future source material. That would mean that the expense of publication must be borne twice: once by the journal or institution printing the author's paper, and once by the institution sponsoring the catalogue. One of these costs would be waste—and the money, if spent, should go into productive publication.

We suggest, therefore, that while efforts are being made upon the catalogue, as originally conceived by Dr. Kindle, and sponsored by the Paleontological Society, others be devoted to the problem of providing original publication, upon cards, of future original paleontologic descriptions and of significant revisionary material. This plan will demand, of course, funds for printing and for maintaining a central office where cards may be edited, published and sold; as well as international cooperation among contributing agencies and authors.

We do not minimize these problems of securing support, but the rewards to be achieved command attention. Instead of a future of widely scattered descriptions, periodically assembled and republished upon cards, the paleontologist would have those cards, bearing initial descriptions and figures, and available from a central office. Single species, instead of being buried in papers on stratigraphy, areal or economic geology, would appear upon individual cards, each under its own name and readily discoverable. Authors need not wait for the completion of long papers—nor will they resort to the almost useless "preliminary description," often published to establish priority rather than to enlighten its users. By the use of cards, one species may be published as readily as a dozen, and as readily found by other workers. The fear that a description may become "buried" will haunt neither its author nor the subsequent student, who will find the sources that he needs for study available without extended search, at a price which (if necessary) he himself can pay.

Mildred Adams Fenton
Carroll Lane Fenton
West Liberty, Iowa

AN APPEAL TO AMERICAN BIOCHEMISTS

J. L. W. Thudichum, pupil of Liebig, has been recognized for many years as one of the great biochemists. His splendid contributions in the field of lipoid chemistry (chemistry of brain tissue) are well known. His contributions in pigment biochemistry, not as well recognized, were also fundamental. He was the pioneer investigator of the pigments, named by him "luteins," now known as carotinoids. He also contributed outstanding papers upon the urinary pigments, bile pigments and hematoporphyrin, which he recognized as appearing in other sources besides the blood. The amino-acid "norleucin" was originally discovered by Thudichum. A number of other substances of biochemical interest began their existence as entities in the laboratory of this unusual worker, although they were rediscovered and renamed by later investigators. In the interest of science Thudichum wrote numerous texts, all replete with profound historical introductions, upon many divergent topics.

Thudichum also, somehow, found time to carry on a medical practice, using a good deal of his income to purchase platinum utensils, etc., for carrying on his researches, many of which were conducted in his private laboratory.

An interchange of communications with Dr. Otto Rosenheim (London), who for many years has been collecting data upon Thudichum's life, has brought the information that the five daughters of Thudichum are in dire financial need. The members of the American Society of Biological Chemists and others who care to do so may contribute towards a fund for them. Contributions, however small, will be highly appreciated. Checks may be mailed to Dr. David L. Drabkin, Medical School of the University of Pennsylvania, who will transmit the collected fund as a contribution of American biochemists to the parties abroad.

Russell H. Chittenden
Phoebus A. Levene
Lafayette B. Mendel

CONFERENCE ON ASTROPHOTOGRAPHIC PROBLEMS

A Conference on Astrophotographic Problems was held at the Harvard Observatory on March 23, on the occasion of the dedication of the new astrophotographic building. The building contains the large collection of photographic plates, the library of the observatory and many offices.

The following are abstracts of the papers presented:

The Harvard collection of astronomical photographs: Annie J. Cannon. The history of astronomical photography at the Harvard Observatory dates from 1850, when the first photograph of a star ever taken was made here with the 15-inch equatorial telescope. Since that time the collection of plates has grown steadily, and it now contains about 400,000 glass negatives, of sizes from 4 x 5 inches to 14 x 17 inches. The earliest plates, obtained in 1850–1852, were daguerreotypes taken under the direction of William C. Bond, the first director of the observatory. The process was so slow that only the brightest stars would "take," and no impression could be made of the North Star, however long the exposure. The introduction of "wet" collodion plates brought new hope, and George P. Bond, the son and successor of William Bond, succeeded in 1857 in photographing by their use stars of the sixth magnitude, which includes all visible to the naked eye. About one hundred plates of this period are still in good condition. The Harvard collection forms a continuous series from 1885, when dry plates were first available. At that time Edward C. Pickering, the fourth director of the observatory, started with great zeal and enthusiasm on the large task of photographing the whole sky. The Bache fund enabled him to secure an 8-inch photographic lens which has been continually in service since that early day. With the help of Mrs. Henry Draper, of New York City, who established the Henry Draper Memorial, and of the Boyden fund for the erection of an observatory at a high altitude, four photographic telescopes were installed between 1885 and 1890, two in Cambridge and two in Peru. Up to the present time, these four telescopes have taken 142,000 plates. The results of a study of these plates include the discovery of the first spectroscopic binary; of one thousand variable stars, in globular clusters and elsewhere, and of ten novae; as well as the spectral classification of 225,000 stars, and the establishment of an international system of stellar magnitudes. In 1893, by the generous gift of $50,000 from Miss Catharine Bruce, of New York City, a 24-inch doublet was ordered by Professor Pickering from Alvan Clark and Sons, and was sent to the Boyden station at Arequipa, Peru, at an elevation of 8,000 feet. Although the construction of a doublet of such unprecedented size was strongly criticized in those days, the telescope has been effective, and is responsible for 16,000 negatives in the Harvard collection. The revelations from the Bruce plates include the faint ninth satellite of Saturn, Phoebe; numerous studies of the Magellanic Clouds, including the discovery in them of more than two thousand variable stars, and of the period-luminosity relation, one of the most effective measuring tapes for determining the scale of the universe. At least thirty thousand spiral nebulae have also been discovered by means of the Bruce telescope. Three other telescopes, for which the lenses were ground by the late Reverend Joel Metcalf, have taken about 45,000 photographs, on some of which over 2,500 variable stars have been discovered in the Milky Way regions. Forty-one minor planets were discovered by Dr. Metcalf on plates which he took with his 12-inch lens, plates later donated by Mrs. Metcalf to this observatory. For thirty years small photographic telescopes, with lenses of one-inch aperture, have patrolled the northern and southern sky, so that for observational work there are often semi-monthly plates of various parts of the sky, showing stars down to the eleventh or twelfth magnitudes. The Harvard Map of the Sky was made from these plates, from studies of which many variable stars and eighteen novae have been found. In 1927 the Boyden station was moved from Arequipa, Peru, to Bloemfontein, South Africa, by Dr. Shapley, fifth director of the observatory. Excellent prospects for a bright future in the photography of the southern stars are promised by modern mountings for the old instruments, a new Ross-Fecker lens for patrol work and a 60-inch reflector for detailed investigations. The prospective removal of the Cambridge photographic instruments to Oak Ridge in the town of Harvard, comparatively free from smoke and electric lights, will be of great advantage in the photography of the northern stars. And the completion of the new fireproof structure to house the negatives will insure for many years to come the usefulness of the Harvard Collection of Astronomical Photographs.

The chemistry of the photographic process: G. B. KISTIAKOWSKY.[1] The problem of the chemical processes that occur in the production of an image on a photographic plate has long been a very difficult one. It is possible to do little more than present the attitude of modern physicists and chemists towards theories of the way in which light acts on the silver salt grains in the photographic emulsion, and the way in which the silver salt (such as silver bromide) is changed, by developing the plate, into metallic silver. Observation shows that development starts at the edge of the microscopic grain, and that its occurrence depends on the presence of smaller specks of silver sulphide in the grain. These specks of silver sulphide are produced during the "ripening" of the emulsion (effected by adding ammonia to the emulsion, and heating) by a minute quantity of sulphur compound contained in the gelatin. The presence of this sulphur is due, curiously enough, to mustard plants in the diet of the cattle from whose bones the gelatin is made (and gelatin made from cattle whose diet contains no mustard is found to be inferior for this purpose). It seems possible that the bromine atoms travel around until they encounter these "sensitivity specks" of silver sulphide, and that a reaction then starts which makes the whole grain of emulsion developable. There was a hypothesis that the light quanta falling on the plate acted upon individual silver bromide molecules, separating them into silver and bromine; but this hypothesis seems to be refuted by several properties of the photographic emulsion, such as the fact that the light must be of a certain minimum strength to make an impression on the plate at all; very weak light produces no image. An important modern branch of photography treats of the action of certain dyes on the emulsion, making the plate sensitive to other colors than blue and violet. A noteworthy example of such a dye is the one used by the Eastman Kodak Company in making a plate that is sensitive to the infra-red rays of light that are invisible to the eye. The way in which the dyes work is very imperfectly understood. Much remains to be done in photography as an art, as distinct from photography as a science; and the fundamentals for understanding the reactions that are used in photography are the materials for further research by the chemist.

[1] Professor of Chemistry, Harvard University.

A survey of photographic astrometry: FRANK SCHLESINGER.[2] Pioneer work in photographic astrometry was done at the Harvard Observatory by Bond. Especial tribute should also be paid to the painstaking investigations which Rutherfurd made in his private observatory at 11th Street and Second Avenue, New York City. Rutherfurd showed definitely, as early as 1865, that star positions could be measured with great accuracy from photographic plates and that the much disputed distortion of the film did not affect the measurements seriously. Rutherfurd's early optimism was more than justified; at present one measurement from a photographic plate can compete in accuracy with ten visual measurements made with a telescope of the same focal length. In 1886 and 1887, conferences of some of the world's most prominent astronomers met in Paris to consider the project of making a photographic map of the whole sky containing stars one thousand times fainter than the faintest star visible to the naked eye. The accuracy with which star positions can now be photographically measured is very great; the accidental error of measurement is equal to only 0.000,020 inch, or 0.0005 mm. In conclusion, some of the most important future problems in this field should be mentioned. Our knowledge of the radial velocities of the stars (motions directly towards us or away from us) is very meager for the fainter stars. Progress in such work can only be expected after what may prove to be a long period of trial and experiment. Success in determining radial velocities by means of the objective prism does not look less promising to us now than was the prospect of determining radial velocities by any method forty years ago. The importance of being able to determine velocities in this way is so great as to warrant years of patient effort on the part of many workers. The importance must again be emphasized of a close cooperation between the astronomer and the chemist who specializes in the chemistry of photography. Astrometry will enter a new era if a method can be found for eliminating the inherent inaccuracies in the measurement of positions on the photographic plate. The cause of these inaccuracies is still to some extent a mystery, but it appears certain that the major source of inaccuracy lies in the plate itself and not in the methods now at hand for measuring it.

The current photographic programs of the Harvard Observatory: HARLOW SHAPLEY. Seven major observing programs and eleven smaller programs are in operation with the Harvard telescopes; nine instruments are in continual use on the programs at the Cambridge station, five at the South African station, and three special cameras with the meteor expedition at Flagstaff, Arizona. Nearly 15,000 photographs have been made since 1924 on the program of Milky Way variable stars—a research designed to give information on the structure and dimensions of the galactic system. The survey of the photographic brightness of the stars is to extend to magnitude 8.5, and includes approximately 120,000 stars over the whole sky; the photographs are made at Cambridge and at Bloemfontein, and are measured with the thermo-electric microphotometer. An extensive program on the motions of the nearby stars is carried on in cooperation with the University of Minnesota. Investigations dealing with the variable stars that have been selected for international cooperation are carried on in conjunction with the University of Missouri, Hood College, Cornell University, the Case School of Applied Science, Connecticut College, and several other institutions. The photographs are made at Harvard and measured at the other observatories. Only nine meteor spectra are now known—three on Harvard plates, three on Moscow plates, two from Mount Wilson and one from Hamburg. In the Harvard collection only about one spectrum plate in 20,000 shows spectra of meteors, but with special cameras it is hoped to get one spectrum out of every fifty to a hundred attempts. In the systematic sky patrol approximately 90,000 photographs have been accumulated—all on glass negatives, 8 x 10 inches in size. These plates form the basis of numerous investigations of variable stars and stellar distribution. Cooperative programs dealing with the structure of the stellar universe are carried on in conjunction with the astronomical departments of Amsterdam and Groningen; for the Groningen work the photographs are taken on specially made plate glass plates. Other active researches at the Harvard Observatory deal with the discovery and measurement of extragalactic nebulae, and with the less remote globular clusters, and the Magellanic Clouds. The classification of the spectra of faint stars in interesting regions is a special problem of the highest importance. A number of special photometric programs, including the determination of standard photographic sequences and the establishment of systems of photovisual and red magnitudes, are also in active operation.

AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE

BUSINESS PROCEEDINGS OF THE EXECUTIVE COMMITTEE

THE executive committee of the council of the American Association for the Advancement of Science met on Saturday, April 23, and Sunday, April 24, in Washington, D. C. Since the executive committee acts for the council when it is not in session, the following items of business transacted are to be interpreted as actions of the council:

1. The Genetics Society of America and the American Sociological Society were accepted as affiliated societies.

[2] Director of the Yale University Observatory.