is to be made a permanent feature of the academy. This section will be managed by an academy committee to insure continuity.

The next annual meeting of the academy and the cooperating societies will be held at Lawrence, Kansas. This will be the seventy-fifth annual meeting and plans are being formulated for a suitable celebration.

The following officers were elected for the next year and meeting: *President,* R. H. Wheeler, University of Kansas; *President-elect,* H. A. Zinszer, Fort Hays Kansas State College; *Vice-president,* L. D. Bushnell, Kansas State College; *Secretary,* John C. Frazier, Kansas State College; *Treasurer,* F. W. Albertson, Fort Hays Kansas State College.

Executive council members are F. C. Gates, Kansas State College; John W. Breukelman, Kansas State Teachers College, Emporia; and J. A. Trent, Kansas State Teachers College, Pittsburg. Two associate editors, chosen for three years, are A. B. Cardwell and Mary T. Harmon, both of Kansas State College.

Dr. Robert Taft, of the University of Kansas, is the editor of the *Transactions,* now in its 45th volume, and Dr. Roger C. Smith, of Kansas State College, will serve the third year of his three-year appointment as representative to the academy conference.

TABLE 1
Section Record, with Past and Future Officers—Hays Meeting

Name of Section	Chairman, 1942	No. papers on program	No. persons attending	Chairman for 1943
Biology Teachers	R. L. Tweedy	4	37	Sherwin B. Griswold
Botany	S. M. Pady	23	50	Andrew Riegel
Chemistry	L. C. Kreider	10	55	Wilbert Chappell
College Students	E. O. Deere	4	25	E. O. Deere
Entomology (At Lincoln, Nebr., April 4)	Don B. Whelan	20	45	H. B. Hungerford
Geology	George M. Roberston	11	15	H. T. U. Smith
Junior Academy	John Michener, Jr.	15	60	Ernest Sellers
Junior Academy Committee	L. D. Wooster			Edith Beach
Physics	R. F. Miller	10	30	W. D. Bemmels
Psychology	H. E. Schrammel	14	44	O. W. Alm
Weather Crops (At Lawrence, Kans., Dec. 6, 1941)	R. H. Wheeler	6	150	H. H. Laude
Zoology	E. H. Herrick	16	30	Jacob Uhrich
Kans. Assoc. Teach. Math.	Kathleen O'Donnell	7	40	Daniel Pease
Math. Assoc. of America, Kansas Chapter	C. F. Lewis	7	35	C. F. Lewis
A. A. U. Professors	A. B. Sageser	5	35	E. O. Stene

A new standing committee dealing with science in public relations was set up, with Roger C. Smith as chairman. In addition a temporary committee dealing with the relation of the academy to the war was established under the chairmanship of Dr. L. C. Heckert, of Kansas State Teachers College, Pittsburg.

JOHN C. FRAZIER,
Secretary

MANHATTAN, KANSAS

REPORTS

FIELD MUSEUM OF NATURAL HISTORY[1]

DURING the past year I have been on active duty with the United States Army, serving at Sixth Corps Area Headquarters in Chicago. I desire to express my sincere appreciation to the Board of Trustees for permitting me to continue as director of the museum during this period. I further desire to record my gratitude to President Stanley Field, who by assuming many of the duties which normally fall to the director has made it possible for me to carry the remaining load in the evening hours and in the week-ends at my disposal.

The activities of the past year have been colored somewhat by anticipation of the impending war, which finally came to our country on December 7. Every effort was made at the museum to bring to a conclusion the many required tasks of maintenance and the many purchases of equipment which might be difficult to obtain due to the increasing restrictions brought about by so-called "defense priorities."

On June 30 the federal Work Projects Administration program at Field Museum was discontinued by governmental order to make available the full force of WPA assistance for other projects closely connected with the national defense efforts. The administration of Field Museum had long anticipated the discontinuance of this program, and the director had repeatedly warned the staff to bring as many special projects to a conclusion as possible. It was desired to avoid being caught with several unfinished projects on hand and no labor available. This course of action proved to be a wise one. Temporary provision was made for a very few unfinished items of business, as it was manifestly impossible to foresee accurately the exact month when discontinuance of WPA work would occur.

[1] From the annual report of the director, Dr. Clifford C. Gregg, to the Board of Trustees for the year 1941.

During the latter part of the year plans were made for operations on a greatly reduced scale, because the current and future enormous increases in taxation are almost certain to be felt in the way of reduced income for this institution. The competition for contributions, due to the needs of many worth-while wartime projects such as United Service Organizations, the Red Cross, and others, together with the proper desire of our citizens to purchase as large quantities as possible of government bonds for war purposes, is bound to be felt in the form of loss of income at the museum. It seems proper, then, to plan to operate on a reduced income, maintaining as far as is possible all of the many services available to the public in order that the influence of this institution may still be felt at a time when normal educational and cultural influences are most necessary. It is hoped, however, that members of the museum will appreciate the problems of this institution as well as its services to the public, and will therefore continue their support to the best of their ability. It is encouraging to note that despite the increasing demands made upon the public purse, the museum achieved a modest gain in memberships during 1941. There were 4,313 names of members on the rolls at December 31 as compared with 4,225 on the corresponding date of the previous year.

One of the major undertakings completed during the year was the relocation and reconstruction of the library so as to make it more easily available to the public. The opportunity was seized to install the finest type of indirect lighting available, and further, to build into the new library many of the features found to be helpful through an experience of twenty years in its former location. The space formerly occupied by the library has been converted into a stack-room, where provision has been made in advance to take care of the expected increases in space demands due to the additional books and pamphlets which are continually being acquired. It has also been possible to provide for the binding of many years' accumulation of periodicals, and for the rebinding of many fine volumes which had suffered from years of almost constant use.

Another outstanding improvement accomplished during 1941 was the reinstallation of the splendid collection of gems and jewelry in H. N. Higinbotham Hall (Hall 31). These beautiful and valuable precious and semi-precious stones had been displayed since 1894 in the original cases which contained them at the time of their acquisition. It is historically interesting to recall further that these cases housed the basic collection at the 1893 World's Columbian Exposition in Chicago. During the intervening years tremendous improvements have been made in case-building, room construction and lighting. The opening of the new hall late in June brought amazement to many who were quite familiar with the collections, for their great beauty had been so inadequately brought out in the former installation that a sharply striking and certainly most pleasing contrast was provided by the improvements now achieved. On the day of opening, a reception and tea were announced for the members of the museum, many of whom responded and were welcomed to the new Hall of Gems.

One of the most unusual exhibits in any museum of anthropology or natural history is that of the mummy Harwa, which was installed in the Hall of Egyptian Archeology (Hall J) in 1941 after being seen by millions at the New York World's Fair during 1939 and 1940. This mummy came to America in 1904 and has been a part of Field Museum's collection since that time. It was lent to the General Electric X-ray Corporation for the purpose of their special exhibit, due to the fact that this institution and that company had previously cooperated in experiments to perfect the technique of x-raying material of this type. At the close of the second year of the fair in New York, the General Electric X-ray Corporation, in appreciation, graciously presented the entire exhibit to Field Museum. I desire here to express publicly the sincere thanks of this institution for such a splendid gift. The exhibit has been placed in a special chamber in Hall J. There visitors may see Harwa first in his external mummy wrappings; then, automatically, a fluoroscopic screen moves in front of the mummy and an electric current of 125,000 volts activates x-rays which penetrate to Harwa's interior and project the image of his ancient skeleton on the screen. Lead glass protects visitors from being harmed by the rays. The x-ray and mechanical equipment were especially designed and built for this particular purpose, at a cost of many thousands of dollars. General Electric engineers and technicians assisted in the work of installing it at the museum. When visitors to the Egyptian Hall are few in number, they may themselves operate the exhibit by pushing a button. On days when there are many visitors, the cycle is repeated automatically at 40-second intervals throughout the day.

The opening in 1941 of the Hall of Fishes (Hall O) on the ground floor completes a series of three splendid halls which are devoted to marine life. The Hall of Marine Mammals (Hall N) occupies a central position and contains habitat groups of seals, sea lions, manatee and narwhal. On the south side of this hall is the Hall of Lower Invertebrates (Hall M) which was announced in the annual report of the director for the year 1939. The new Hall of Fishes, which was opened in July, is adjacent to and directly

connected with the Hall of Marine Mammals. Habitat groups include one showing the fishes of the Bahama coral reefs, another showing the rocky coast of Maine, and one of the sandy ocean floor of the Texas coast. In addition, there is an extensive systematic collection of fishes in kindred forms running from the giant whale-shark down to the tiny frog-fish from the Sargasso Sea.

Throughout this report there are cited many instances of new exhibits which have been opened to the public. It is only natural that any reader would attribute full credit to the department sponsoring each exhibit. Little thought or appreciation is given to the Division of Maintenance or the Division of Engineering through whose efforts the painstaking details of case-planning, lighting, construction and even to a large extent the actual installation are carried out. I am pleased to call especial attention to the effectiveness, thoroughness and spirit of cooperation with which these divisions carry on their work.

There are many persons whose names are not found in the press reports or on the labels of the museum exhibits, who contribute valuable service without which the museum could not continue. I acknowledge a debt of gratitude to the many men and women who perform routine jobs with skill and extreme care, and who thus contribute to the maintenance of the good name of this institution.

SPECIAL ARTICLES

THE SEPARATION AND CHARACTERIZATION OF CAROTENOID PIGMENTS PRODUCED FROM MINERAL OIL BY BACTERIA[1]

DURING the course of research studies[2] on the utilization of petroleum products by microorganisms a culture of *Mycobacterium* was isolated which produced "oil-soluble" yellow and orange pigments when grown on a substrate composed of mineral salts and mineral oil.[3]

The identification of these pigments, which were subsequently found to be carotenoids, was complicated by the fact that they could not be removed from the oil by the conventional methods used in the analysis of plant tissues. Extraction methods employing various solvents were not successful because the pigments were either not removed or, if removed, were accompanied by some of the oil.

In the preliminary trials, the chromatographic adsorption technique used by Strain[4] in the separation of leaf xanthophylls was used with a mixture of 50 per cent. MgO (Micron Brand No. 2641), and 50 per cent. siliceous earth as the adsorbent; however, when saponified pigment-bearing oil was passed through the column, incomplete separation resulted. When an attempt was made to wash the column free from mineral oil by the use of petroleum ether (B. P. 30°–60°), the pigments migrated with the ether and oil mixture. However, a column of the MgO alone was found to retain the pigments very tenaciously in the upper one-fourth inch of the column. Repeated washings with petroleum ether failed to remove the pigments, but the oil was removed by this means.

Since the pigment fraction in all separations was confined to the extreme upper portion of the column and because the passage of the oil through the column was too slow, the orthodox type of adsorption tube used in chromatographic analysis was discarded for the preliminary separation of the pigments and oil. Instead, a Jena glass filtering crucible (capacity, 30 cc; height above disc, 45 mm; diameter of disc, 30 mm) of the Gooch type was used. This device, when packed with adsorbent, permitted a rapid separation of the pigment from the oil because of the increased surface area of the adsorbent. Complete separation of the pigments was effected from as much as 100 ml of oil by this technic.

The pigmented portion of this column was then removed mechanically, and the pigments eluted by petroleum ether containing a small amount of ethyl alcohol. Extraction of the petroleum phase with 90 per cent. methanol at this point showed xanthophylls to be absent. The pigment solution was then evaporated to dryness under vacuum. The semi-crystalline residue was redissolved in a minimum amount of petroleum ether (1.0 to 2.0 ml) and chromatographed on a column containing 50 per cent. MgO and 50 per cent. silicious earth. Three distinct pigmented bands were obtained in this manner.

The color of the successive bands from the lowest to highest were: (I) yellow, (II) orange and (III) pink. In addition to the above-described pigments, a red pigment (IV) appeared in the 90 per cent. alcoholic-KOH solution used in the saponification of the oil. This pigment exhibited all the chemical properties of astacin[5] and possessed a single absorption maximum at 5,000 Å in carbon disulfide.

[1] Contribution No. 213, Department of Bacteriology, and No. 273, Department of Chemistry.

[2] H. F. Haas, M. F. Yantzi and L. D. Bushnell, *Kansas Acad. Sci. Trans.*, 44: 39–45, 1941.

[3] Refined light mineral oil having a specific gravity of 0.84 at 25° C. and a viscosity of about 105 (saybolt) at 100° F.

[4] "Leaf Xanthophylls," H. H. Strain, Carnegie Institution of Washington, Pub. No. 490, 1938.

[5] G. Wald and H. Zussman, *Jour. Biol. Chem.*, 122: 449–460, 1937.