, died at his home on Saturday, June 6, in his seventy-seventh year. He is survived by his wife and seven children.

Dr. Hart was born in Doylestown, Pennsylvania, and studied law for two years, after which he went to Dr. Thomas M. Drown in Philadelphia to study chemistry. They came to Lafayette together in 1874, the young Hart ranking as assistant. During 1876 and 1877 he was at Johns Hopkins University with a fellowship under Dr. Remsen and he is believed to have been the first one to receive the Ph.D. degree from that institution.

Dr. Hart published numerous papers and he took out many patents, particularly for his nitric acid condenser and ceresine bottle for hydrofluoric acid, for the latter of which he was awarded the John Scott Medal. He became editor of the *Journal of Analytical Chemistry* in 1882, one of the first journals in America devoted exclusively to chemistry. Later, in 1892, he was appointed editor of the *Journal of the American Chemical Society* and it was decided to merge the two journals. Dr. Hart had already started a printing establishment in 1887