share the same fate, but every physics laboratory has facilities for testing it.[1]

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THE BACTERIAL LIGHT ORGAN OF CERATIAS

PIERANTONI[1] and Zirpolo[2] were the first to describe living bacteria as the normal source of light in the luminous organ of an organism, *Sepiola,* a squid. Basing their opinion on this, they have attempted to show that such bacteria are the source of light, not only in this squid, where the bacteria are found in the open lumen of the gland, but also in many other luminous organs where the objects supposed to be bacteria are those hitherto identified as secreted granules of luciferin that operate *in situ* in the cells that formed them or in the lumen of the gland or after being ejected from the gland.

While the writer agrees that the bacterial origin of the light has been fairly well proven in the case of *Sepiola,* he does not agree with the idea that the light granules in these other forms are bacteria, but is convinced that they are secreted granules of luciferin formed by the specific light cells of the organ.

Harvey[3] in studying the luminous organ of the fish *Katablephron* describes the content of this gland as a mass of luminous bacteria and although he was unable to cultivate them the case seems to be pretty well established. Y. Yasaki[4] has made a more detailed study of the light organ on the tip of the lower jaw of the fish *Monocentris japonicus* and has proved more definitely that the light is produced by living bacteria harbored by this gland. Recently, Harms[5] has described the remarkable case of an East Indian fish *Equula,* which has developed a light organ from the epithelium of the esophagus. Here again the light seems to take its origin from bacteria that live in masses in the lumen of the gland. Full weight is given to this discovery by Harms' ability to demonstrate the bacteria as constituting the major bulk of the content of the gland.

The writer has been studying the open gland found on the tip of the anterior dorsal fin ray of a species of *Ceratias,* and again it seems certain that the light from this organ is produced by bacteria which fill a large portion of its lumen. Owing to the rarity of this fish and the difficulties under which it must always be secured (it is a deep sea form captured dead by the dredge or tow net) it has been impossible to study the organ in any natural condition. But the bacteria have been seen and its agreement in structure with the bacterial light organs of the other four forms seems to identify its function with theirs.

This organ on the fin ray of *Ceratias* is evidently an ectodermal invagination whose fundus consists of several thousand acini arranged in the form of a hollow sphere and discharging inward through their ducts into a central chamber. From this chamber the contents of the gland pass distally through an aperture in the spherical line of glands into a second and more distal chamber and from this latter again into a third chamber from which a small duct leads to the exterior. A second small duct also leads out from the second chamber and opens to the exterior, close to the other duct, on the distal and anterior surface of the total organ.

The entire organ, as has been described by Brauer, is quite globular in shape and is invested, as is the rest of the body, with a deeply black, pigmented layer which would shut in all light produced internally except near the distal extremity where a circular zone is wanting in pigment altogether. In life this "illuminating zone" must be quite transparent and the only surface of the organ from which light rays could emerge.

[1] Since the above article was in the hands of the publishers I have modified the experiment in a still more striking and conclusive manner. A quadrant electrometer has one diagonal pair of quadrants removed and the metallic needle suspension connected to the remaining pair. The instrument thus becomes a very sensitive electroscope which, when charged, will give a rotation of the needle. The system thus formed is insulated upon amber supports inside a brass case which is inside of and connected with an earthed wire cage. Set up in this way, after being discharged to the inside of the wire cage, with no battery or artificial charge near it, and doubly protected from outside induction, the needle undergoes a double deflection each day, due to a negative charge on the instrument in the day time and a positive charge on it at night. The deflections are not due to temperature, barometric variations or changes in illumination. Their magnitude has been greater than is caused by charging the instrument to 150 volts. They seem to be due to a positive charge on the day side of the earth and a negative charge on the night side, which charges can not be shared with the insulated instrument.

[1] Pierantoni, U., "Gli organi simbiotici e la luminescenza batterica dei Cefalopode," Pub. Staz. Zool., Napoli, Vol. 20, p. 105, Tav. 6–8, 1917.

[2] Zirpolo, G., "I batteri Fotogeni degli organi luminose de *Sepiola intermedia* Naef.," 1918.

[3] Harvey, E. N., "The Production of Light by the Fishes *Photoblephron* and *Anomalops,*" Pub. No. 313, Carnegie Inst. of Washington, pp. 43–60.

[4] Yasaki, Y., "On the Nature of the Luminescence of the Knightfish, *Monocentris japonicus* (Houttum)," *Journ. of Exper. Zool.,* Vol. 50, No. 3, April, 1928.

[5] Harms, J. W., "Bau und Entwicklung eines Eigenartigen Leuchtorgans bei *Equula spec.,*" *Zeit. f. Wiss. Zool.,* Vol. 131, first part, 1928.

Thus we have a third kind of fish and a fourth organism in which this interesting method of light production is evident, but important work remains to be done on one or more of them. The kinds of bacteria used, the nature of the gland secretion and its effects on the bacteria, whether the organ was originally auto-luminous and the possibility that the secretion is still a luciferin or not and many other interesting questions remain to be solved. The writer has more extensive studies on this organ in progress.

ULRIC DAHLGREN

THE AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE

THE SOUTHWESTERN DIVISION

THE ninth annual meeting of the Southwestern Division of the American Association for the Advancement of Science was held at Flagstaff, Arizona, from April 23 to 26, inclusive. The meeting opened with a general session in the auditorium of the Northern Arizona Teachers College. As both the president and vice-president of the division were unavoidably absent, Dr. O. C. Lester, a member of the executive committee, was selected as acting chairman for the meeting. American Forest Week was properly observed by a program presented at the first noon-day symposium, at which time short interesting and instructive talks were made by Mr. F. C. W. Pooler, district forester of the Southwestern District of the United States Forest Service, and by two other members of the Forest Service, Mr. Quincy Randles and Mr. Herman Krauch. A general dinner on Monday evening was followed by a lecture on the Boyce Thompson Southwestern Arboretum by the director, Mr. F. J. Crider. The talk was illustrated with three reels of motion pictures, showing the vegetation in the vicinity of the arboretum and the work being carried on there. Tuesday evening a picnic supper near Sunset Peak, an old volcanic crater, was followed by an open house at the Lowell Observatory. Here the members had an opportunity of viewing the moon through the large telescope and to examine many celestial photographs. On Wednesday noon at a luncheon symposium the future of the Southwestern Division and ways and means of securing new members were discussed. Wednesday evening, Mr. E. C. La Rue, who was for many years with the U. S. Geological Survey, studying the Colorado River, gave an illustrated talk on "The Colorado River and the Possible Damsites."

On Thursday, an excursion to Tuba City under the leadership of Dr. H. S. Colton was enjoyed by many members of the division. The features of the excursion were the various geological formations, dinosaur tracks, the Painted Desert, the Moencopi Pueblo, ancient Indian ruins and a wide variety of vegetation.

The biological sciences section program had twenty-nine titles listed. Wednesday afternoon the members of the section visited the Southwestern Forest Experiment Station near Flagstaff, where the silvicultural and grazing research work underway was shown and explained by members of the staff. One session each was devoted to plant pathology and forestry, and two to general biological papers. The physical sciences section had an exceptionally strong program, with forty titles listed. The discussion of Meteor Crater by Mr. G. M. Colvocoresses excited considerable interest and many members of the section visited the crater Tuesday afternoon. One session each was devoted to geology, physics, chemistry and astronomy. The social science section had sixteen titles listed. Members of this section were able to study many ruins easily accessible to Flagstaff. The education section had a rather short program, but the papers presented made up in quality what was lacking in quantity.

Newly elected officers of the Southwestern Division are: Forrest Shreve, Carnegie Desert Laboratory, Tucson, *president*; Walter P. Taylor, U. S. Biological Survey, Tucson, *vice-president*; W. G. McGinnies, University of Arizona, Tucson, *secretary-treasurer*, and Francis Ramaley, University of Colorado, Boulder, *member of executive committee*.

Section officers for the coming year are: Biological Sciences, F. J. Crider, director, Boyce Thompson Southwestern Arboretum, Superior, Arizona, *chairman*, Quincy Randles, U. S. Forest Service, Albuquerque, New Mexico, *vice-chairman*, W. G. McGinnies, University of Arizona, *secretary*; Physical Sciences, T. F. Buehrer, University of Arizona, *chairman*, R. J. Leonard, University of Arizona, *vice-chairman*, R. S. Rockwood, University of New Mexico, *secretary*; Social Sciences, K. M. Chapman, School of American Research, Santa Fé, *chairman*, Mrs. Eileen E. Alves, El Paso, *vice-chairman*, O. S. Halseth, Arizona Museum, Phoenix, *secretary*; Education, Grady Gammage, Northern Arizona Teachers College, Flagstaff, *chairman*, Samuel Burkhard, Tempe Normal School, Tempe, *secretary*.

The local committee, under the leadership of Dr. Grady Gammage, was largely responsible for making this meeting an outstanding success. The program was an unusually full one, and the entertainment and attractions afforded will make this meeting one long to be remembered by all who attended.

The tenth annual meeting of the division will be held in Albuquerque, April 22 to 25, 1929.

W. G. MCGINNIES,
Secretary