

seen America who has not visited one or more of the caverns in the Shenandoah Valley. Until recently the only caverns that were accessible to the public were the celebrated Luray Caverns, in Page County, and Weyer's Caves, in northern Augusta County, near Grottoes. However, within twelve months, the Endless Caverns, near New Market, in Shenandoah County, have been opened, and on May 31 another cavern near Mount Jackson, also in Shenandoah County, made its first bid for public favor.

The latest-opened caves have been named Shenandoah Caverns. They are about three miles south of Mount Jackson and two miles west of the Valley Pike, with which they are connected by a macadamized road. The visitor descends into these caverns by a concrete stairway and soon sees the first stalactites, which appear as stout daggers of crystallized lime carbonate, hanging like icicles from points where surface water drips from the limestone roof. At the foot of the stairs is the spacious anteroom to a long chain of high-vaulted chambers connected by narrow passageways, forming in general plan a gigantic letter S, all illuminated by cleverly concealed lights. Attractive natural decorations are found in every room. Here the side walls are covered by fluted veneer done in crystal stucco, there in graceful drapery hang creamy lambrequins in ruddy-tinted stripes. From place to place, singly or in groups, are pendent stalactites and uprising stalagmites—the first inverted narrow cones fed by trickling films of lime-bearing water; the second pillars or columns fed by spattering drops of the water. In one room midway down the chain the show piece is a narrow 30-foot cascade of white glittering crystal flanked by twin falls of pale translucent ocher. At the base and to the rear of this diamond cascade, visible by peering between slender columns of oriental alabaster, is the "Fairy's Secret," a tiny pool illuminated in due season by animated torches, presumably carried by a brood of phosphorescent larvæ of some insect, perhaps a small fly that is commonly present in such caverns. At the end of the developed portion of the cavern a chamber of high vaulted roof suddenly gives

place to a low-ceiled room containing a lakelet in which are mirrored a multitude of delicate stalactites—a pool of a thousand crystal pendants.

According to A. C. Spencer, of the United States Geological Survey, the caverns of the Shenandoah Valley are far more numerous than the casual visitor would be likely to imagine. The rocks in which the broad trench-like valley has been excavated by water are mainly limestone, and wherever these rocks occur the existence of caverns is indicated by two unfailing signs—the presence of innumerable water sinks and the absence of brooks tributary to the rather regularly spaced creeks. The brookless tracts receive a due share of rainfall and must obviously contribute water to maintain the flow of the creeks and rivers, but their contributions are not delivered by way of the surface drains, but through underground channels that supply copious springs in the deep valleys. The sinks are rude funnels, by means of which surface waters are diverted to the subterranean waterways.

The development of extensive underground waterways in limestone formations like those of the Shenandoah Valley hinges upon the two geologic facts that large masses of rock are always cut by joints and that limestone is dissolved by rainwater, which always contains more or less carbon dioxide. Surface water entering fissures, joint cracks and bedding planes attacks the limestone walls and thus by a process of etching converts close fractures and joints into relatively open crevices. As this process of solution goes on lateral connections will be made from crevice to crevice, and the downward etching of the linked openings will be halted only when the subsurface water channels have become closely adjusted to the water table controlled by surface streams. Thus it is that the caverns of the Shenandoah Valley are formed.

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### THE SALT LAKE CITY MEETING

THE sixth annual meeting of the Pacific Division, American Association for the Advancement of Science, held at Salt Lake City, June 22 to 24, 1922, in conjunction with a summer session of the national association, was

perhaps the most successful meeting since the organization of the division and, in the opinion of those who attended at least, thoroughly justified the policy of the Executive Committee, maintained in the face of some opposition, to hold the annual meetings in rotation in widely separated centers of population throughout the Pacific Coast region.

While Salt Lake City is somewhat isolated geographically with respect to the major portion of the membership of the division, and its inaccessibility prevented the attendance of many who would have attended a meeting in a coastal city, nevertheless the number in attendance exceeded the expectations of the committee and comprehended a very good representation of the active scientists of the Pacific Coast. Besides, owing to the cooperation of the National Association which called a summer session at the same time and place, many distinguished men attended from the middle west and eastern points.

The general sessions and the meetings of the affiliated societies were accommodated at the University of Utah, which is beautifully located in the eastern part of Salt Lake City on a plateau commanding a view of the great valley which is geologically famous as Ancient Lake Bonneville.

Eleven affiliated societies united with the Pacific Division in holding meetings upon this occasion as follows:

- The American Physical Society.
- American Meteorological Society.
- American Phythopathological Society, Pacific Division.
- Ecological Society of America.
- Pacific Coast Entomological Society.
- Pacific Slope Branch, American Association of Economic Entomologists.
- Pacific Division, Physiological Section, Botanical Society of America.
- Seismological Society of America.
- The Society of American Foresters.
- Utah Academy of Sciences.
- Western Society of Naturalists.

Sessions of extraordinary interest were reported in each case and many significant papers were presented which it is hoped will find publication in the various technical journals if not in the organs of the association.

In addition to the regular meetings of the affiliated societies there was a meeting of the agronomists and soil experts which resolved itself into an "Alkali Congress" in which the experience in reclaiming alkali soils in various sections of the west was presented with great mutual benefit. It was determined to organize a permanent association which would affiliate with the Pacific Division and hold regular meetings in future.

The general sessions of the Pacific Division were well attended and of more than usual interest. Dr. John A. Widtsoe addressed the Research Conference, speaking on "The research problems of the Great Basin."

The address of the retiring president, Dr. Barton Warren Evermann, on "The conservation and proper utilization of our natural resources," provoked a warm eulogium from President George Thomas, of the University of Utah, and from Dr. L. O. Howard. A pleasant feature of this session, which came as a surprise to the recipients no less than to the audience, was the conferring of the degree of doctor of laws upon Dr. Barton Warren Evermann, president of the Pacific Division and director of the Museum of the California Academy of Sciences, and Dr. James Harvey Robinson, associate of the New School for Social Research of New York City. With impressive ceremony the degrees were conferred by President George Thomas, of the University of Utah, who stated that the honor had been conferred but six times previously in the history of the university.

Of peculiar interest and significance at this time was the session devoted to the symposium on "The Problems of the Colorado River." The great reclamation project, which contemplates the utilization of the waters of the Colorado River for power and irrigation, involves the more or less conflicting rights of seven states. The thorough discussion of the scientific phases of this subject was of absorbing interest, and will prove to be a direct contribution to the furthering of the project. The papers presented in this symposium will doubtless be published in *SCIENCE*.

A notable feature of the convention was the address by Dr. James Harvey Robinson, which appeared in a recent number of *SCIENCE*.

Announcement was made of the election of Dr. E. C. Franklin, professor of chemistry, Stanford University, as president of the Pacific Division for the ensuing year.

A resolution was unanimously adopted expressing appreciation and gratitude to the University of Utah, the Brigham Young University, the Utah Academy of Sciences and the Utah Agricultural College, who acted as hosts to the convention. The great success of the meeting was largely due to their very efficient handling of the arrangements.

Dr. Robert G. Aitken, astronomer of Lick Observatory, was elected a member of the Executive Committee in place of Dr. W. W. Campbell, whose term expired.

The thoughtful hospitality which marked the reception and entertainment of visiting members reached its climax on the last day of the convention, when automobiles and lunches were provided and the visitors who had previously designated their choice of several all-day excursions were conveyed under the guidance of scientific experts to points of interest in this famous region of geological records and scenic wonders.

An organ recital in the Mormon Tabernacle and a dip in Great Salt Lake in the cool of the evening brought the final day of the convention to a close.

There was a total registration of about 400, of which 110 were members of the association.

The publicity afforded through the local press of Salt Lake City was very gratifying. Each year there is apparent a wider general interest in the proceedings of the annual meeting which promises well for its future usefulness.

W. W. SARGEANT

## SCIENTIFIC EVENTS

### THE INTERNATIONAL RESEARCH COUNCIL

IN an article in *Nature* it is stated that a meeting of the International Research Council was held at Brussels on July 25 and the four succeeding days, under the presidency of M. E. Picard, secretary of the Académie des Sciences, Paris. Twenty countries have now joined the International Research Council, the

following seventeen being represented at the meeting: Belgium, Canada, Denmark, France, Great Britain, Greece, Holland, Italy, Japan, Norway, Poland, Portugal, Spain, Sweden, Switzerland, United States of America, and Czecho-Slovakia.

The greater part of the business of the meeting was concerned with the organization of international scientific unions additional to the five for Astronomy, Geodesy and Geophysics, Chemistry, Mathematics, and Scientific Radio-Telegraphy, which are already in activity. As a result of the meeting the formation of unions for Pure and Applied Physics and for Geography is said to be assured. The proposed union in Geology awaits the consideration of the Geological Congress, and some advance has been made in connection with the biological sciences.

At a previous meeting of the International Research Council it had been provisionally agreed to unite medical and biological sciences; this decision did not find favor, and the intention now is to separate medicine from physiology, zoology and botany. Proposals will be submitted to the countries belonging to the Research Council, and the ultimate formation of this union will depend on the number of countries willing to join.

Among other matters dealt with, a proposal submitted by the National Research Council of the United States and accepted by the meeting may prove to be an important addition to the responsibilities of the Research Council, which hitherto contented itself with the formation of unions which became practically autonomous as soon as their statutes were approved. As problems in which several unions were concerned ran a danger of being neglected, the proposal was now made by the United States that the Research Council itself should take such problems under its own special protection. Three inquiries were mentioned as likely to fall within this category. One of them had already been considered by the International Astronomical Union, which requested the Research Council to make arrangements for a collaboration of several of the unions in the study of the correlations between solar and terrestrial phenomena. The second referred to the