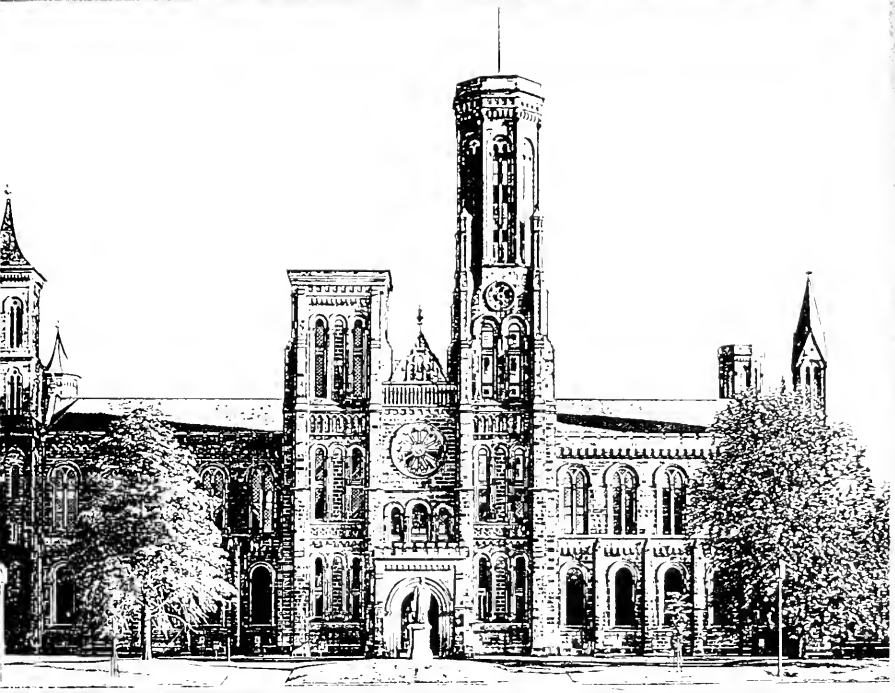


SMI

Smithsonian Year 1966

ANNUAL REPORT OF THE

EAR
THE
'IVE
.NTS

N

flice

CORRECTION

Page 60—

In second paragraph, third line from end—for "to that" *read* "so that"

In next-to-last paragraph, the fourth line, starting "Program concerns . . ." *should read—*

"Program was expanded to provide additional support for staff members"

Page 89—

Under "New Programs", *in first paragraph, last line—for* "Security" *read* "Secretary"

Smithsonian Year 1966

ANNUAL REPORT OF THE SMITHSONIAN INSTITUTION FOR THE YEAR ENDED JUNE 30, 1966, INCLUDING THE FINANCIAL REPORT OF THE EXECUTIVE COMMITTEE OF THE BOARD OF REGENTS

SMITHSONIAN INSTITUTION
Washington 1966

For sale by the Superintendent of Documents, U.S. Government Printing Office
Washington, D.C., 20402 - Price $1.75

The Smithsonian Institution

The Smithsonian Institution was created by act of Congress in 1846, in accordance with the terms of the will of James Smithson, of England, who in 1826 bequeathed his property to the United States of America "to found at Washington, under the name of the Smithsonian Institution, an establishment for the increase and diffusion of knowledge among men." In receiving the property and accepting the trust, Congress determined that the Federal Government was without authority to administer the trust directly, and, therefore, constituted an "establishment," whose statutory members are "the President, the Vice President, the Chief Justice, and the heads of the executive departments."

The Establishment

Lyndon B. Johnson, President of the United States
Hubert H. Humphrey, Vice President of the United States
Earl Warren, Chief Justice of the United States
Dean Rusk, Secretary of State
Henry H. Fowler, Secretary of the Treasury
Robert S. McNamara, Secretary of Defense
Nicholas deB. Katzenbach, Attorney General
Lawrence F. O'Brien, Postmaster General
Stewart L. Udall, Secretary of Interior
Orville L. Freeman, Secretary of Agriculture
John T. Connor, Secretary of Commerce
W. Willard Wirtz, Secretary of Labor
John W. Gardner, Secretary of Health, Education, and Welfare
Robert C. Weaver, Secretary of Housing and Urban Development

Board of Regents and Secretary

June 30, 1966

Presiding Officer ex officio	LYNDON B. JOHNSON, President of the United States
Chancellor	EARL WARREN, Chief Justice of the United States
Regents of the Institution	EARL WARREN, Chief Justice of the United States, Chancellor
	HUBERT H. HUMPHREY, Vice President of the United States
	CLINTON P. ANDERSON, Member of the Senate
	J. WILLIAM FULBRIGHT, Member of the Senate
	LEVERETT SALTONSTALL, Member of the Senate
	FRANK T. BOW, Member of the House of Representatives
	MICHAEL J. KIRWAN, Member of the House of Representatives
	GEORGE H. MAHON, Member of the House of Representatives
	JOHN NICHOLAS BROWN, citizen of Rhode Island
	WILLIAM A. M. BURDEN, citizen of New York
	ROBERT V. FLEMING, citizen of Washington, D.C.
	CRAWFORD H. GREENEWALT, citizen of Delaware
	CARYL P. HASKINS, citizen of Washington, D.C.
	JEROME C. HUNSAKER, citizen of Massachusetts
Executive Committee	ROBERT V. FLEMING, Chairman, CLINTON P. ANDERSON, CARYL P. HASKINS
Secretary	S. DILLON RIPLEY
Assistant Secretaries	JAMES BRADLEY, Assistant Secretary (Administration)
	SIDNEY R. GALLER, Assistant Secretary (Science)

A listing of the professional staff of the Smithsonian Institution, its bureaus, and its offices, appears in Appendix 6.

Last year, the Annual Report of the Secretary of the Smithsonian Institution for the first time appeared under the general title *Smithsonian Year*. At that time certain changes were instituted in the procedures pertaining to Smithsonian annual reports:

1. Issuance of the Annual Report of the Secretary of the Smithsonian Institution (now *Smithsonian Year*) is no longer followed by appearance of a greenbound volume containing a General Appendix of articles in the sciences and the arts. The last of the old series is that for 1964.
2. For 1965, the objective of the General Appendix was met by a Smithsonian yearbook containing the eleven addresses delivered at the scholarly sessions of the Smithson Bicentennial Celebration held in Washington in September 1965. Entitled *Knowledge Among Men*, it was published in 1966 by Simon and Schuster for the Smithsonian Institution.
3. The *United States National Museum Annual Report* is no longer issued initially as a separate document reporting on the activities of its component Museums of Natural History and of History and Technology. These reports are henceforth incorporated in *Smithsonian Year*, together with the reports of the other branches of the Institution.
4. Reprints of each of these reports are available. To some of them are appended tabulated and statistical information which is of primary interest to those concerned with the particular field covered, and which for reasons of space can no longer be carried in this volume.

Contents

Statement by the Secretary

Statement by the Secretary

S. Dillon Ripley

The re-endorsement of the essential role of this Institution in research and various processes of education came dramatically this past year in the celebration of the two hundredth anniversary of the birth of James Smithson. The two and a half days of the meetings, September 16–19, 1965, included an extraordinarily interesting seminar on the situation of man's knowledge by scholars of international eminence. The twelve commissioned papers have just been published.* During the celebration and with great pageantry a robed procession of nearly five hundred delegates of universities and kindred scholarly institutions, preceded by our mace bearer and banners of the various bureaus, by members of the Smithsonian's Establishment, and by its Chancellor and Regents, marched across the Mall. Thus we restated the unique circumstance of our half-government, half-private character, a symbolic composite, underscoring the spirit of freedom of inquiry and freedom of scholarly exchange with all nations of the world.

President Lyndon B. Johnson addressed the assemblage with significant words: "learning respects no geographic boundaries. . . . partnership between Government and private enterprise can serve the greater good of both. . . . the Institution financed by Smithson breathed life in the idea that the growth and spread of learning must be the first work of a nation that seeks to be free. . . . We can support Secretary Ripley's dream of creating a center here at the Smithsonian where great scholars from every nation will come and collaborate. . . . Together we must embark on a new and a noble adventure:

*_Knowledge Among Men_ (New York: Simon and Schuster for the Smithsonian Institution, June 1966), the first in a new series to be known as the _Smithsonian Annual_.

"First, to assist the education effort of the developing nations and the developing regions.

"Second, to help our schools and universities increase their knowledge of the world and the people who inhabit it.

"Third, to advance the exchange of students and teachers who travel and work outside their native lands.

"Fourth, to increase the free flow of books and ideas and art, of works of science and imagination.

"And, fifth, to assemble meetings of men and women from every discipline and every culture to ponder the common problems of mankind."*

The Smithsonian hopes to work closely with the appropriate branches of Government in international scholarly meetings in furtherance of its traditional and pioneering international role.

RESEARCH

Our research accomplishments during the year have spread over a wide spectrum in science, history and art.

An accomplishment of particular significance has been achieved by David L. Correll in the field of protein chemistry. One of the studies in this area has been the isolation of phytochrome, a proteinaceous pigment occurring in all higher forms of plants. This pigment serves as a photoreceptor that absorbs the radiant energy which regulates the morphological development of plants and that is controlled by the red and far-red portions of the visible spectrum. Without phytochrome there would presumably, be no stem elongation, no leaf expansion, and no flowering in the higher plants. It is only in the past few years that this pigment has been isolated, and then in impure form. Dr. Correll has isolated phytochrome in pure form and, with collaborators from the National Institutes of Health, has determined its amino acid content, molecular weight, and fluorescence spectrum, information that will undoubtedly lead to defining the metabolic role and physiological responses occurring as a result of the pigment's regulatory action.

In astrophysics the culmination of a 10-year effort in the geodetic phase of the Smithsonian's Satellite-Tracking Program

*_The Noble Adventure, Remarks of the President at the Smithsonian Bicentennial Celebration, September 16, 1965_ (Washington: Government Printing Office, 1965).

The Regents and the Secretary

of the

Smithsonian Institution

request the honor of your presence

at the Bicentennial Celebration

commemorating the two hundredth anniversary

of the birth of

JAMES SMITHSON

Thursday, Friday, and Saturday,

September Sixteenth, Seventeenth, and Eighteenth,

one thousand nine hundred and sixty-five

at the Smithsonian Institution

Washington, District of Columbia

The favor of a reply
is requested

THE ROYAL SOCIETY OF LONDON

TO THE

SMITHSONIAN INSTITUTION

THE President, Council and Fellows of the Royal Society of London send their greetings and congratulations to the Smithsonian Institution on the occasion of the two hundredth anniversary of the birth of its founder James Smithson.

The Royal Society is happy to recall that James Smithson was elected a Fellow of the Royal Society on 19 April 1787 at a very early age, and contributed a number of scientific papers to its *Philosophical Transactions*.

The Royal Society has followed with admiration the splendid way in which the Smithsonian Institution has developed over the years since its foundation in 1846, and has fulfilled the wish of its founder by the great contribution it has made to the increase and diffusion of knowledge among men.

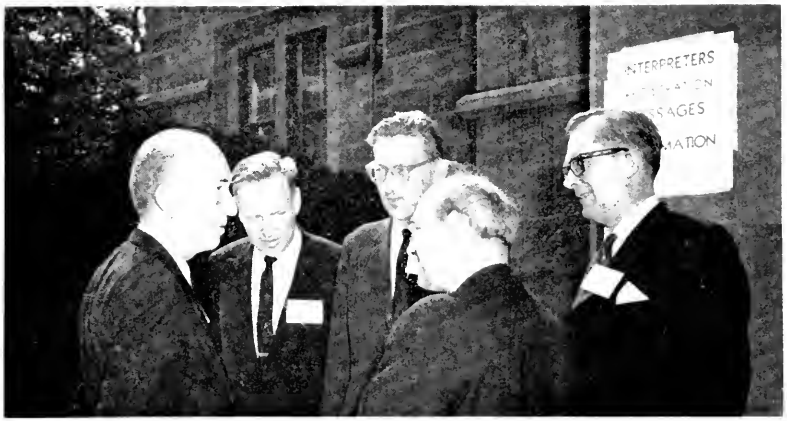
The Royal Society confidently expresses the hope that the Smithsonian Institution may long continue its valuable contributions to the increase of knowledge and the welfare of mankind.

Florey

PRESIDENT

SEPTEMBER 1965

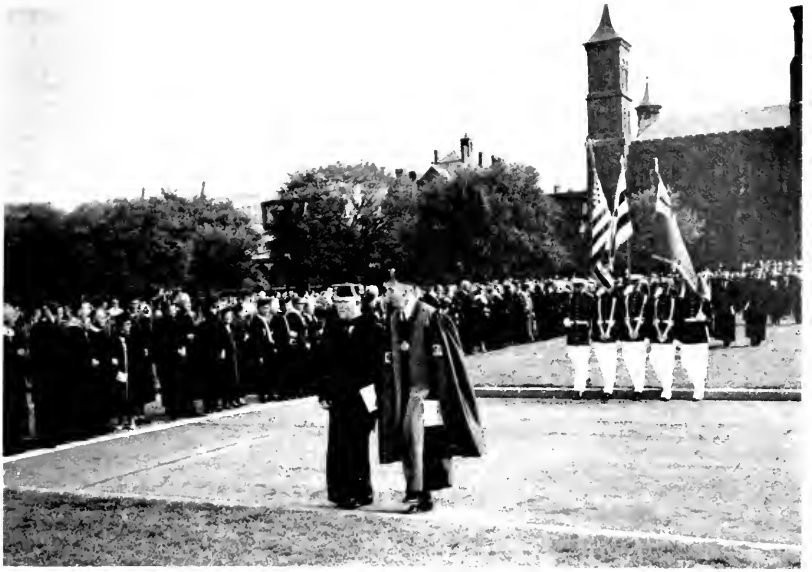
James Smithson Bicentennial Celebration guests were registered September 16, 1965, in the great hall of the Smithsonian building. Renovated and refurbished in the spirit of architect James Renwick's design, the hall's red and gold carpets, marbleized pillars, and plush settees convey a sense of Victorian elegance of the period (1850–1860) when it was built. Harmonizing modern cases display objects that illustrate the wide range of Smithsonian activities.



Secretary S. Dillon Ripley (left) and Science Information Exchange Associate Director Frank J. Kreysa greet museum directors from Czechoslovakia: Vladimir Denkenstein, National Museum, Prague; Jan Jelinek, Moravian Museum, Brno; and Joseph Kuba, Technical Museum, Prague. Below: Foreign Currency Program Director Kennedy B. Schmertz with Mohamed Yacoub, Director of the Musée National du Bardo, and Mohamed Masmoudi of the Musée Regional de Sfax.

Smithsonian Secretary's badge of office, worn about the neck from a cherry-red ribbon, depicts the owl of Athena, symbol of wisdom. Below: Chief Justice Earl Warren, Chancellor of the Smithsonian, greets former Secretary Charles G. Abbot, before robing for the Academic Procession.

From the rampart behind the statue of Joseph Henry, the Smithsonian's first Secretary, Tower Musicians have sounded a fanfare and the Herald has read President Johnson's proclamation on the occasion of the Bicentennial Celebration. Below: Preceeded by banners of the Smithsonian bureaus, procession of nearly 500 scholars from 90 nations march in the order of the founding of their institutions.

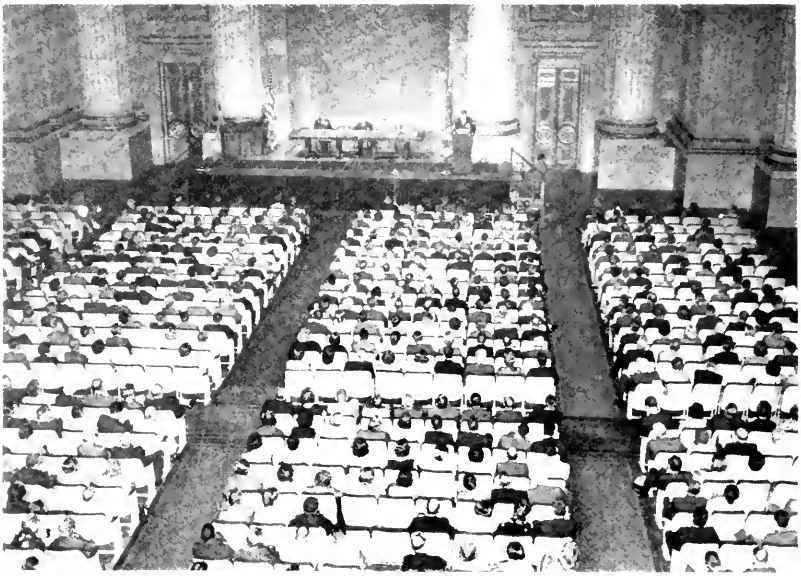


The Procession: Chancellor Earl Warren and Secretary Ripley. Below: Three past Secretaries of the Smithsonian (from left) Charles G. Abbot (1928–1944), Alexander Wetmore (1945–1952), and Leonard Carmichael (1953–1964). (Photo courtesy Washington Star.)

230–457—66——2

After the Procession, President Lyndon B. Johnson addressed the convocation. He announced support of the plan to create at the Smithsonian a center "where great scholars from every nation will come and collaborate."

Guests of the Celebration were served meals in colorful pavilions on the Mall, in front of the Museum of History and Technology. Below: At the exhibit "The Art and Spirit of a People," featuring objects from the Eleanor and Mabel Van Alstyne collection, were gathered speakers who were to address the scholarly sessions (from left): Fred L. Whipple, Ian McTaggart Cowan, Stephen E. Toulmin, Arthur Koestler, G. Evelyn Hutchinson, Claude Lévi-Strauss, Herbert Butterfield, and Jerome S. Bruner.



The scholarly sessions were held in the Departmental Auditorium. The Auditorium is located on Constitution Avenue, opposite the Museum of History and Technology. Below: Mrs. Lyndon B. Johnson and Secretary Ripley greet Bicentennial Celebration guests at the White House lawn party and reception Friday afternoon, September 17.

Thomas Boylston Adams, president of the Massachusetts Historical Society and descendant of two Presidents, addressed the banquet that concluded the Bicentennial Celebration. Below: At the banquet Lord Florey, President of the Royal Society of London, exhibits the citation accompanying award of the first Smithson Medal to the Royal Society. Robert V. Fleming (right), Chairman of the Executive Committee of the Board of Regents, made the presentation. Sir Patrick Dean, British Ambassador, is at left.

Smithson Medal, awarded for outstanding contributions in the areas of art, science, history, and technology. A bronze copy of the medal was presented to each guest at the Celebration.

was reached with the completion of the Smithsonian Standard Earth, a determination of the gravitational field and figure of the earth and of observing-site positions accurate to within 10 to 20 meters. Observations of Explorers 19 and 24, the first balloon satellites placed in near-polar orbits, led Luigi Jacchia and Jack Slowey of the Observatory to the conclusion that, in addition to solar heating, the earth's magnetic field plays a role in the formation of the daytime "bulge" of the earth's upper atmosphere in the rarefied air 600 kilometers (400 miles) above the surface of the earth.

These impressive dividends of fundamental discovery add greatly to the value of the satellite-tracking program entrusted to the Smithsonian by the National Aeronautics and Space Administration.

The *Smithsonian Astrophysical Observatory Star Catalog*, originally compiled for satellite-tracking use, was printed with the aid of electronic computers. A 4-volume catalog of some 260,000 stars, it contains data that heretofore had to be sought in more than 50 catalogs.

Significant advances in meteorite research in the Museum of Natural History included the intensive study of the minute inclusions of glass in the chondrules of stony meteorites. This glass is proof of the original molten state of these enigmatic bodies, and its nature provides evidence of conditions during a very early stage in the history of the solar system.

Tektite investigations continued cooperatively with colleagues at the Corning Glass works and the U.S. Geological Survey. Emphasis was placed on the study of artificial glass systems of tektite composition. A particularly interesting series of experiments demonstrated that artificial glasses prepared from geologically old raw materials can give potassium-argon ages for the glass as high as five million years. This ties in with our studies of tektites from Central Australia, which have established that a serious discrepancy exists between their young geological age and the much greater age indicated for them by potassium-argon measurements. These findings may indicate that the currently accepted interpretation of the potassium-argon method as applied to tektites needs reexamination.

Toward the end of the fiscal year, the new Smithsonian Office of Anthropology was engaged in preliminary planning for sev-

eral major new research programs under the leadership of Professor Sol Tax, who on January 1, 1966, was appointed special adviser on anthropology to the Secretary of the Smithsonian Institution.

Inspired by Professor Claude Lévi-Strauss' address at the Bicentennial Celebration, planning began for a large-scale program in salvage or urgent ethnology, our part of which is now called the Smithsonian Research Program on Changing Cultures.

For at least a century anthropologists have understood a main purpose of their field investigations to be the recording of data on cultures undergoing change. Even when the focus of their research was different, most field workers have felt that in a sense they were producing primary historical documents on a unique cultural situation which would never again be quite the same, if indeed it would not soon be totally unrecognizable. From the beginnings of the field study of human cultures a sense of urgency has been created by the awareness that there were too few anthropologists to keep up with this culture change.

In the last 15 or 20 years this sense of urgency has become more intense as it has become obvious that the course of industrialization and "modernization" and the rapid development of means of communication have so speeded up culture change all over the world that the disappearance within the near future of a very large part of the cultural variability of mankind can be foreseen, perhaps even the disappearance of most of that cultural variation which is important to anthropology and crucial for the testing of anthropological hypotheses. At the same time the study of culture and society has advanced to the point where we are more aware of the theoretical importance, actual or conceivable, of the data we are losing. It is no longer only historical or antiquarian interests that are threatened by the rapid transformation or disappearance of ancient cultural traditions. While it is true that all cultures change at all times, it can hardly be denied that the present situation is qualitatively different, and that anthropology is in danger of losing the largest portion of its laboratory just at the time when investigators have become able to use it most effectively.

To assist SOA in planning an attack on this problem, an advisory conference with financial support from the Wenner-Gren Foundation was held in Washington on April 10–12.

This was attended by 29 anthropologists from abroad and 11 from the U.S. (in addition to Smithsonian anthropologists). As a result, the Smithsonian now plans to take a leading role in the rapid increase in anthropological field research that is required.

J. Lawrence Angel during the summer of 1965 studied skeletons from the first farming populations on the Anatolian plateau (Çatal Huyuk) and on the Macedonian plain (Nea Nikomedeia), dating to the 7th and 6th millennia B.C. About a quarter of the 59 skulls from these sites, located in marshy areas, show a virtual doubling of marrow space (diploe) and another third show lesser signs of this porotic hyperostosis. This is the bony expression of anemia, probably thalassemia and sicklemia. Since the heterozygotes carrying genes for these conditions have increased resistance to *falciparum* malaria, this early occurrence of severe porotic hyperostosis at these easy-to-cultivate marshy sites, but not at early sites in dry areas (Kephala, Khirokitia, etc.), implies that *falciparum* malaria increased greatly in some areas as man settled down in farming villages. This finding parallels Livingstone's observations on modern sicklemia in Liberia, and suggests that in the early Eastern Mediterranean we are getting close to the provenience of origin of the mutation which produced *Plasmodium falciparum* from the better tolerated parasite *P. malariae*.

The Smithsonian Office of Anthropology in December 1965 inaugurated a new series, *Smithsonian Contributions to Anthropology*, that replaces the Institution's former series in anthropology. The new series introduces a larger size, double-column page, with a format that makes for a more effective presentation of illustrations, and its subject matter is not restricted to one geographical region as was that of the older series. Volume 1 is a definitive monograph on one aspect of the archeological work that the Smithsonian Institution conducted cooperatively with the late Emilio Estrada of Guayaquil, Ecuador, from 1954 through 1961.

Written by Betty J. Meggers, Clifford Evans, and Emilio Estrada, the study, *Early Formative Period of Coastal Ecuador: The Valdivia and Machalilla Phases*, suggests that the earliest pottery making culture in South America is the Valdivia Phase, dated by carbon-14 at between 5150 ± 150 and 4270 ± 60 years

ago, and it argues provocatively that the pottery is a trans-Pacific introduction by an accidental drift from the Island of Kyushu, Japan. In addition to this speculative hypothesis the study adds considerable information on the culture sequences of the Andean area of South America, especially concerning the highly important transition from wild food collecting to the introduction of agriculture.

The bamboos, economically one of the most important groups of flowering plants, received a fresh treatment in Floyd A. McClure's work *The Bamboos* published in 1966. The book, based on a lifetime of experience, deals with the propagation and use of this versatile plant, as well as with its morphology and taxonomy.

Too often treated only from the classical and traditional viewpoints, the algae and other marine plants are difficult subjects for study in the classroom. E. Yale Dawson's new book, *Marine Botany*, presents a concise and readable text in a single volume especially adapted for class use. There are sections on marine flowering plants, food chains, algal physiology, commercial uses of algae, and algal ecology, as well as the systematics of algae, the sum of which has never appeared before in a college textbook in English. Dawson's book transects disciplinary lines within the broad field of marine botany and is certain to become a model of its kind.

In a single step, the Smithsonian Institution has now become one of the important repositories of algal specimens in the United States. By securing the marine herbarium of the Beaudette Foundation and by negotiating a long-term loan for the algal herbarium of the Hancock Foundation, the Institution now has outstanding competence for research on the marine floras of Pacific North America and the islands of Oceania. These rapid advances were the result of the energy and resourcefulness of Dawson, who had rapidly established a vigorous program of algal research and collection at the Smithsonian during the past year, prior to his tragic death in Egypt in June 1966.

Ostracodes are microscopic arthropods that leave an abundant fossil record. The history to be learned from their remains may reflect changes in shorelines, formation of estuaries, drying up of lakes, and elevation or depression of the deep ocean floor. Dr. Richard H. Benson and his associate Dr. Rosalie F.

Maddocks, who recently have been active participants in the International Indian Ocean Expedition, are studying modern ostracode faunas from many parts of the world, with the double objective of developing more precise methods of making historical and environmental interpretations from fossil ostracode assemblages and of contributing to a fuller understanding of the history of the ocean basins. Computer analysis of species distribution patterns in coral reef environments of northern Madagascar has reaffirmed the trustworthiness and usefulness of ostracode assemblages as sensitive indicators of environmental change. A similar analysis of Arctic and northern Pacific ostracodes has successfully demonstrated that the Bering Strait has not been a significant passageway for migration of marine bottom-dwelling animals, at least since the beginning of the Ice Age.

This past year important field studies on Lepidoptera were undertaken by Donald R. Davis in the Philippines in concert with scientists from San Carlos University. An unsuspected relict Paleartic fauna was discovered on Mount Apo in southern Mindanao Island. The only previously known relict Temperate Zone insect fauna in the Philippines had been known from northern Luzon, far to the north. Presence of certain birds such as the Mount Apo bullfinch and the newly discovered Mindanao serin finch tend to underscore the importance of the highlands of Mindanao as refugia for old, relict invasion animals and plants.

During a trip to Egypt, the new chairman of the department of entomology, Karl V. Krombein, made an exchange which has brought to our collections a few of the stored-products pests found in alabaster vases from the tomb of Tutankhamen. These represent several extant species of beetles whose larvae feed on dried vegetable matter, such as cracked grains, spices, or milled products. The beetles, recovered from tightly sealed vases, definitely date from the year of Tutankhamen's burial some 3,500 years ago. Except for fossilized forms, these are the oldest insects in the Smithsonian collections.

Since July 1965 the department of vertebrate zoology has become increasingly involved in the development of research programs which depend for their success on collaborative relationships with scientists representing a variety of disciplines.

Although some of the programs to be mentioned below involve groups of organisms other than vertebrates, Smithsonian participation in these programs has stemmed from the enthusiastic interest of its vertebrate zoologists.

Through the support of the Office of Ecology under Helmut K. Buechner, the department of vertebrate zoology in January 1966 participated in the establishment of the Area de Pesquisas Ecologicas do Guama (APEG), Belém, Brazil. APEG was established through a series of official announcements by Dr. Jose Maria Conduru, Director of the Instituto de Pesquisas e Esperimentacão Agropecuarias do Norte (IPEAN). In addition, a Commission for the Coordination of Research Activities was formed to review and coordinate research at APEG. A primary objective of APEG is the establishment of a broad program of basic research on the ecology of the Amazonian forest—one which will also offer scientific training directly related to regional needs. Both the Smithsonian and IPEAN are collaborating in the development of a scientific program for APEG through the provision of grants from the Smithsonian and of facilities, personnel, and equipment from IPEAN. From this support have sprung research programs on soils, botany, entomology, and epidemiology. Other institutions participating with IPEAN and the Smithsonian are the Belém Virus Laboratory (Instituto Evandro Chagas), the Museu Paraense Emilio Goeldi, the Escola de Agronomia de Amazonia (Belém), the University of Brasilia, the Faculdade de Filosofia (Rio Claro, São Paulo), and INPA (Manaus). These institutions are all represented in the membership of the Commission for the Coordination of Research Activities on APEG.

The Smithsonian Institution historically has a deep interest in problems of tropical biology, in which perhaps over half its scientists have at one time or another specialized, especially in Brazil and adjacent countries of northern Latin America. The recently renamed Smithsonian Tropical Research Institute (STRI—formerly the Canal Zone Biological Area), which administers the Barro Colorado Station in the Panama Canal Zone, has a continuing role to play in the expansion of collaborative activities with Latin American scientists. It has established marine stations in the Panama area at Fort Amador on

the Pacific and at Galeta Island on the Atlantic. Important work in tropical animal ecology is proceeding at STRI under Dr. Moynihan's vigorous direction. Some of these studies are outlined further on in this report.

We view these components of our activities as a valid and highly productive part of the developing United States segment of the International Biological Program.

Activities in history at the Smithsonian include research into and eventual publication on a wide variety of problems in the history of various aspects of science and military and naval history as well as the history of economics and technology.

Howard I. Chapelle has completed a history of ship design in the United States during the period of sail. The book will be published next winter by Norton under the title *Search for Speed Under Sail in North America, 1700–1855.*

Elvira Clain-Stefanelli published what we believe to be the first up-to-date history of numismatic research, "Numismatics, An Ancient Science," (Paper 32 in *Contributions from the Museum of History and Technology*, 1965).

Bernard S. Finn completed an elaborate study of the telephone research of A. G. Bell, based upon experimental study of the characteristics of the original instruments in our collection. Publication is expected in the *Smithsonian Journal of History.*

Sami K. Hamarneh completed a catalog of the medical manuscripts in one of the most important Near Eastern libraries, the Zahiriyah National Library, Damascus, Syria. The work (in Arabic) will be published in Syria. This work was supported in part by a grant from the Fluid Research Fund.

Melvin H. Jackson is undertaking, with a Dutch collaborator, the preparation for publication of an extraordinary collection of 18th-century drawings of the operations of the Royal Brass Foundry at Woolwich, England.

Peter C. Welsh organized and carried out two notable special exhibits, "The Art and Spirit of a People" and "The Trotter in America," both of which involved recently acquired collections. For each he prepared and the Smithsonian published a catalog.

John H. White, Jr., has completed a manuscript, "Representative American Locomotives Before 1880." This work features engineering drawings of fifty locomotives, no less than

half of which have not heretofore been represented by drawings. This work was supported by a Smithsonian Research Awards grant.

Deborah J. Warner completed a biographical article (*American Scientist*, vol. 54, 1966) on an unusually elusive figure in the history of American astronomy—George Willis Ritchey (1864–1945), who was the pioneer designer of big telescopes.

In connection with work undertaken in furthering the eventual development of the Armed Forces Museum, Assistant Director J. S. Hutchins commenced a study of the development of horse equipments used by cavalry, light artillery, and mounted infantry troops in United States service.

Research in the archives of the Smithsonian, developed during the past year by Samuel T. Suratt, holds much promise for the future. Much of the history of American scientific activity during the 19th century reposes in these records and documents. A certain exposure of the value of these materials will undoubtedly come through the work in future years of Nathan Reingold on the Joseph Henry Papers, a project of paramount importance in the history of science in America which we hope will be undertaken under the sponsorship of the American Philosophical Society, the National Academy of Sciences, and the Smithsonian.

This year marks the completion by John A. Pope of the monumental work "The Freer Chinese Bronzes" to appear in 1967 in two volumes, it will be a major addition to the subject, owing to the wide range and quality of the Freer collections.

Continued vitality and energy has been evidenced in the work of the National Collection of Fine Arts and the National Portrait Gallery. Three exhibitions at the National Collection this year included important catalogs containing research material brought together by the staff: Mrs. Adelyn Breeskin's *Roots of Abstract Art in America 1910–1930*; Richard Wunder's *Frederic Edwin Church*, for a retrospective exhibit of the great American landscapist; and David W. Scott's *American Landscape, a Changing Frontier*.

Both these galleries plan a major move during the coming year into the imposing Patent Office building, a long-heralded event of great importance to Washington and to the Nation, affording as it will identity to these organizations, a sense of unity, and a

strong commitment to research in American art, and in biography and iconology.

PHYSICAL DEVELOPMENTS

Much of the life of the Smithsonian centers round the Mall, that stretch of greensward which epitomizes for so many Americans the very heart of the Nation's Capital. As a member of the President's Temporary Commission on Pennsylvania Avenue and the Mall, the Secretary of the Smithsonian is but demonstrating the historic interest which the Institution has always had in the Mall and its surroundings. Under its original charter in 1846 the Smithsonian was granted a park encompassing land on the south side of the Mall from Ninth to Twelfth Street. Its first Secretary, professor Joseph Henry, was much concerned with Smithsonian Park and wrote in his pocket diary in July 1848

> The idea has occurred to me that the Mall might be made one of the most delightful places in the United States by filling up the canal, planting the ground with clumps of *native ornamental* trees and making a broad gravel road entering around the whole, extending from the foot of Capitol Hill to the Monument. This would be one of the finest "drives" in the World.

How right he was. The Mall can be and should remain one of the most magnificent and beautiful spots in the world. The Smithsonian is deeply committed to supporting and encouraging all those concerned with the Mall in their plans for keeping it as an inspiring and enlivening heartland for the American people. Let it never be sterile and dull. Let it always be lively, vigorous, restful, varied, and above all, beautiful.

Plans proceed apace for preserving and renovating James Renwick's delightful and entertaining Smithsonian castle on the Mall. It is our plan that the spirit of Renwick's design for this building will be preserved, but redesigned for amenities in such a way that it will stand as visible symbol of the paramount intellectual position and stature of the Institution it houses. Renwick's designs were among thirteen submitted to the Special Committee of the Regents who went in search of a building to epitomize the Smithson bequest. Prominent among these was Robert Dale Owen, Congressman from Indiana, whose taste and style had such an impact on the early Smithsonian, and whose brother David, the geologist, selected the stone for the

building. His lineal descendant in Congress today, the Honorable Winfield K. Denton of Indiana, with whom the Secretary journeyed this past summer to New Harmony to visit the home of the Owens, has served as chairman of a subcommittee of the House of Representatives charged with overseeing the Federal appropriations of the Institution. It is a pleasant coincidence indeed.

The Regents chose Renwick after a searching survey of monumental public buildings on the Eastern Seaboard which included presumably not only Renwick's Grace Church (1843) and Saint Patrick's Cathedral (1853–87) in New York City, but also such outstanding buildings as the House of Refuge and the Eastern Penitentiary in Philadelphia, and the State Lunatic Asylum in Trenton. The subcommittee could hardly be accused of lack of diligence.

The proposed and dramatic moves of the National Collection of Fine Arts and the National Portrait Gallery have already been mentioned. This year plans are under way for the redesign and renovation of the Smithsonian Arts and Industries building of 1879–81 which stands on the Mall next to the Renwick Castle. Now to be rechristened "Exposition Hall," the building was designed by Clauss and Schultz in a fanciful manner reminiscent, in plan, of the great 5th-century basilica of St. Simon Stylites in the Syrian Desert. Just a few years before Clauss and Schultz created their design, this remarkable basilica, with its central octagon sending out four naves of equal length, had been brought to the attention of the western world by the Count de Vogüé's monumental publication on the early Christian buildings of Syria. He and subsequent scholars have been uncertain whether the central octagon had been crowned by a dome above the column on which the saint had sat in self-mortification for over two decades. The American architects thoughtfully provided us with a polygonal dome. Goode (1897)* called the design "admirable" as an exhibition building, which it is, but wrote that it is neither "externally or internally . . . as pleasing or dignified as would have resulted from the use of a more expensive system of construction and more costly materials." To be sure it was built of brick, but it is light and airy inside,

* *The Smithsonian Institution, 1846–1896*, edit. George Brown Goode (Washington: Smithsonian Institution, 1897).

and is indeed admirably designed for its purposes, as modern architects like Buckminster Fuller would probably testify. It is, moreover, a charming reminder of a whole period of "exposition" architecture. The Smithsonian is undertaking additional studies to make its immediate surroundings in "Smithsonian Park" more gracious and appealing, more in keeping with the spirit of the Mall.

Plans for another Renwick building, the original Corcoran Art Gallery on Pennsylvania Avenue at Seventeenth Street, are also under way. Recently used by the Court of Claims, this stylish gallery, in a 17th-century French mode, amply deserves the renovation and restoration which the late President Kennedy and the Fine Arts Commission under its talented chairman William Walton decreed for it. President Johnson has taken the keenest personal interest in its allocation to the Smithsonian as a center for decorative arts and design where, near Blair House, it can convey to foreign heads of state a certain sense of the reality of American fine arts, style, and aesthetic creation—part of the American dream.

The most notable contributions of the President and Mrs. Johnson to the artistic life of the capital, and indeed of the Nation, occurred this year when, as a result of their direct concern and intercession, Mr. Joseph H. Hirshhorn decided to present his collection of nearly sixty-seven hundred objects of painting and sculpture to the United States. The Smithsonian will act as custodian of this vast collection, valued at in excess of twenty-five million dollars. This is one of the three great art events of this century in Washington, the others being the Charles Lang Freer Gift of 1915 and the Andrew W. Mellon gift of 1938, continued so munificently by himself and his children. A site has now been chosen and approved by the Congress for this great Hirshhorn collection.

This year, too, marked the authorization of a National Air and Space Museum building for the Museum that was first established by Congress in 1946 as a Smithsonian bureau. This Museum is destined to become a vital center for education and historical research to which will come scholars, historians, and professionals from many fields of learning to study its comprehensive reference collections.

An additional and most important project of the year was the

230-457—66——3

creation of the Chesapeake Bay Center for Field Biology on parcels of land known as Java Farm and Ivy Neck on the western shore of Chesapeake Bay south of Annapolis. This research center, a collaborative venture with the Johns Hopkins University and the University of Maryland, has been made possible through the original bequest of Robert Lee Forrest, through a most stimulating and seminal grant of $375,000 from the Ford Foundation, and through the collaboration of the Colhoun family, relatives of the late Miss Adelaide Murray, former hereditary owner of Ivy Neck. More recently, a grant of $100,000 from the Research Corporation has given the Smithsonian an additional most valued contribution toward the funds needed to complete land acquisition.

This past year has witnessed the setting up of the National Foundation for the Arts and Humanities, with its component Endowments, and the Federal Council on the Arts and Humanities, of which latter body the Secretary has been asked to serve as Chairman. This is an honor which the head of the Smithsonian accepts with the assumption that it has a certain significance beyond mere symbolism. The relationships of the Foundation, the two Endowments, other agencies of government and the cultural scene generally deserve careful understanding and analysis. To these relationships the development of the National Science Foundation bears certain analogies. Above all, the future relations of these Foundations to the components of American education present fascinating opportunities for study and instruction. Art is still largely free of directed, or fraternally controlled management by the apparatus of education. The directions taken by the humanities, on the other hand, depend largely upon the interests of higher education, especially upon research in the graduate departments of universities.

The university is an omnium gatherum today in the United States. As Robert Hutchins recently said, in addressing the Fund for the Republic convocation on the university, held in Los Angeles on May 8, 1966: "The responsibility of the professions for the preparation and induction of neophytes, the operation of training schools and research institutes outside the university, and a break of the greatest significance between secondary and higher education are the general rule in other countries," but are

unknown or *exceptional* in the United States [italics mine]. Every other nation assigns some tasks of education, training and research to other institutions. Nowhere else is it automatically assumed that everything anybody wants by way of educational experience beyond the high school or anything anybody would like to see done by way of solving practical problems, collecting data, investigating the universe, or cleaning up the landscape may as a matter of course be a function of the university."

Presumably the reason the National Foundation on the Arts and Humanities is not a part of the Office of Education is in partial recognition of the fact that support for the arts and humanities should relate to people, to groups and organizations not directly connected with the degree-granting processes. This has often been a problem for the National Science Foundation, which to some considerable extent has had to assume that science is performed by groups in laboratories, and that priorities for science may depend on relationships to national goals in education. Let us hope that the arts and the humanities can remain free from any dominating institutional pattern, on the highest plane of creativity and original research.

LEARNING

The Smithsonian Institution is much interested in the present condition of learning. We are concerned to relate our bureaus and offices to those in higher education at various levels. The Institution hopes to join with other institutions in the city to foster an international center for advanced studies; we shall continue to develop individual programs with universities. We now have programs with 17 for the training of graduate students. Last year 35 graduate students and 12 postdoctoral fellows worked in bureaus of the Smithsonian, while some 50 undergraduates had various term appointments to study at the Smithsonian, including summer training courses. All this is an appropriate evocation of our original purposes and our duty indeed to the cause of learning. In the coming year we hope to extend our work with students and specialists into a study of exhibit techniques and audience responses which may prove to be of direct benefit to the cause of education and its relation to the state of learning in our country.

STAFF CHANGES

Important changes took place within the Secretary's immediate staff during the year. Dr. Sidney R. Galler, formerly head of the Biology Branch in the Office of Naval Research, was appointed to the position of Assistant Secretary (Science). This position had been unfilled since T. Dale Stewart's return to fulltime research in the Office of Anthropology.

A Public Information Office was established to bring together the press office and other responsibilities for public information which had been shared by several offices. The first director of the new office, B. Richard Berg, came to the staff from the George Washington University.

After more than seven years of service as a staff assistant to the Secretary, Dr. T. W. Taylor resigned to accept appointment as Deputy Commissioner, Bureau of Indian Affairs.

Robert C. Cunningham, who had joined the staff in 1964 to organize the Smithson Bicentennial Celebration and later to manage the Development Office, left the Institution to return to secondary education.

The Institution's largest museums gained new directors. Dr. Richard S. Cowan, a member of the department of botany from 1957 and Assistant Director of the Museum of National History since 1962, became Director of the Museum, succeeding T. Dale Stewart. Dr. Robert P. Multhauf was appointed the second director of the Museum of History and Technology after John C. Ewers' return to the Office of Anthropology as senior scientist.

Upon the retirement of Paul H. Oehser as Chief, Editorial and Publication Division, Anders Richter came to the Institution from the University of Chicago Press. Under Mr. Richter's direction this division has been reorganized into the Smithsonian Press.

THE BOARD OF REGENTS

The membership of the Board of Regents remained unchanged. The roll of Regents at the close of the fiscal year is given on page iii.

The customary informal dinner meeting, preceding the annual meeting, was held on January 26, 1966, in the Great Hall of the Smithsonian Institution Building. Dr. Harold Stern, Assistant Director of the Freer Gallery, spoke on Japanese hand scrolls; Mr. Charles Olin, Chief of the Conservation Laboratory, spoke on the Smithsonian's new conservation program. Mr. Donald McClelland, Assistant to the Director of the National Collection of Fine Arts, gave a presentation on the White House Art Project. The annual meeting was held on January 27, 1966, in the Regents Room.

The spring meeting of the Board of Regents was held on May 17, 1966, in the Regents Room. At the conclusion of the meeting a brief installation ceremony was held in the Great Hall to recognize the recent appointments of Dr. Richard S. Cowan as Director of the Museum of Natural History and Dr. Robert P. Multhauf as Director of the Museum of History and Technology. The reception was followed by an informal dinner in the Associates Hall.

FINANCES

Federal funds appropriated to the Institution for its regular operations for the fiscal year ended June 30, 1966, totaled $18,921,000 and were obligated as follows (Appendix 1 contains a report on the private funds of the Institution):

Astrophysical Observatory	$1, 164, 000
International Activities	31, 000
International Exchange Service	121, 000
National Air and Space Museum	385, 000
National Armed Forces Museum Advisory Board	91, 000
National Collection of Fine Arts	430, 000
National Portrait Gallery	258, 000
Radiation Biology Laboratory	336, 000
Tropical Research Institute	213, 000
United States National Museum	7, 013, 000
Research Awards	335, 000
Office of the Secretary	324, 000
Management Support	237, 000
Buildings Management Department	6, 063, 000
Administrative Services	1, 894, 000
Unobligated	26, 000

VISITORS

Visitors to the six buildings comprising the Smithsonian complex on the Mall this year totaled 12,150,854, of whom 3,895,758 came in July and August. The greatest number of visitors for a single day was 114,441 on April 9, 1966. The tabulation on page 18 gives a summary of attendance records for the six buildings. The National Zoological Park had an estimated 4,383,463 visitors during the year. This figure, added to the attendance in the Institution's buildings on the Mall, and to the record 1,577,108 at the National Gallery of Art, brings the total Smithsonian attendance for fiscal 1965 to 18,111,425.

RECORD OF VISITORS DURING FISCAL YEAR 1966

July 1, 1965–June 30, 1966

Month	*Smithsonian Building*	*Arts and Industries Building*	*Museum of Natural History*	*Air and Space Building*	*Freer Gallery of Art*	*Museum of History and Technology*	*Totals*
July (1965)	104, 235	277, 514	400, 278	281, 625	35, 435	762, 067	1, 861, 154
August	89, 686	330, 232	468, 120	295, 850	38, 235	812, 481	2, 034, 604
September	52, 769	101, 193	147, 409	90, 047	18, 417	292, 019	701, 854
October	51, 473	81, 121	136, 977	64, 491	10, 934	260, 275	605, 271
November	45, 960	69, 481	131, 860	54, 943	12, 222	254, 731	569, 197
December	32, 439	44, 254	104, 767	42, 169	8, 750	152, 030	384, 409
January (1966)	25, 417	35, 623	79, 450	30, 941	6, 786	108, 993	287, 210
February	32, 038	48, 047	114, 476	43, 752	7, 828	131, 958	378, 099
March	52, 474	77, 379	159, 475	68, 114	11, 301	203, 211	571, 954
April	155, 167	254, 494	500, 171	205, 112	30, 190	737, 319	1, 882, 453
May	102, 293	192, 079	388, 732	146, 190	19, 642	550, 454	1, 399, 390
June	126, 059	235, 298	356, 291	171, 688	22, 349	563, 574	1, 475, 259
TOTALS	870, 010	1, 746, 715	2, 988, 006	1, 494, 922	222, 089	4, 829, 112	12, 150, 854

Smithsonian Activities

Office of the Secretary

OFFICE OF INTERNATIONAL ACTIVITIES

WILLIAM W. WARNER, *Director*

On March 7, 1966, the Institution established an Office of International Activities. William W. Warner, who joined the Smithsonian staff in March of 1964 as a consultant to the Secretary, was named its first Director.

Broadly conceived, the role of the Office of International Activities is to promote international programs in those disciplines or fields of study which find relatively little support from other sources, and in particular, those areas of basic research in the sciences and humanities where further advancement of knowledge in this country requires continuing and strong cooperative research programs with other nations. These programs benefit not only the Smithsonian, but many other American institutions. The Office also serves as the Institution's point of liaison with government agencies and international organizations dealing with international matters of interest to the Smithsonian.

The Director represents the Institution on such working groups as the Department of State's Interagency Council on International Educational and Cultural Affairs, which is a policy-making body for government-sponsored exchange of persons programs; the Cultural Activities Committee of the United States National Commission for UNESCO; and the International Committee of the National Trust for Historic Preservation.

Beyond these basic responsibilities, the Office also helps other elements of the Smithsonian in the establishment of research projects or exhibit programs which involve substantial participation of foreign institutions or the international exchange of scholars. Examples range from an Archeological Survey of Brazil to a proposed scientist-exchange program with the Leningrad Institute of Zoology. Once established, some of these programs are directly administered by the Office of International Activities. More often, however, they are administered by the organizational units within the Smithsonian that are most interested or have greatest competence in the subject matter of the program.

SPECIAL FOREIGN CURRENCY PROGRAM

Fiscal Year 1966 saw the Smithsonian receive its first appropriation of excess foreign currencies deriving from the sale of agricultural

surplus under Public Law 480, in order to undertake a grant program for archeological excavation or research in the so-called excess-currency countries. At the beginning of the year Kennedy B. Schmertz, a former Foreign Service Officer with experience in the Near East, was appointed director of the Smithsonian's Foreign Currency Program within the Office of International Activities. By the end of the year, a total of $1,250,000 in foreign currencies had been granted to some 21 American universities or museums. (A list of grants is found in Appendix 2)

Among the major recipients of first-year grants were the American Research Center in Egypt and the Hebrew Union College-Jerusalem School of Archeology. The former is a consortium of ten American universities, with headquarters in Boston, Massachusetts, and an overseas office in Cairo, which was established in 1948 to facilitate the research or excavations of the member institutions in Egypt. The Smithsonian's grant permitted the Center to field six archeological projects during the 1966 season, ranging from the excavation of Fustat near modern Cairo, which was a great Arab capital and trading center in the Middle Ages, destroyed during the Crusades, to a study of the hieroglyphics of the temples of Rameses II at Karnak. The Hebrew Union-Jerusalem School of Archeology grant was used to support a seminar on Near Eastern Civilization for American graduate students and to excavate at Gezer in southern Israel. This excavation uncovered a massive "cyclopean" defense tower dating from the 19th century B.C. and provided the first archeological proof that the city of Gezer was destroyed by Nebuchadnezzar.

In the exercise of this program, the Institution has been especially interested in supporting projects in those excess-currency countries where American institutions have had little or no opportunity for archeological investigation. For this reason special attention was given to the establishment of the American Academy of Benares through a grant to the American Institute of Indian Studies at Poona, a research center administered by the University of Pennsylvania. The guiding purpose of the Academy at Benares is quite clear. Experts have long maintained that the archeology and art history of India are so rich that often the most difficult question is where to begin. The Benares Academy seeks to answer this question by conducting long-range surveys which will document, record, and photograph ancient temples and both above-ground and below-ground archeological sites throughout India, as a prerequisite to the determination of intelligent research priorities. With the appointment of Dr. Pramod Chandra of the University of Chicago as resident director, the Academy began operations in September 1965 in the historic Rewa

Palace building generously provided by the Hindu University of Benares. Shortly after establishment of the Academy, the Smithsonian was pleased to acknowledge a grant of $56,750 from the John D. Rockefeller III Fund to meet the necessary dollar costs which are mainly for equipment unobtainable in India and for the travel within the United States of Indian scholars connected with the Academy.

Other noteworthy achievements during the first year of the Foreign Currency Program include:

The Peabody Museum of Natural History of Yale University excavations of the El Fayum badlands of Egypt, which have unearthed fossil remains of the oldest known land mammal of the African Tertiary and various examples of Oligocene primates ancestral to both man and the apes.

The University of Missouri-Corning Museum of Glass survey and excavations of ancient glass factories along the Phoenician coast of Israel, which uncovered a massive nine-ton slab of opaque raspberry colored glass in an abandoned cistern of the ancient city of Beth She'arim. The site has since been converted into a small museum.

The award of a joint dollar-foreign currency grant, with the Atomic Energy Commission, to the Lawrence Radiation Laboratory of the University of California, to test the practicability of X-raying Egyptian pyramids for unknown interior chambers. The first tests are being made on the Second Pyramid at Giza.

As the Smithsonian's Foreign Currency Program developed through the year, the Institution received many expressions of interest and support from American scholars, the Congress, and United States Embassies abroad. Ambassador Chester Bowles in a letter to Secretary Ripley urged the Institution to become more and more involved in promoting archeological studies in India. Professor Robert Adams, Director of the Oriental Institute of the University of Chicago, characterized the program as "an important breakthrough in funding overseas research in archeology and related disciplines." Congressman Leonard Farbstein, in the course of House hearings on the utilization of U.S.-owned foreign currencies, commended the Smithsonian for the rapidity and efficiency with which its program was established and termed it "a very satisfactory addition to the manner of disposition of the funds that we have been collecting in these various countries."

Toward the close of the year under review, the Congress granted the Smithsonian a substantially increased foreign currency appropriation and also authority to extend the program to other fields of Smithsonian interest, especially projects in systematic and environmental biology which support the goals of the International Biological

Program. With this in mind, the Director travelled to Yugoslavia and Poland in the spring of 1966 to explore the possibilities for supporting binational research projects using excess currencies in both those countries. Similar program explorations were carried out in Tunisia, Guinea, Pakistan, and Ceylon.

EXCHANGE OF PERSONS PROGRAMS

By a working agreement with the State Department's Bureau of Educational and Cultural Affairs, the Smithsonian Office of International Activities advises the State Department and other federal or private organizations on promising candidates for international exchange programs in fields of Smithsonian competence. Suggestions concerning American scholars to fill Fulbright and other openings abroad are usually forwarded to the Conference Board of Associated Research Councils. Suggestions concerning foreign scholars or museum curators who might benefit from study at the Smithsonian or kindred institutions in the United States are forwarded through the Department to Cultural Affairs Officers in U.S. Embassies overseas.

In addition, the Office helps in or assumes total responsibility for programming the visits of foreign grantees coming to the United States under State Department or other exchange programs. Following the Smithson Bicentennial, a six-week study and observation tour was arranged for Dr. Mehmet Onder, Director of Antiquities of the Turkish Ministry of Education, and Dr. Raci Temezer, Director of the Hittite Museum in Ankara, as well as one-week tours for Dr. Hamit Kosay, Director of the Ethnographic Museum of Turkey, and Dr. Tahsin Dolunay, Director of the Topkapi Museum in Istanbul. Following their return to Turkey, the United States Embassy in Ankara reported that the visits of these museum directors had been instrumental in creating a favorable climate for increased exchange of exhibits and increased opportunities for American archeologists wishing to work in Turkey. Dr. Kosay published an account of his visit and his observations of the Smithsonian in the Bulletin of the Turkish Historical Society.

From January to March 1966, Joseph A. Patterson, Director of the American Association of Museums, made extensive visits to museums in the Middle East, Southeast Asia, and the Far East. The purpose of this trip, funded and planned by the Office of International Activities, was first to determine what needs to be done by museums in the developing world in order to better realize their potential for public education and second what American museums can do to help. Mr. Patterson discovered that the priority need, common to all countries visited, was for trained museum personnel, before improved facilities. Although physical plants and exhibit facilities are in most cases inadequate,

Mr. Patterson found that foreign museum directors themselves understood that new museums or new exhibit techniques cannot be successfully planned or maintained without at least a strong nucleus of trained museum professionals in each country. Highlights of his trip included a meeting with Prime Minister Indira Gandhi of India, who expressed herself as extremely interested in museum education, and conferences with Korean officials which laid a firm groundwork for the establishment of a National Science Museum in Seoul.

Brief conferences and observation tours with the Smithsonian's scientific or administrative staff were arranged for a total of 37 foreign grantees coming through Washington under State Department, Agency for International Development, Department of Health, Education and Welfare, and other auspices. A number of these visitors were ranking government officials interested in learning about the organization of the Smithsonian itself, as an example of how federal and private sources in the United States combine to support museums, basic research in the sciences or humanities, and the performing arts. Included in this category were M. Michel Pomey of France, Chief of Mission and General Counsel to the Ministry of Cultural Affairs; Dr. Dusan Popovski of Yugoslavia, Member of Parliament and former head of the Secretariat for Education and Culture; Dr. Zaven Hacobian of Iran, Director General of the Cultural Relations Department of the Ministry of Culture and Arts; and Mr. Mapatunage James Perera of Ceylon, Permanent Secretary of the Ministry of Education and Cultural Affairs. Other visitors were primarily interested in museum administration or museum education; among them were Dr. Abdem Ramon Lancini, Director of the Museum of Natural Sciences of Caracas, Venezuela, who came to study the administration of science museums, and a group of ten Ugandan secondary school and college instructors, who conferred with Smithsonian staff members on the role of museums in supplementary primary education.

INTERNATIONAL EXCHANGE OF EXHIBITS

During much of the period under review, Director William W. Warner and David W. Scott, Director of the National Collection of Fine Arts, held meetings with representatives of the United States Information Agency concerning increased Smithsonian responsibility in presenting exhibits of American art abroad. In the view of USIA officials, a true exchange program in the fine arts—that is, both the sending of American exhibits abroad and the circulation of exhibits of foreign provenance within the United States—might best be administered by a single institution internationally recognized in the field. Since USIA was prevented by statute from the domestic circulation of

foreign exhibits, while the Smithsonian had long been engaged in presenting foreign art to American museums through its Traveling Exhibition Service, the Institution seemed to USIA the logical organizational home for a two-way exchange program in the fine arts.

Accordingly, in November 1965, an agreement was signed in which the Smithsonian took on responsibility for presenting American art exhibits abroad, including American representation at the Venice and São Paulo Biennials. The agreement encompassed only the fine and decorative arts, with USIA retaining responsibility for all other kinds of exhibits. USIA agreed to provide guidance on international cultural relations factors and a system for communicating requests for exhibits from foreign museums or galleries, through the good offices of Cultural Affairs Officers at U.S. diplomatic posts abroad. The Agency also agreed that its overseas posts would assist in scheduling and publicizing all exhibits sent abroad by the Smithsonian.

The first major exhibit undertaken by the Smithsonian following the transfer of responsibility was the United States entry at the thirty-third Venice Biennale, which opened in the American Pavilion in Venice on the 18th of June. An account of this and other exhibits under the new exchange program is found in the report of the National Collection of Fine Arts (p. 281).

In conjunction with the Traveling Exhibition Service and the NCFA, the Office also assisted in making arrangements for the Washington showings of various exhibits of international significance. These included *Embroideries by Children of Chijnaya*, an exhibit of embroideries made by Indian children of the Puno highlands of Peru and assembled by Peace Corps Volunteers, which opened at the State Department and subsequently toured 23 American museums with wide critical acclaim, including feature articles in the *New York Times Magazine* and *Woman's Day; The World of Peru*, a photographic panel exhibit depicting Peru's archeology, architecture, folk arts, natural history and industry, which opened at the Museum of Natural History; and *The Preservation of Abu Simbel*, a photographic and 3-dimensional exhibit prepared by the University of Pennsylvania and the National Geographic Society designed to create interest in the campaign of the American Committee to Preserve Abu Simbel, which also opened at the Museum of Natural History and was later enthusiastically received by some 18 museums across the nation.

In addition, the Office assisted with the scheduling of *Art Treasures of Turkey* by providing a tour for three Turkish museum curators who visited the ten major cities where the exhibit was subsequently shown, in order to make advance arrangements and advance planning of installations.

THE SMITHSON BICENTENNIAL

The Office Director served as Chairman of the Committee on Foreign Invitations, which had the responsibility of determining the foreign invitation list for the Bicentennial. Since the Washington expenses of all foreign guests were provided for by the Institution, there were obvious budgetary limits to the numbers invited. The formula eventually adopted was to invite directors of prominent museums, zoological parks and botanical gardens from the world over and to invite representatives from such universities, research organizations or other institutions of higher learning as had historical or contemporary ties with the Institution. Similarly, individual foreign scholars or scientists who had carried out research at the Smithsonian or otherwise collaborated with the Institution were also invited. In addition, invitations were sent to all Ministers of Culture or Education in countries with which the United States has diplomatic relations.

The Office staff assisted the Bicentennial staff in advising foreign guests on appropriate institutions and individuals to contact in their travels within the United States following the Bicentennial celebrations.

But perhaps the greatest benefit of the Bicentennial, in the view of the Office of International Activities, were the many opportunities to confer with foreign scholars and museum curators concerning future collaboration or the establishment of programs of common interest. Thus, for example, conversations were held with Drs. Mohamed Jacoub and Mohamed Masmoudi, Directors of Tunisian National Museums and the Sfax Ethnographical Museum, respectively, and Dr. Kazimierz Michalowski, Deputy Director of the National Museum in Warsaw, concerning extension of the Foreign Currency Program to Tunisia and Poland. Discussion concerning cooperative museum projects were held with Dr. Karl Katz, Director of the Bezaliel (National Museum) in Israel, Dr. Ajit Mookerjee, Director of the National Crafts Museum of India, and many others.

CONFERENCES

Early in December the Office of International Activities sponsored a small working-group conference on problems affecting the rich marine resources of the Peruvian coast. In attendance were representatives from the Department of Interior's Bureau of Commercial Fisheries, the Pan American Union, the National Academy of Sciences, the Conservation Foundation, the Agency for International Development, the State Department, and the Smithsonian itself. The conference was inspired by Secretary Ripley's concern over the alarming decline in the populations of guano-producing sea birds of Peru's coastal islands

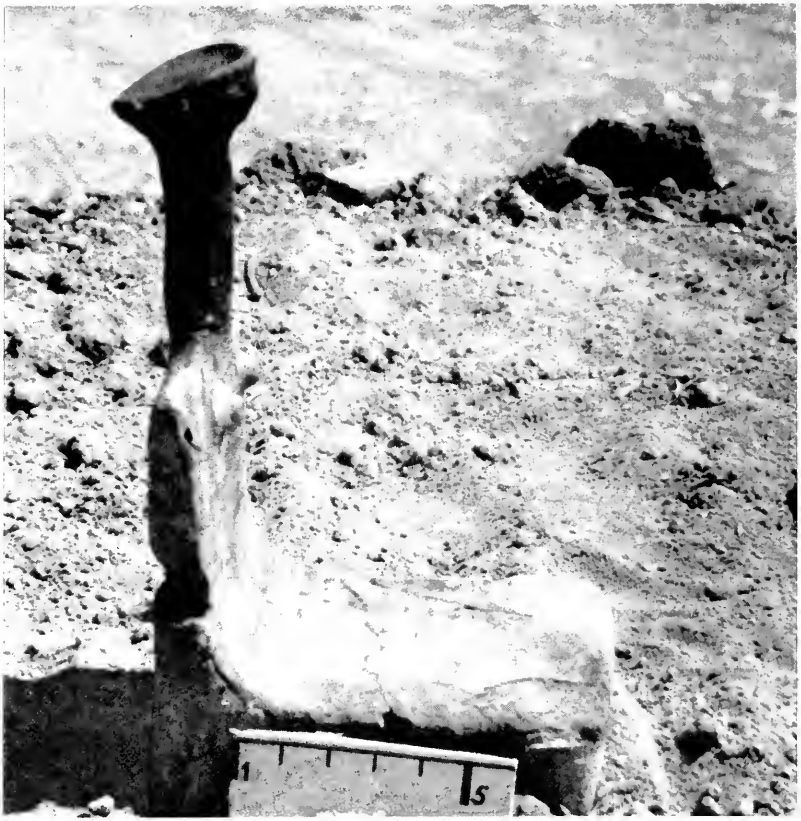
and the need to stimulate research with an ecological approach to the interdependent factors—birds, fish, man's exploitation, variations in the Humboldt current—which influence Peru's marine environments.

Various papers emanated from this conference, and in February, George E. Watson, curator of birds, Museum of Natural History, visited Peru to discuss the need for coordination of existing avian, fisheries, and oceanographic research with appropriate Peruvian scientists and government officials. Watson found that the *Instituto del Mar*, Peru's principal oceanographic center, was extremely interested in intensified and more coordinated research, with the help of appropriate American institutions and international organizations. By the end of the year under review, the Smithsonian forwarded a proposal to the Agency for International Development for funding of a small international conference in Peru, the purpose of which would be to determine how to apply modern systems analyses, with the development of mathematical models and computer simulation, to the interrelated problems of Peru's marine eco-system.

The Office also assisted in planning for the Office of Anthropology Conference on Changing Cultures, held at the Smithsonian in April. This conference, which considered preliminary planning for world-wide research on cultures or groups of peoples whose identity will soon be lost through rapid acculturation, was attended by some 36 foreign delegates whose travel was mainly provided for through the Foreign Currency Program.

In May the Smithsonian played host to the Foreign Service Institute's Senior Seminar on Foreign Policy. A class of 25 senior Foreign Service, U.S. Information Agency, and Department of Defense officers heard Secretary Ripley explain the Institution's general mission, after which various staff members gave briefings on the forthcoming International Biological Program, the Smithsonian Astrophysical Observatory and its role in the International Geodetic Bureau, new programs of the division of education and training, and the Special Foreign Currency Program. Following lunch at the Museum of History and Technology, the class was given a conducted tour of two exhibits in preparation, growth of America and the history of medicine, by MHT Director Robert Multhauf. Ambassador G. Lewis Jones, coordinator of the Senior Seminar, called the visit important and useful, since it gave our senior diplomatic representatives abroad greater familiarity with the Institution's overseas commitments, as well as international scientific programs in general. He therefore made plans to have succeeding Seminar classes visit the Smithsonian on a regular basis.

230-457—66——4



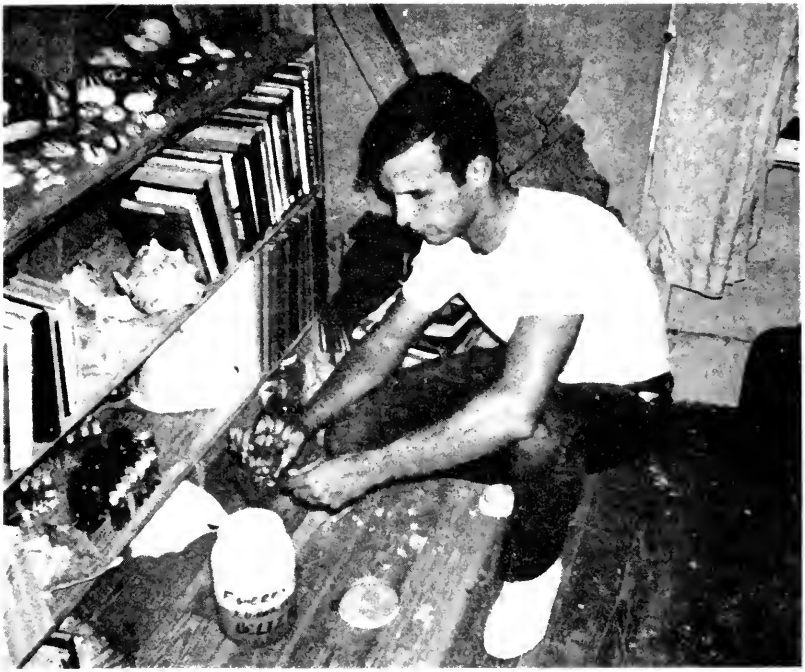
Above: Philistine votive tablet dating from the 11th century, found during the Carnegie Museum–Pittsburgh Theological Seminary excavations at Ashdod, Israel, in July 1965, under the direction of Dr. James L. Swauger.

Projects supported by grants from the Smithsonian Office of International Activities, Foreign Currency Program (see pp. 21–24).

Opposite: Facade of the Rewa Palace (above), a fine example of early 19th century architecture in India, which houses the American Academy of Banares. Symposium (below) on the present-day study needs of South Asian art and archaeology held on April 3, 1966, in the main hall of the American Academy of Benares, Rewa Palace, Varanasi.

←

Overleaf: Egyptian laborers at Mendes, a stratified Pharonic site in the Nile Delta, under the direction of Dr. Donald Hansen of the American Research Center in Egypt.



Under a cooperative program arranged by the Office of International Activities with the Peace Corps (see p. 30), Volunteers in their spare time collect specimens for the Smithsonian. In Placencia, British Honduras, Volunteer James Grover (above) preserves a rare species of lobster, and (below) unearths insect larvae in the "bush" behind his house.

COOPERATIVE PROGRAMS

In February the Pan American Union awarded the first three grants to Latin American biologists for study at the Smithsonian's Tropical Research Institute (STRI), in the Canal Zone, or the Museum of Natural History under a new joint program with the Smithsonian.

The initial grants went to Estanislau Kostka Pinto da Silveira, a vertebrate zoologist with the Brazilian Forestry and Conservation Research Center in Rio de Janeiro; to Maximo Alcides Galvez Riveros, associate professor of biology at the National University in Ayacucho, Peru; and to Brother Daniel Gonzalez Padiño, F.S.C., professor of pharmacology at the University of Antioquia in Medellín, Colombia. Professors Pinto da Silveira and Galvez Riveros are conducting field studies on Barro Colorado Island, while Brother Daniel is studying specimens of the economic plants of Colombia at the Museum of Natural History.

The purpose of this program is to advance basic research in the natural sciences in Latin America by providing the opportunity for systematic biologists to study the Smithsonian's unique collections or, in the case of those primarily interested in environmental biology, the opportunity to carry out field work utilizing the equally unique resources of the Tropical Research Institute. The joint program was evolved by the Office of International Activities and the Pan American Union's Department of Scientific Affairs; it is funded through the Organization of American States' Fellowship Program. Candidates are free to carry out their own research interests or, as the case may be, to serve as research assistants in the on-going projects of the STRI scientists, in order to gain general experience in field investigative methods. It is hoped that this program, now relatively modest in scale, will grow as the opportunities become better known in Latin American universities and the number of qualified candidates increases.

In the field of UNESCO relations, the Office provided study papers for the Department of State concerning the advantages of United States membership in the International Centre for the Study of the Preservation and the Restoration of Cultural Property in Rome, more popularly known as the "Rome Centre," which is an international organization dedicated to the advancement of museum conservation and historical or archeological site preservation, through training programs, consultation and technical publications. The study papers were in part based on a visit to the Rome Centre made by Charles Olin, chief of the Smithsonian's conservation research laboratory. The Office also held preliminary discussions with the Bureau of Educational and Cultural Affairs of the Department of State concerning the

Smithsonian as a potential site for UNESCO conferences of a scholarly or scientific character.

Beginning in July of 1965, the Office of International Activities established a cooperative program with the Peace Corps in which Peace Corps Volunteers overseas collect specimens or make field observations in their spare time, according to the specific needs of Smithsonian curators. The Office Director wrote an article in the *Volunteer*, the monthly magazine sent to Peace Corps Volunteers around the world, explaining the Smithsonian's research objectives and describing the collecting needs of the different departments or divisions. Soon thereafter Volunteers began to respond in significant numbers. The department of entomology has received many insect specimens from Africa and corresponded with Volunteers in 22 countries. The department of mineral sciences and the division of birds have also received significant help, while in the Museum of History and Technology the division of textiles has received photographs and descriptive material on weaving and dyeing processes in Sierra Leone.

Toward the close of the period under review, the Office Director held preliminary conversations with Mr. Jack Vaughn, Director of the Peace Corps, concerning possible Peace Corps-Smithsonian projects utilizing Volunteers in conservation education, ecological surveys and major archeological excavations.

OFFICE OF EDUCATION AND TRAINING

CHARLES BLITZER, *Director*

The programs of the Office of Education and Training fall into two broad categories, reflecting the major activities of the Institution. The first, and larger, category includes those programs directly related to Smithsonian research in science, history, and the arts. The second category includes those programs directly related to the exhibit and public education functions of our museums. In both cases, the programs of the Office are designed to support and strengthen continuing and fundamental Smithsonian activities and, at the same time, to make the results of these activities more widely available to the appropriate groups.

The research-related programs of the Office consist primarily of three sorts of visiting research appointments: for post-doctoral scholars and scientists, for graduate students, and for undergraduates. These appointments serve a number of purposes: they make the enormous resources of the Smithsonian, both in collections and in trained professional staff, available to the scholarly and scientific community;

they bring these resources to bear directly upon the training of excellent students from our universities; they bring to the Smithsonian scholars and scientists whose researches contribute to the fulfillment of our research mission, and whose presence enlivens the intellectual atmosphere of the Institution. Evidence of the need met by these appointments is to be found in the numbers of applications received for the current academic year—a total, after preliminary screening, of more than 500 applications for some 80 appointments in all categories. The National Research Council, which administers the Institution's post-doctoral appointments in the sciences, reports that the ratio of applicants to available positions was the highest in its entire experience.

The names and projects of those appointed for the academic year 1965–66, and the summer of 1965 are listed in Appendix 5.

Cooperative education programs were established between the Smithsonian and nine universities. A total of 17 such programs, aiming primarily at the training of graduate students, now exist. Programs which have been formalized since the publication of the 1965 annual report are:

University of Cincinnati	Paleobiology
Duke University	Marine Sciences
George Washington University	Invertebrate Zoology
Johns Hopkins University	Paleontology
University of Maryland	American Studies
	Fine Arts
	Ornithology
University of Miami	Marine Sciences
University of Michigan	Oriental Art
University of Washington	Oceanography
Yale University	Paleobiology

The Office of Education and Training sponsored six conferences of interest to Smithsonian staff members and their colleagues in the academic community:

1. Seminar on Aviation History (in cooperation with the American Aviation Historical Society)
2. Revision of Smithsonian Institution Meteorological Tables
3. Flora of North America
4. Role of Historic Archaeology in the Study of American Culture and History
5. Veterinary Medicine
6. Political Campaigning in the Nineteenth Century.

OFFICE OF PUBLIC INFORMATION

B. RICHARD BERG, *Director*

To strengthen the Smithsonian's capabilities for keeping the public informed about the expanding programs and activities of the Institution, a Public Information Office was established September 1, 1965. B. Richard Berg was appointed Director, with George J. Berklacy as press officer. William C. Grayson was appointed chief of film and broadcasting on March 15, 1966, and at the close of the fiscal year the audio-visual library also became part of the office, with Mary Ann Friend in charge, and Albert J. Robinson was appointed motion picture and public affairs photographer.

The Bicentennial of James Smithson's birth in September, focused international attention on the Smithsonian and marked the culmination of a number of projects designed to improve public understanding of the work of the Institution. The early history and present diversity of the Smithsonian was documented by Walter Karp in a colorfully illustrated volume entitled *The Smithsonian Institution* published by the Institution in association with the editors of *American Heritage*. The first volume of the *Smithsonian Annual* brought together the scholarly papers presented during the three-day celebration in a volume entitled *Knowledge Among Men* (New York: Simon and Schuster, 1966).

A documentary film on the founding of the Institution was produced by Charles and Ray Eames with a grant from the International Business Machines Corporation, for premier showing at the Bicentennial. This 20-minute historical film, "The Smithsonian Institution," tells the story of James Smithson and his will, the intense debates in Congress over use of the legacy, the founding of the Institution, and decisions by early Secretaries which set the Smithsonian on its present course.

The National Broadcasting Company arranged a nation-wide telecast of President Johnson's historic speech on "The Noble Adventure" of international education to delegates attending the Bicentennial convocation on the Mall, and the Voice of America broadcast the convocation program around the world.

The celebration served as a focal point for a number of major articles in national magazines both here and abroad. The work of the Smithsonian was described in *Nature* (London's weekly journal of science), *Punch*, *Life*, *Business Week*, *American Education*, *Science*, *National Geographic Magazine*, and many other publications. Editorials appeared in newspapers ranging from *The New York Times* to *The Times* (London) to the *Pasco Times* (Texas) to *The Wall Street Journal*.

The number of press releases announcing educational programs and

research results more than doubled during the year. However, more information was provided to the public through direct cooperation with reporters, writers, and photographers than was generated through the production of formal news releases.

More than 78,000 telephone inquiries were handled by the Office's Dial-A-Satellite service, providing recorded messages on satellites and other celestial objects visible in the Washington skies. Prepared by James C. Cornell, Jr., information officer at the Smithsonian Astrophysical Observatory, Cambridge, Massachusetts, Dial-A-Satellite service is also provided to residents in the Boston metropolitan area, in the New York City area through an arrangement with the Hayden Planetarium of the American Museum of Natural History, and in the Philadelphia area through an arrangement with the Fels Planetarium of the Franklin Institute.

A Dial-A-Museum service, providing recorded announcements on museum hours and special events open to the public, is being inaugurated on August 1, 1966, to provide better assistance to the public by making general information accurately and quickly available and to free the Institution's switchboard for more efficient handling of complex inquiries.

In broadcasting, the Smithsonian was represented this year in three half-hour programs on 100 stations of the National Educational Television network featuring the creation of exhibits, the Everglades life group, the hall of everyday life in the American past, and the hall of physical anthropology. These were produced by WETA of Washington in cooperation with the Smithsonian. Other programs included a half-hour documentary on the Smithson Bicentennial, on WRC–TV, and a number of radio programs featuring the cultural activities of the Smithsonian.

Efforts to achieve a full network program on the Smithsonian culminated in 1966 in successful negotiation with NBC for production of the first Smithsonian network television series of 26 programs to start October 15, 1966.

SMITHSONIAN PRESS

ANDERS RICHTER, *Director*

In fulfillment of the founder's prescription for the "diffusion" of knowledge, the Smithsonian has from the days of its establishment placed its weight on the two pillars of publications and exhibits. In his "Advertisement" for *Ancient Monuments of the Mississippi Valley*, the first volume to appear (1848) in the *Smithsonian Contributions to*

Knowledge, Joseph Henry, the Institution's first Secretary, elaborated a most pregnant plan for the publication of scholarly and popular works. The prolific output of over twelve thousand titles in the ensuing 118 years is the natural issue of the first part of Smithson's prescription, for the "increase" of knowledge, for it is a truism that publication is a consequential extension of research. The Smithsonian's publications program partakes of the newly defined emphasis given by the present administration to research and education. The outer manifestation of this, during fiscal 1966, occurred with the creation of the Smithsonian Press and the appointment in May 1966 of a Director to succeed Paul H. Oehser, whose many years of superb service as Chief of the predecessor Editorial and Publications Division and as Public Relations Officer terminated with his retirement in December 1965. The responsibility for public relations was transferred to a separate Office of Public Information. At the close of the fiscal year, the Director of the Press proposed for approval of the Secretary a general reorganization of the publications department. According to this plan, there will be further definition of Press responsibilities through elimination of most non-publishing functions. The Press will continue its strong editorial and design effort in support of the several established series which report the explorations and research of staff and collaborators of the Smithsonian in science, history and art; as well as of more popular publications, such as museum guidebooks and art catalogs. It is expected, however, that the Smithsonian Press imprint will be extended to a greater number of books written as independent works by the staff, by other scholars in the Federal Government, and members of the academic community at large. Inasmuch as the pragmatic definition of publishing is "to make public," it will be necessary to expand the promotion and distribution services of the Press. In keeping with the objectives of the present administration, our purpose is the establishment of a university press of professional and academic excellence.

Under the imprint of the Smithsonian Press are issued ten active series emanating from the various Museums and Bureaus of the Smithsonian. This is a rare advantage to Smithsonian staff members and their collaborators, for few universities offer such a captive medium for reports of research. Much more, the Smithsonian serials constitute a public and scholarly service of extraordinary value, for they enable the publication of reports which fall between the journal article and the book—a most neglected species of publication. The present series are, from the Museum of Natural History, the *United States National Museum Bulletins*, the *Proceeding of the United States National Museum*, the *Contributions from the National Herbarium*, and the *Smith-*

sonian Contributions to Anthropology; from the Museum of History and Technology, the *United States National Museum Bulletins* and the *Contributions from the Museum of History and Technology;* from the National Air Museum, the *Annals of Flight;* from the Smithsonian Astrophysical Observatory, the *Contributions to Astrophysics;* and from the Freer Gallery of Art, the *Freer Gallery of Art Oriental Studies*, *Occasional Papers of the Freer Gallery of Art*, and *Ars Orientalis.* The National Collection of Fine Arts and the Travelling Exhibition Service sponsor a good many art catalogs, and the *Smithsonian Miscellaneous Collections* is a series with no particular source. The titles of all works issued in these series during fiscal 1966 are included in the list of Smithsonian publications in Appendix 3.

The *Smithsonian Contributions to Anthropology* series was inauguarted during the year as a medium for material formerly published in the *Bureau of American Ethnology Bulletins*, which will be discontinued. Another venerable series, the *Annual Reports of the Smithsonian Institution*, was re-designed and named *Smithsonian Year.* The "General Appendix" to the annual report, which formerly contained review essays, was eliminated and in its stead will appear a series of separate *Smithsonian Annuals.* The first such annual, *Knowledge Among Men*, containing the addresses delivered by notable scholars at the bicentennial celebration of James Smithson's birth, was published in June 1966 by Simon and Schuster.

In keeping with its purpose to make available works which describe and interpret its activities and related science to the public at large, the Smithsonian has continued and furthered its cooperative arrangements with private publishers. During the past year Simon and Schuster published the *Smithsonian Treasury of 20th-Century Science.* Edited by Webster P. True, this volume is composed of articles reprinted from the "General Appendixes" of recent annual reports. Under terms of another agreement, the firm of American Heritage assisted in the preparation and production of a beautifully illustrated popular history of the Smithsonian, entitled *The Smithsonian Institution*, which was published upon the bicentennial anniversary of James Smithson's birth.

During the past fiscal year, 109 publications appeared under the Smithsonian imprint. Of these, sixty-eight were funded by the federal appropriation in the amount of $238,319, thirty-eight were issued through Smithsonian private funds in the amount of $225,661, and three were supported by grants and gifts in the amount of $56,526. Among them are two works which must be considered major publishing events.

The initial volume of the *Smithsonian Contributions to Anthropology*

appeared in January. In it, authors Betty J. Meggers, Clifford Evans and Emilio Estrada have, under the innocuous title of *Early Formative Period of Coastal Ecuador, The Valdivia and Machalilla Phases*, adduced detailed evidence in support of a radical theory of trans-Pacific Japanese influence upon the early culture of South America. The book quickly received major reviews and promises to be a landmark in New World archeology. In April the Smithsonian Press scored another major event with issuance of the 4-volume *Smithsonian Astrophysical Observatory Star Catalog*, compiled by the Smithsonian Astrophysical Observatory staff. This work identifies and locates every recorded star in the firmament to the ninth magnitude, more than one-quarter million in all. The work is distinguished further in that its twenty-six hundred pages were produced from computer tapes programmed to project each page on the face of a cathode-ray tube, where it was photographed for offset printing. This basic reference work encompasses information which previously had to be sought in more than fifty separate catalogs.

The publications distribution section of the Smithsonian Press continued to receive requests for publications from libraries, universities, research institutions, bookstores, and individuals throughout the world. A total of 360,781 publications were distributed (exclusive of those distributed by the Superintendent of Documents of the Government Printing Office) as opposed to 341,439 in fiscal 1965. Of these, approximately one-hundred thousand were sent to foreign addresses. In addition, 551,642 Smithsonian information leaflets were printed for the use of Smithsonian staff members for use in answering queries.

The Press continues to administer a Print Shop, a small branch of the Government Printing Office, which exists to serve immediate printing needs—many of which, such as labels for collections, are peculiar to the Smithsonian. The Print Shop, with a staff of two journeymen, completed 849 printing jobs during fiscal 1966.

By means of its publications has the Smithsonian conserved and communicated the fruits of its scholarship. But, in common with other university presses, the Press may provide less important benefits as well. The presence of an effective publishing program within the Institution plays an immeasurable but certain part in the attraction and retention of research staff. More measurable, though as easily overlooked, is the "public relations" effect of publications by themselves. It has been said that the Smithsonian is known and respected in some of the world's remotest parts by penetration of its books and pamphlets. Each publication distributed under the imprint carries the name of the Smithsonian in the very best context.

SMITHSONIAN MUSEUM SERVICE

MEREDITH JOHNSON, *Acting Director*

During 1966 the Smithsonian Museum Service continued to expand its facilities for interpreting Smithsonian Museums and their functions to the nearly 19 million visitors who come to the Institution. Special emphasis has been placed upon on-the-spot information, direction, and orientation for visitors through Girl Scout information guides, leaflets, floor plans, and teleshows.

The staff of the Museum Service carried on its previous program of providing the public with accurate and extensive information on the Smithsonian and other museums in the Washington area through phone calls and letters. They continued to give tours, often in foreign languages, to special guests of the Institution. In this fashion they served as host to The Princess Margaret, Countess of Snowden, and the Earl of Snowden, and to His Imperial Highness Prince Mikasa of Japan and his wife and daughter.

The Junior League of Washington donated its 12th year of service to the elementary schools of the Greater Washington Area. The program of tours was conducted by the Museum Service in cooperation with Mrs. Gilbert M. Grosvenor, Mrs. Joseph Smith, Jr., and Mrs. Ernest N. May, Jr., chairmen of the Junior League Guide Program, and with the curatorial staff of the Smithsonian. More than 32,000 children were taken on 1,137 tours during the school year. The Junior League tour service is a significant contribution to the Institution's educational program. Teachers from the area were invited to come and help the guides and curators develop scripts that would follow closely the curriculum of the local school systems.

The Docent Program provided visitors and scholars with written information on our zoological and anthropological exhibits and research facilities. They assisted in the training of the Junior League Guides, prepared bibliographies in their respective areas, and revised leaflets and brochures for distribution.

The Free Film Theater continued to provide Wednesday evening films and lectures to the public. Curators often gave introductory talks and participated in question periods after the films. Over 7,000 people attended these film showings during the year. Slides and films, made available to schools and other groups all over the country by the Audio-Visual Library, made it possible for those unable to visit the Smithsonian to take advantage of its exhibits and research. Films such as "The Smithsonian's Whale" and "The Leaf Thieves" do a great deal to publicize the activities of its Museums.

For the benefit of the children who visit the Smithsonian Museums, a carousel was operated on the Mall, and its activities were accompanied by a steam calliope. Through an increasing number of evening functions the Service hopes to involve a greater percentage of the public in our work and to familiarize them on a less formal basis with our exhibits, their preparation and function.

The special events division of the Museum Service greatly expanded its activities this year because of the tremendously increased number of presentations, receptions, permanent and temporary exhibit hall openings, and concerts.

The Museum Service provided the invitations, programs, catering, and greeting of guests at all the special events of the Smithsonian. Many of the arrangements for the Bicentennial Celebration of James Smithson's birthday were handled by the Museum Service. This included the provision of bilingual guides and information aides for the many museum personnel who came from abroad to help the Smithsonian celebrate the anniversary of its benefactor.

The Museum Shops of the Institution provided visitors with books, cards, slides, and reproductions relating to its exhibits. An additional shop was opened in the Smithsonian building this year in order to provide visitors there with attractive and educational remembrances of their visit. Museum Shops are now operating in each of our seven buildings.

The Society of Associates began its first year under the joint guidance of Mrs. Vernon Knight and Mr. G. Carroll Lindsay, Director of the Museum Service. The tremendous success of its membership drive has been both an exciting experience and a rewarding insight into the interest in our Museums among the general public, not only here in Washington but throughout the country.

SMITHSONIAN ASSOCIATES

G. Carroll Lindsay, *Acting Executive Secretary*

On September 18, 1965, during the celebration of the two-hundredth anniversary of the birth of James Smithson, the Secretary formally announced the establishment of the Smithsonian Society of Associates.*

Formal recognition of the support accorded the Smithsonian by its friends across the Nation and, indeed, across the world, has long been a dream of the Institution. Charles D. Walcott, fourth Secretary of the Smithsonian, had considered the formation of a nationwide society of friends of the Smithsonian as part of an endowment cam-

*The name was later shortened to Smithsonian Associates.

paign in the 1920s, but the project failed to materialize as a result of Walcott's death in 1927, and the onset of the great depression of the 1930s prevented its revival. Membership in the Associates is open to all who care to join with the Smithsonian Institution in furtherance of the Institution's objective, stated by founder James Smithson in his will as "the increase and diffusion of knowledge among men."

Through their modest annual dues, members express their desire to participate directly in the work of the Smithsonian in the fields of science, art, and history. In response to this concretely expressed interest, the Institution provides the Associates with special educational and cultural benefits, including events that acquaint them with the wide range of Smithsonian activities and its programs in education, scientific and historical research, museum exhibition, and the performing arts. Associates are encouraged to participate in these activities to the fullest possible extent.

The Smithsonian will continue, as it has for the past 120 years, energetically to serve the scientific and scholarly community of the nation and the world, and make its museums and information resources available to the general public. The Associates, because of their special interest in the Smithsonian, will have the privilege of an especially close relationship with the Institution and the opportunity to share deeply in its programs.

Since November the Associates in the Washington area have enjoyed a variety of lectures, film showings, programs for children, exhibit openings, and similar opportunities to become more fully acquainted with the varied work of the Smithsonian. One event of great interest was a behind-the-scenes tour of the Smithsonian's exhibit-production activities. Silk screen artists showed how they produce exhibit labels and graphics. Model-makers displayed their intricate wares in cutaway form, showing the delicate mechanisms which go into the production of a "working" exhibit. A large group of freeze-dry specimens, the freeze-dry process that is rapidly replacing conventional taxidermy methods at the Smithsonian, and a wide variety of other exhibits-making techniques were demonstrated.

Another event of special interest was a program presented by cartoonist Milton Caniff, who drew for an audience of eager adults and children their favorite characters from "Steve Canyon." Johnny Hart and Brant Parker on another memorable evening delighted young and old with the King, Rodney the Cowardly Knight, the Wizard, the King's horse Bung, and other characters who inhabit the Kingdom of Id.

In a more serious vein the Associates heard Archaeological Institute of America lecturer Machteld J. Mellink describe the archaeological

work at Lycia, and heard Link lecturer George M. Low evaluate the Apollo space program.

Younger audiences of members' children were captivated by Saturday morning programs that dealt with subjects ranging from a study of minerals to the exploration of outer space, all under the direction of Smithsonian scientists.

Many members were absorbed by the contemporary art works from the São Paulo Bienal, shown for the first time in the United States at the Smithsonian and introduced to Washington at a gala Associates reception also attended by the artists whose works were on view.

On May 1, 1966, Mrs. Vernon Knight, executive secretary of the Associates, resigned to take up residence in Texas and G. Carroll Lindsay, director of the Smithsonian Museum Service, assumed the position as acting executive secretary. On June 1, Mrs Lisa Suter, formerly membership secretary for the Corcoran Gallery of Art, joined the staff as program director, with responsibility for planning and directing the various programs of lectures, films, children's events, and other educational activities.

Publications and Addresses

The following addresses and statements were delivered by the Secretary (the scientific papers of the Secretary are listed on pages 137–138):

Commencement address, Marlboro College, Marlboro, Vermont, June 6, 1965.

Statement on basic research and the National Science Foundation, presented to the Subcommittee on Science, Research, and Development of the Committee on Science and Astronautics, U.S. House of Representatives, July 22, 1965.

"The museum as an enigma." Address before the closing banquet of the Bicentennial Celebration commemorating the birth of James Smithson, Washington, D.C., September 18, 1965. (Published in *Knowledge Among Men.* New York: Simon and Schuster, 1966.)

"Museums in today's changing world." Address to the International Council of Museums, New York City, September 27, 1965.

Address to the Council of Fellows of the American Anthropological Association, Denver, Colorado, November 20, 1965.

Opening remarks to the International Union for the Conservation of Nature and Natural Resources, Bangkok, Thailand, November 29, 1965.

Statement on a center for advanced study in Washington, presented to the Woodrow Wilson Memorial Commission, Washington, D.C., March 10, 1966.

"A perspective of the Smithsonian program in ecology." Address to the National Parks Association, Washington, D.C., March 15, 1966.

"Three challenges to biology." Address to the Sigma Xi Initiation Banquet, University of Maryland, College Park, Maryland, April 21, 1966.

"The future of environmental improvement." Address to the Environmental Improvement Lecture Series, The Graduate School of the U.S. Department of Agriculture, Washington, D.C., May 31, 1966.

"Status of learning." Commencement address, The George Washington University, Washington, D.C., June 5, 1966.

Publications and speeches by members of the Secretary's staff included the following:

G. CARROLL LINDSAY. George Brown Goode. Pp. 127–140 in *Keepers of the Past*, edit. by Clifford Lord. Chapel Hill, N.C.: University of North Carolina Press, 1965.

RITTERBUSH, P. C. Outside professional activities by federal laboratory personnel. In *The Environment of the Federal Laboratory*, Third Symposium of the Federal Council for Science and Technology (Washington: U.S. Government Printing Office, 1965), pp. 98–102.

———. Research training in governmental laboratories in the United States. *Minerva* (Winter 1966), vol. 4, no. 2, pp. 186–201.

———. "Science and technology in support of civilian power." Address, The Air War College, Maxwell A.F.B., Alabama, April 21, 1966.

Among the many newspaper and magazine articles about the Smithsonian appearing during the year, those listed below were of particular interest:

BURKETT, WARREN. Science chases dust from "Nation's Attic"—The Smithsonian. *Business Week*, May 21, 1966, pp. 110–113.

CARMICHAEL, LEONARD. James Smithson: Pathfinder in Science and Philanthropy. *Nature* (London: October 23, 1965), vol. 208, no. 5008, pp. 320–321.

The many splendored Smithsonian. *Carnegie Magazine* (September 1965), pp. 239–244.

COWAN, R. S.; DAVIS, D.; HUMPHREY, P. S.; KLEIN, W. H.; RITTERBUSH, P. C.; and SHETLER, S. Smithsonian Institution Conference on Environmental Biology. *Bioscience*, vol. 15, 1965, pp. 607–608.

CURRY-LINDAHL, KAI. Museijubileum i Washington. *Svenska Dagbladet*, October 19, 1965, p. 1.

DOWNIE, LEONARD, JR. The National Air Museum. *The Washington Post; Potomac* [Magazine], September 5, 1965, pp. 10–11.

ESTEROW, MILTON. Man in the news: Smithsonian's birdman. *The New York Times*, May 30, 1966, p. 1.

GLUECK, GRACE. Smithsonian widens art vistas—cluster of museums emerging as great national center. *The New York Times*, May 30, 1966, pp. 1, 8.

HERRON, PAUL. A legacy of learning. *The Washington Post:* [Magazine] *Potomac*, September 5, 1965, p. 2.

MARTIN, DAVID. The Smithsonian, wellspring of a Nation's pride. *Life* (November 19, 1965), vol. 59, no. 21, pp. 86–102.

MORALES, HERBERT. Diffusing knowledge among men. *American Education* (September 1965), vol. 1, no. 6.

The Smithsonian Institution. *NEA Journal* (September 1965), vol. 54, no. 6, pp. 30–32.

RIPLEY, JOSEPHINE. The Smithsonian looks ahead. *The Christian Science Monitor*, August 14, 1965, p. 1.

SCHADEN, HERMAN. The Smithsonian, old and new. *The Washington Star: Sunday Magazine*, September 12, 1965, pp. 4–25.

SIMONS, HOWARD. A thoughtful party. *New Scientist* (London: September 30, 1965), p. 831.

TASSLER, ALAN, and PAYNE, WILLIAM A. Museum of History and Technology. *The Washington Post: Potomac*, September 5, 1965, pp. 18–23.

TOULMIN, STEPHEN. Dusting off the attic. *Punch*, October 27, 1965, pp. 605–607.

WHITE, O. M. Smithsonian: storehouse of science and culture. *National Geographic School Bulletin*, vol. 44, no. 3. September 27, 1966, pp. 42–44.

WITHERSPOON, THOMAS C. Resource for understanding in the Nation's Capital. *The George Washington University Magazine* (Spring 1966), vol. 3, no. 1, pp. 20–21.

WOLFF, GEOFFREY A. The Smithsonian Institution. *The Washington Post: Potomac*, September 5, 1965, pp. 5–8.

WYANT, WILLIAM K., JR. Preserving the past for the future. *Coronet*, July 1966, pp. 138–143.

YENCKEL, JAMES. The Natural History Museum. *The Washington Post: Potomac*, September 5, 1965, pp. 14–17.

United States National Museum

FRANK A. TAYLOR, *Director*

IN THE GREAT HALL of the Smithsonian Institution, on the evening of May 17, 1966, Secretary Ripley installed Dr. Richard S. Cowan and Dr. Robert P. Multhauf as directors of the Museum of Natural History and the Museum of History and Technology, respectively. The installation ceremony was attended by members of the Board of Regents and Smithsonian colleagues of the Directors and their families.

Dr. Cowan, botanist, came to the Smithsonian Institution in 1957 as associate curator of botany and served from 1962 as assistant and later as deputy director of the Museum of Natural History. He was appointed Director in December 1965. Dr. Multhauf, historian of science, joined the Smithsonian staff in April 1954 as curator of engineering and has served as chairman of the department of science and technology of the Museum of History and Technology since June 1957. He was appointed Director on April 4, 1966.

The Act of 1846 establishing the Smithsonian Institution provided for a museum, and the name "United States National Museum" came into use in the 1850s. In 1884 appropriations to the Smithsonian for the U.S. National Museum were authorized and an annual report to the Congress by its Director was required. Today, its component museums are institutions of individual and world-wide reputation. The reports on the Museums of Natural History and History and Technology are therefore treated separately, in accordance with the reporting procedures established in the *Smithsonian Year 1965*, and are to be found on pages 63 and 221.

On September 10, 1965, the Senate passed the National Museum Act of 1965 and forwarded it to the House of Representatives. On June 2, 1966, the Committee on House Administration reported favorably on the House version of the bill, with recommendations that it pass. The prospect for passage was favorable.*

The preamble of the Act states that the museums of the Nation constitute cultural and educational institutions of great importance to its progress, and that national recognition is necessary to insure that museum resources for preserving and interpreting the Nation's heritage may be more fully utilized in the enrichment of public life in the community.

Implicit in the Act is recognition of the Smithsonian's traditional role of making available to all museums the results of its research into museum practices and techniques and the development of innovations in such areas as the exhibition and preservation of museum objects, cataloging of collections, and Museum administration. Also implied is the assistance given others by advice, by training of personnel, and by the review and evaluation of museum programs, building plans, and projects. The Act specifies that the Director of the United States National Museum shall cooperate with museums and their professional organizations in continuing study of museum problems and opportunities, both in the United States and abroad, and that he shall prepare and carry out programs for training, publication, research, and the development of museum techniques.

Pending the appropriation of funds to implement the National Museum Act, plans have been made for a modest start of new programs in fiscal year 1967. The need most frequently voiced by museum officers is for trained museum personnel. A series of seminars on museum functions will start with a meeting on museum education, to be held in late summer 1966. Arranged by the Smithsonian Office of Education and Training, this first seminar is being supported by the Office of Education, Department of Health, Education, and Welfare. Guidance obtained from these meetings will be followed in developing cooperative programs under the Act.

During the year, the Smithsonian cooperated with the American Association of Museums and the Department of Health, Education, and Welfare in compiling and testing a questionnaire on the basic data of museums and their educational programs. The returns from this will bring up to date information about the museum field and will be the start of a machine-record information tool to be compiled and

---

*The bill was passed and was signed by President Lyndon B. Johnson on October 15, 1966.

administered by the American Association of Museums with the assistance of Smithsonian computer facilities.

The Director, United States National Museum, at the invitation of Dr. Roland Force, Director of the Bernice P. Bishop Museum, Honolulu, Hawaii, acted as one of several consultants advising on proposals to expand the scope of that museum in fields of archives, Hawaiian history, and the history of technology and industry in the State.

The Director, with others, discussed with Dr. Grover Murray, incoming President of Texas Technological College, the development of the University Museum as a teaching aid and as a source of educational exhibits for developing countries, as part of Dr. Murray's plans for an international center for research in the utilization of arid and semi-arid lands.

As president of the International Committee for Museums of Science and Technology of the International Council of Museums, the Director assisted in planning for the Washington meetings of ICOM '65 and conducted the programs of the International Committee in Washington, Philadelphia, and New York.

The ICOM General Conference adopted a resolution calling upon governments owning blocked currencies in developing countries to employ these funds in aid of museums and their organizations. The Director assisted the Smithsonian Office of International Activities in drafting tentative programs for aid to museums in these excess currency countries. Joseph A. Patterson, Director of the American Association of Museums, made a preliminary survey of museum opportunities in Asia, under the proposed program.

The National Museum arranged a day at the Smithsonian for the foreign museum professionals on the annual State Department-American Association of Museums tour of United States museums. Directors of the museums of the Smithsonian entertained the visitors at luncheon and with tours of their museums.

The Director spoke at the celebration of the 25th anniversary of the Nashville Children's Museum. He was elected a member of the Council of the American Association of Museums.

OFFICE OF THE REGISTRAR

A primary function of the Office of the Registrar is the accessioning of new material. As Registrar for both the Museum of Natural History and the Museum of History and Technology, this office recorded the accessions for 1,412,279 specimens, of which 1,281,062 were natural

history materials. (Statistics on the present totals of the collections and the distribution of specimens in these two museums are given on pages 122 and 242.) Another function of the office is handling mail for both Museums. Its increased activity is reflected in the volume of mail flowing through the mail room, which this year rose to 3,553 pieces daily, as compared to 2,639 three years ago.

Often overlooked as an educational aspect of the Smithsonian is still another service performed through this office—processing replies to daily requests for information on every conceivable subject. These inquiries come from the housewife, the farmer, the retired military man, the young man in the military service, the teacher, the businessman, and always, the school child. This year the queries totaled approximately 13,000, and who knows how many careers have been started or helped by the thoughtful, authoritative replies, many requiring for their preparation considerable time and research, which this office sought from the Smithsonian's professional staff and forwarded to the enquirer.

Freight and express shipments processed by the office numbered 5800 and totaled 581 tons. The equipment sent for use of Museum staff members engaged in explorations consisted not only of collecting and camping gear, diving equipment, and scientific instruments, but also of several pickup trucks and two boats that were shipped to foreign ports. Collecting equipment was likewise shipped to members of the Peace Corps, as well as to other Americans stationed in foreign countries, who have offered to collect specimens distinctive to the particular areas of their official activities.

Among the incoming foreign shipments cleared through the U.S. Customs in 1966 were items ranging from every variety of natural history specimen to a portable proton magnetometer (for use in underwater exploration). Four cases of rare Dürer drawings from Berlin and 13 tons of art treasures carried by air freight from Turkey, together valued at more than six million dollars, were entered for the Traveling Exhibition Service.

Official assignments for foreign travel accounted for more than three hundred individual passport transactions requiring visas to worldwide areas. Collecting permits and clearances were obtained from many countries for remote localities where field work was undertaken in behalf of the Smithsonian.

To keep abreast of the rapid growth within the Smithsonian, a review is being made of procedures to simplify and improve registration methods, including the possibility of automating some phases of the work.

REGISTRARS OFFICE—SUMMARY OF ACTIVITIES

Fiscal Year ended June 30, 1966

Accessions (specimens)	
Museum of Natural History	1,281,062
Museum of History and Technology	131,217
Mail (pieces)	895,356
Transportation—shipments arranged (16,680 pieces, 581 tons)	5,800
Letters of inquiry processed	13,000
Foreign travel requests processed	
Passports obtained	300
Visas obtained	600

OFFICE OF EXHIBITS

Under the direction of chief of exhibits John E. Anglim and assistant chief Benjamin W. Lawless, the office of exhibits made its contribution to the Smithsonian's public education, information, and inspirational objectives. By means of imaginative design, effective arrangement of specimens, and readable labels, the office of exhibits gave significant support to the effort of museum scientists and historians to make readily understandable to the general viewer, complex and often little-understood historical, cultural, scientific, and technological concepts, and to awaken an interest in the fields of knowledge they represent.

Research in new approaches to exhibit design was continued with the development of a learning-aid for elementary school children on the subject of the physics of light. The first unit was installed for testing in a Fairfax County, Virginia, school near the close of the school year. Progress made on the individual experiments assure that 16 will be ready for rotation to 3 schools during the 1966–1967 school year.

As part of a planning project to investigate principles of exhibits for the blind, a comparison was made between the effectiveness of an exhibit made especially for the blind and one made for the sighted but explained to the blind with the aid of touch objects passed around by a guide lecturer. Other experiments will be made under a grant from the Vocational Rehabilitation Administration of the Department of Health, Education, and Welfare.

History and Technology Exhibits Laboratory

The Museum of History and Technology exhibits laboratory completed the architectural restoration of the great hall in the Smithsonian

building in time for the Bicentennial Celebration of James Smithson's birth. This work included research on furniture and furnishings, color schemes, all appropriate to the architecture of the 1840s, and the design of cases to display exhibits in the many disciplines of history, art, science, and technology embraced by the Smithsonian, Riddick Vann was the exhibits designer and coordinator for this project and was assisted in case installation by production teams under the supervision of Walter N. Lewis.

In November, exhibits were completed by production teams under the supervision of Frank A. Gambino in a major portion of the Armed Forces history section of the museum, including chronological exhibits through the Civil War; the ordnance hall; the Continental gondola *Philadelphia;* and the hall of orders, medals, and decorations. The chronological exhibits tell by means of historic specimens, documents, and finely detailed ship models the military history of America from the earliest explorations through the final battles of the Civil War. Such notable relics as General George Washington's campaign tent and General Philip H. Sheridan's horse mounted in a lifelike stance associate the visitor with the actual objects of history. Design of the hall layout as well as many of the individual exhibition units was by John W. Brown. Layout and design of the second part of the chronological series, from the Civil War to the present, is being undertaken by John R. Clendening.

The ordnance hall shows military and naval arms dating from Colonial times to the Korean War, generally arranged by chronology and type. Hall designer Brown, assisted by Nadya Kayaloff and John Clendening, show graphically the development of military weapons from the wheel-lock musket of the 16th century to the modern repeating rifle.

The oldest American man-of-war still in existence, the gunboat *Philadelphia*, was installed adjacent to the ordnance hall under the design supervision of Mr. Brown. Adjacent exhibits cases and panels document the strategically important battle of Valcour Island and the part played in that battle by the crew of the *Philadelphia.*

In the exhibition of orders, medals, and decorations of all countries, which progresses from the earliest orders of knighthood to the medals and decorations of our present century, designer Deborah Bretzfelder made use of the rich decorative content of the exhibit specimens to create an exhibition area of unusual visual interest.

In March 1966, the hall of physical sciences was opened to the public. Covering the development of the physical sciences from ancient times to the present, the hall features a full-scale replica of the observatory of Ptolemy; a documented display of astronomical devices dating back

to medieval times; a reproduction of the shop front of Benjamin Pike, complete with optical instruments built by this remarkable 19th-century American; a collection of early teaching instruments from major American colleges and universities; a life-group showing Andrew Ellicott and Benjamin Banneker surveying the northwest boundary of the District of Columbia; and actual portions of the Mark I and Eniac computers. Other specimens in this hall include a special exhibition of ruling and dividing engines, a special exhibit on the nature and theory of light, and a reconstruction of the interior of Henry Fitz's telescopemaking shop of the late 19th century. The exhibits designer was James J. Shelton, assisted by Miss Kayaloff and Mr. Clendening and installation of the hall was by production teams led by Harry H. Harris and Walter N. Lewis.

The hall of ceramics opened to the public in April 1966. In it designer Barbara Bowes utilized a variety of room sizes and decorative motifs to complement and enhance a variety of ceramic objects ranging from sophisticated examples of European porcelain and delftware to the beginnings of American ceramics of the 17th and 18th centuries. Of particular note are the Robert McCauley collection of Liverpool jugs, the Hans Syz collection of porcelain, and the Ellouise Baker Larson collection of English earthenware and Staffordshire ware for the American market. The hall was installed by production teams under the supervision of Carl A. Alexander.

The last two permanent exhibit halls opened during this fiscal year were the hall of medicine and dentistry and the hall of pharmacy. In these, a series of cases and period rooms portray in chronological order the development of the healing arts from Greek and Roman times to the present. The halls were designed by Mr. Clendening and the exhibits were installed by production teams led by Mr. Lewis.

Special and temporary exhibits numbered 42, a great increase over previous years, and they demonstrated in 3-dimensional form the vast scope of the Smithsonian collections and the increasing scholarly interest in bringing the results of current research work on these collections before the general public. They ranged from American folk art to the life and times of Jawaharlal Nehru and from German glass to Atlas computers.

Throughout the year, units of the MHT exhibits laboratory continued their work of modelmaking, restoration, plastics, preparation, and cabinetmaking for various exhibits halls and special exhibitions. For the curatorial staff Robert L. Klinger and his group continued to prepare and restore exhibits specimens and to construct detailed museum models and animated devices such as a working model of the locomotive *Stourbridge Lion* recently completed for the hall of trans-

portation. Richard W. Marshall worked on large-scale schematic models of piano, harpsichord, and clavichord key actions for display in the hall of musical instruments and completed a finely detailed model of an early mine pump for the hall of civil engineering. Donald Holst prepared mannequins and reconstructed uniforms for the hall of Armed Forces History. John W. Schulz and Benjamin Snouffer prepared models and restored specimens for exhibit halls completed and in progress, including a schematic model of the Jacquard loom for the textile hall and a Dutch scoop-wheel turbine model for the hall of civil engineering. The restoration section under C. Gordon Dentry and Donald L. Fredette prepared furniture, ceramics, and glass for use in period rooms and case settings.

In addition to its regular duties, the office of exhibits lent support throughout the year to various museums of the Smithsonian complex, as well as offering consultation in a number of exhibits disciplines to various museums throughout the United States and abroad. Here, too, special mention should be made of the considerable number of foreign museum experts who came to the Smithsonian to study our exhibits techniques.

Also during this fiscal year, the exhibits editor's office, which formerly reported to the Director, was transferred to the office of exhibits. Under the direction of chief exhibits editor George Weiner, assisted by Mrs. Constance R. Minkin, the office is responsible for writing or rewriting, editing, coordination, and printing liaison of all exhibits labels for the U.S. National Museum and, as the need arises, elsewhere in the Smithsonian Institution. During this year, Mr. Weiner and his staff, which includes Mrs. Edna W. Wright and Nicholas Rona, produced 8165 labels for 78 permanent and special exhibits of museums and offices of the Smithsonian Institution.

Natural History Laboratory

Under the direction of chief of exhibits John E. Anglim, assisted by A. Gilbert Wright, the Museum of Natural History exhibits laboratory completed 115 cases and panels for seven permanent exhibits halls, as well as producing a dozen special and temporary exhibitions and rendering substantial assistance to the exhibits programs of the National Collection of Fine Arts and the Smithsonian Institution Traveling Exhibition Service.

The new hall of gems, designed by Mrs. Dorothy Guthrie, was opened in September 1965 during the Bicentennial Celebration, and the new jade room, also designed by Mrs. Guthrie, was opened in

December. Also opened during the year were extensions of the cultures of Africa and Asia hall, designed by Lucius E. Lomax; the hall of osteology, designed by Morris Pearson; the hall of physical anthropology, designed by Joseph Shannon; and the life in the sea hall, also designed by Mr. Shannon. In June the reptile and amphibian section of the hall of cold-blooded vertebrates, designed by James Speight, was opened.

Preparation and installation of the exhibits were performed by the production section under the supervision of production chief Julius Tretick, aided by assistant production chief Charles W. Mickens, fabrication supervisor Frank A. Nelms, and graphics supervisor Keith M. Metzler. Labels for the exhibits were edited and coordinated by the exhibits editor and his staff.

During the year, the illustration section, under Christopher H. Reinecke, produced nearly 200 drawings, paintings, charts, and other illustrations for use in exhibits. The models, dioramas, and accessories section, headed by John Babyak, produced diorama figurines and life-size figures for life groups, foreground accessories, replicas of marine invertebrates, and other models. The plastics section, under John C. Widener, continued research into new plastics molding and casting techniques and produced a large variety of small and large plastic casts faithful in surface detail to the originals. Among the more notable were a Semitic storm god for the hall of Old World archeology; a basking shark for the life in the sea hall; life-size mannequins for the MHT First Ladies hall; and such diversified objects as lava formations, meteorites, and Corinthian capitals. The freeze-dry microbiology laboratory, under Rolland O. Hower, continued its work in perfecting this Smithsonian-developed preservation process, which has virtually supplanted the more tedious taxidermy procedures in the preparation of small animals for exhibition purposes. The new section of lighting and audio-visual techniques, headed by Carroll B. Lusk, devised new methods for illuminating diamonds, sapphires, and other precious stones; and Mr. Lusk, assisted by James C. Nyce, engineered an exceedingly popular audio-visual exhibition of African musical instruments for the cultures of Africa and Asia hall and conducted extensive research into visitor-operated random-access slide projectors to be used in both the Museums of Natural History and the Museum of History and Technology.

In April, both Museums jointly developed a behind-the-scenes tour for the Smithsonian Society of Associates. Conducted in the Museum of Natural History, this tour showed the scope and variety of activities of the office of exhibits of the United States National Museum and demonstrated its techniques for bringing to the general public, for its

education and enlightenment, representative portions of our collections and the results of Smithsonian research.

During the year, 12 special exhibits were produced or installed.

CONSERVATION-ANALYTICAL LABORATORY

The conservation-analytical laboratory in 1966 placed its major emphasis on the development of a facility to produce rapid analyses for identification of materials. This is the result of a need for this facility in relation to the accessioning of objects, the determination of authenticity, and the importance of the identification of material used in conservation treatment.

The laboratory is designed and equipped to undertake research in conservation which involves the materials, the environment, and the technology of the object and to cooperate in this research with other bureaus of the Smithsonian Institution and other museums and laboratories in the United States, Europe, and Asia.

One major analytical program which the laboratory undertook in cooperation with curator Gus Van Beek of the Smithsonian Office of Anthropology and Rutherford J. Gettens of the Freer Gallery of Art was the quantitative analysis of bronze objects using X-ray fluorescence analysis.

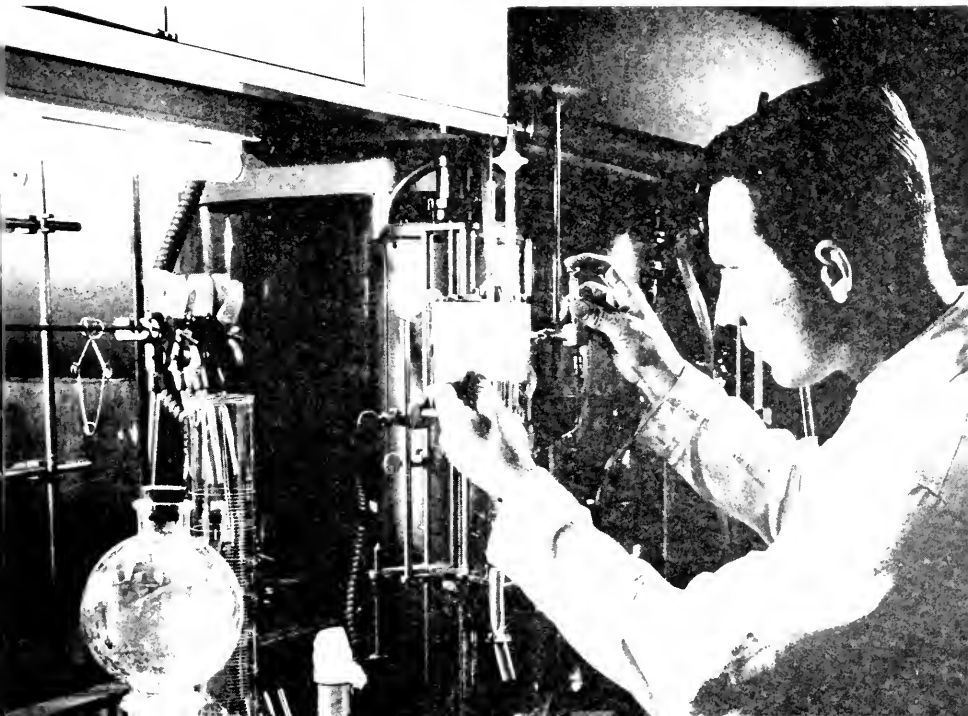
Analysis of pigments was undertaken by the laboratory to authenticate works of art, and to recognize the unoriginal parts of an object. Analytical techniques used for analysis of pigment samples included microscopic examination, chemical microscopy, X-ray diffraction, and infrared spectrophotometry. The latter two instrumental techniques require only 50 micrograms of sample for analysis and quickly provide information on the presence of impurity phases, minor constituents, variations in composition, extenders, and crystal structure, all of which are evidence of artificial or natural origins of mineral pigments and of methods of manufacture.

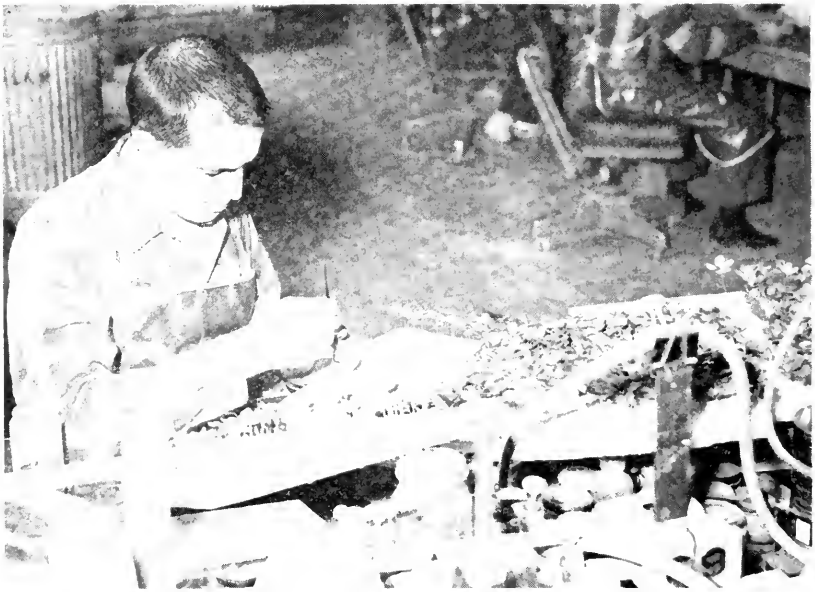
During the past few years, extended-range high-resolution infrared instrumentation has become commercially available and has led to a wealth of new information for practicing industrial spectroscopists, especially those dealing with inorganic pigments and extenders. However, a survey of the literature indicates that few spectra have been published for inorganic pigments encountered in the analysis of fine paintings.

In the course of the preparation of a series of high-resolution infrared spectra and X-ray diffraction patterns on standard known samples of inorganic pigments for use in the identification and study of oil paintings, it became apparent that differences in the method of manufacture

Office of Exhibits: Sculptor John Weaver completing clay figure of Congo Chief for hall of Asian and African cultures.

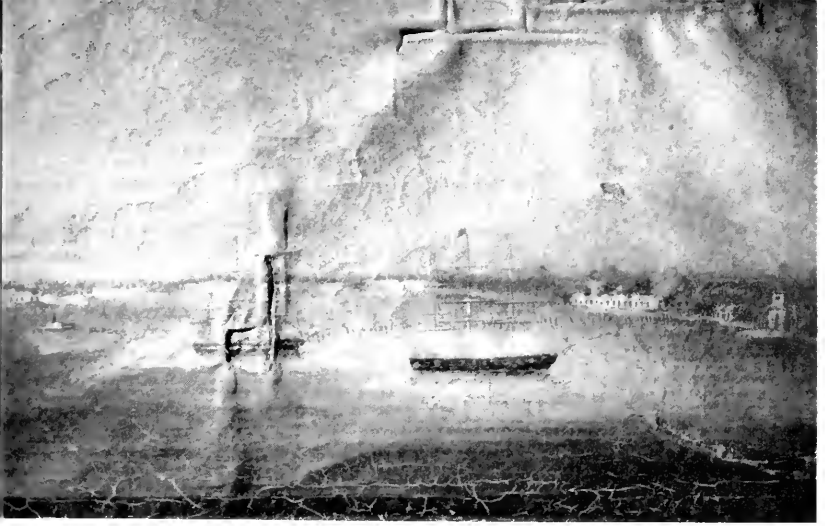
Exhibits specialist Rolland Hower checking data in freeze dry laboratory.

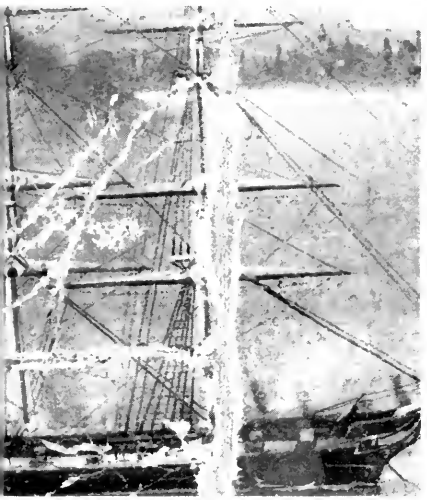




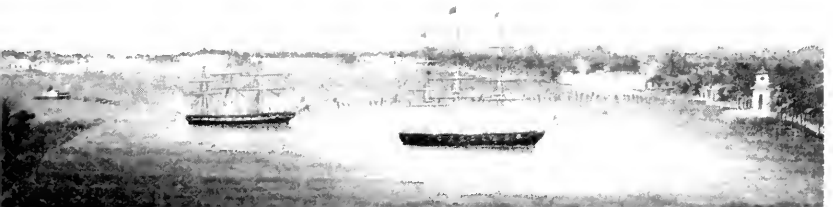
Office of Exhibits: Accessories specialist Juan de Pau working on leaf specimens for the hall of botany.

Installation of hall of ceramics—final stages, with Joseph Faletta working on an exhibit as John Brown and William Haase check plans.





Conservation Research Laboratory. Painting in the Naval History collections is restored and rebacked: Top, Raking light shows tears before treatment. Center, detail of ship at left after tears filled and painting lined. Bottom, treatment compleated.



Traveling Exhibition Service's "Rugs from the McMullen Collection" displayed at the Munson-Williams-Proctor Institute, Utica, New York. Traveling Exhibition Service's "Early Chicago Architecture" at the Chicago Civic Center.

of recent pigments could be observed in the laboratory results. This suggested further work in two areas: clarification of the relationships between method of manufacture and X-ray diffraction and infrared results on the known samples and methods of distinguishing pigment samples from oil paintings on the basis of manufacture. Variations in the elemental composition also occur and can be detected by micro-techniques of X-ray fluorescence analysis.

The detailed study of coinage, its composition, and the method by which it was manufactured, is a fertile field for the study of the history of metallurgy. A program of this nature was begun with curator Vladimir Clain-Stefanelli of the division of numismatics. The primary emphasis in this work is on the totally nondestructive techniques.

The methods of analysis which have been used to date are: X-ray emission spectrography, X-ray diffraction and optical microscopy. X-ray emission spectrography gives us the major alloy composition of a very thin layer of metal on the surface of the coin. X-ray diffraction provides information on the crystal structure and physical state of the crystalline lattice of the surface layer. Optical microscopy is used to examine the surface characteristics of the coin.

Planned future methods of analysis include neutron activation analysis, laser probe optical emission spectrography, X-ray radiography, and possibly ultrasonic and eddy current testing. Neutron activation analysis will allow us to make a more realistic estimate of the average composition of the coins under study because it does not restrict itself to the surface of the object. Laser probe optical emission spectrography is being considered because of the increased sensitivity to trace elements. One objection to laser excitation is a small mark which results on the coin; and the method does remove micro quantities of material. Laser probe emission spectrography does, however, present the possibility of comparing the source of raw material through correlation of trace element patterns. X-ray radiography will be used to reveal details of the gross internal structure while ultrasonic and eddy current methods will be used to obtain information about the internal structure on the micro scale.

TRAVELING EXHIBITION SERVICE

The Smithsonian Institution Traveling Exhibition Service is self-supporting, deriving its income mainly from the rental fees charged for its exhibitions.

It currently circulates throughout the United States and Canada about 100 shows, as listed below.

230-457—66——6

The larger, important exhibitions of 1966 included *Dürer and His Time*, from Berlin, *Pre-Columbian Gold from Peru*, *Rugs From the McMullan Collection*, from Mr. Joseph McMullan, and *Art Treasures of Turkey*, from Ankara and Istanbul. An extension of the loan of *7,000 Years of Iranian Art* permitted this exhibition to be shown at the Allentown Art Museum, an action given favorable notice in an article "Big Show, Small Museum" that appeared in *Arts Magazine* (December 1965). Catalogs were published for the Dürer, Latin American, McMullan and Turkish exhibitions, and a leaflet on Irish architecture and monuments. John Canaday wrote in *The New York Times* that the catalog *Dürer and His Times*, which was reprinted three times, is "a must for every art library."

In accordance with the Smithsonian's widening educational interests, a pilot program to bring art to the District of Columbia schools was instituted. Works supplied by the National Collection of Fine Arts were prepared, transported, and installed at the Taft Junior High School and the Woodrow Wilson High School. On the basis of the enthusiastic response, a proposal to expand the program was submitted.

On February 14, 1966, the Traveling Exhibition Service was placed under the U.S. National Museum. Expansion of the scope of the exhibits into crafts, history, technology, science, and education was initiated, and exhibitions of objects and prints from the Smithsonian collections are being planned with the cooperation of the curators of the Museum of Natural History and the Museum of History and Technology. The current catalog lists four of these exhibitions for 1967.

Requests have been received from many foreign institutions for circulation abroad of exhibits such as the 1964–1965 *Bridges, Tunnels and Waterworks* after they finish their United States tours. Funds are being sought to respond to these requests.

Art in Science and *Polish Graphic Art* were previewed in the Arts and Industries building. The latter exhibit was opened with ceremonies sponsored by the Polish Ambassador.

During the year the small staff of the Service, which negotiates, organizes, and circulates the exhibitions, explained the Service to a number of foreign visitors at the request of the State Department, advised other institutions on circulating specific exhibitions, and responded to many inquiries about the objectives and organization of the Smithsonian Institution. Close liaison was maintained with foreign cultural attaches and embassies. The Chief of the Service was invited to Belgrade as the guest of the Yugoslav Commission for Cultural Relations with Foreign Countries.

Exhibitions carried over from prior years number 53. The service initiated 28 new shows, dispersed 32, and negotiated for 39 new ones during 1966. During the year the exhibits were shown on 625 occasions to an estimated total of 1,250,000 viewers.

Exhibitions Initiated in 1966

Painting and Sculpture

Art in Science
Eyewitness to Space
New Names in Latin American Art
Art Treasures of Turkey
Pre-Columbian Gold from Peru

Drawings and Prints

Six Danish Graphic Artists
The World of William Hogarth
Mirror of the Artist
Action-Reaction
Contemporary African Printmakers
Contemporary Dutch Graphics
Polish Graphic Art
Dürer and His Time

Architecture

Art in Urban Architecture
Early Chicago Architecture

Design and Crafts

Calligraphy in Islamic Textiles
Folk Toys from Japan
Glass from Czechoslovakia
Jazz Posters
Posters from Denmark
Rugs from the McMullan Collection

History

Early Monuments and Architecture of Ireland

Children's Art

Danish Children Illustrate Hans Christian Andersen
Ghanian Textiles
Museum Impressions
Embroideries by Children of Chijnaya

Natural History and Science

The Preservation of Abu Simbel

Photography

Gentle Wilderness: The Sierra Nevada

Exhibits Continued from Prior Years

1964–65: Arte Programmata; Watercolors by Pop Hart; Modern Watercolors from Sweden; The Art of the Yoruba; Contemporary American Drawings II; William Blake: Poet, Printer, Prophet; Bridges, Tunnels, and Waterworks; Contemporary Fine Presses in America; Eskimo Graphic Art III; The Fabulous Decade; Kokoschka: King Lear, Apullian Journey, Hellas; Prints from the Mourlot Press; Old Master Prints; American Costumes; American Furniture; Masters of Ballet Design; Murals in Lace; The American Flag; Be My Guest!; Brass Rubbings from England; World Fairs; Paintings by Young Balinese; Paintings by Mexican Children; National High School Prints; Ancient Rock Paintings and Engravings; Colors and Patterns in the Animal Kingdom; The Stonecrop Family: Variations on a Pattern; The Color of Water; Pier Luigi Nervi.

1963–64: Alvar Aalto; Albers: Interaction of Color; Contemporary American Landscape Architecture; Birds of Asia; Antonio Frasconi 1952–63; Hearts and Flowers; The Nile; Religious Themes by Old Masters; Eero Saarinen; Swiss Posters.

1962–63: Craftsmen of the City; Historic Annapolis.

1961–62: Physics and Painting; UNESCO Watercolor Reproductions; Contemporary Italian Drawings; The Face of Viet Nam; Le Corbusier—Chapel at Ronchamp.

1960–61: The Image of Physics; Tropical Africa II.

1959–60: Images of War; Paintings by Young Africans; Japan I by Werner Bischof.

1956–57: Japan II by Werner Bischof.

Smithsonian Activities

Natural Sciences

For the natural sciences the year was one of reappraisal and program consolidation. During this period an effort was made to reassess the Institution's role in the encouragement and support of of Scientific research in terms of its basic mission to increase and diffuse knowledge among men and in relation to the logistic resources required to maintain the high quality of its research activities. It is appropriate to highlight here some of the new programs and activities to be described in greater detail elsewhere in this annual review in order to point up changes and trends in the Institution's research concepts.

The Smithsonian's traditional interest in the biological sciences, particularly in systematics, prompted creation of a Task Force for Tropical Biology. Its mission was to survey the field of tropical biology and to design a comprehensive Tropical Biology Research Program embracing our existing scientific investigations in the Tropics and at the same time identifying other zones of research warranting the attention and the support of the Institution. One result of this survey, as the Secretary has noted, is that the Institution has broadened the research objectives and activities of its Canal Zone Biological Area, and redesignated it as the Smithsonian Tropical Research Institute. Also, a marine biological laboratory was added to STRI's research facilities and a program of research in tropical biology, involving close collaboration with other organizations concerned with the tropics, was initiated.

During the same period, the Institution established on a tract of land located on the southwestern shore of the Chesapeake Bay, in Maryland, the Chesapeake Bay Center for Field Biology. Its scientific research program is now being formulated by a consortium of academic institutions presently consisting of the Johns Hopkins University, the University of Maryland, and the Smithsonian Institution. The Center, which provides a natural biological preserve, both terrestrial and estuarine, in which to conduct long-term ecological and behavioral investigations, is visualized as the first of several field research stations strategically located so that scientists can construct a set of normal ecological standards, or so-called ecological bench marks. This system will permit them to measure and compare ecological changes, including those resulting from controlled environmental manipulation.

The research objectives of the Office of Anthropology were broadened to include a Program of Urgent Anthropology designed to investigate

and document the cultures, languages, and physical characteristics of isolated communities and tribes threatened with extinction through assimilation and the encroachments of modern civilization. Professor Sol Tax of the University of Chicago is serving as a special advisor in anthropology to the Secretary of the Smithsonian Institution in order to facilitate this program.

Another noteworthy change is the enlargement of the scientific responsibilities of the Office of Oceanography to include limnology. The Institution historically has been a leader in biological oceanography, and this enlargement is a tangible expression of its concern with the need for encouraging basic research concerned with freshwater resources, especially lakes and rivers. The Office of Oceanography and Limnology has established a unique Oceanographic Research Guidance Committee to assist the Institution in assessing the taxonomic and ecological resources needed to support the research programs of public agencies and universities in the field of oceanography. The rapidly growing national program in oceanography involving the collection of marine organisms from the oceans of the world, requires facilities for processing and identifying specimens. The Committee will apprise the Institution of the status of oceanographic research programs and expeditions to that any necessary taxonomic assistance can be made available through the Smithsonian Oceanographic Sorting Center and through the research efforts of its scientists.

To further the objectives of the International Biological Program and to consolidate the several investigations conducted by our scientists, a Smithsonian Institution Committee for the International Biological Program was formed. One noteworthy project initiated under this Program concerns the Center for Ecological Research, established in Belém, Brazil, which offers scientists from the United States and elsewhere an unparalled opportunity to collaborate on numerous interdisciplinary ecological problems in the field.

The problem of providing adequate logistic support for the Institution's many research activities in the natural sciences has come in for a careful appraisal. As a result, the Smithsonian Research Awards Program concerns the center for ecological research established in who require "seed money" to initiate projects or to advance investigations in progress. The Program was established to provide a mechanism for responding rapidly to urgent financial requirements that cannot wait for the usual review and budgeting procedures.

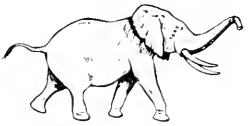
During this same period, the Institution established the Smithsonian Research Foundation as a means for increased administrative and logistic flexibility in the support of research projects. In this connection, the Institution has established an annual inventory of research

projects in order to determine the current and future resources needed to sustain the Institution's scientific research programs. A project-planning system was devised to enable each investigator to present the status of his research project as well as the future fiscal and manpower requirements for maintaining an optimum level of research activity.

Finally, computer programs and automatic data processing techniques are being adopted for the collection, storage, and retrieval of information concerning museum specimens. As a first step in this process, an electronic punchtape system is being used to produce at one operation a tape from which cross-indexed catalog cards, specimen labels, and shipping lists can be produced.

Museum of Natural History

RICHARD S. COWAN, *Director*



MORE AND MORE THE MUSEUM SCIENTIST, whose goal is to elucidate the particular aspect of nature that is his specialty, finds that to achieve his goal he must seek data from ancillary fields to complement the conventional criteria of his own field. Thus, as his scientific horizons widen and he attacks larger, more complex problems, he finds that the research team approach is essential.

In anthropology for example, teams of botanists, archaeologists, and geologists are working together to solve the riddle of ancient man's existence in the Oaxaca Valley of Mexico. In zoology, taxonomists are working directly with histologists and anatomists to unravel the mysteries of evolution in several groups of animals. In at least two major groups of plants, chemical data are being used to support the validity of gross morphology in the study of their systematics. In mineral sciences, rocks from the deep-water mid-Atlantic ridge and extra-terrestrial meteorites and tektites are being analyzed by the non-destructive electron probe. In paleobiology, the significance of variation in fossil animal populations is being tested and evaluated on the basis of studies of modern forms. In entomology, the subadult stages are being studied along with the total biology of the organism in order to better interpret the traditional criteria for elucidating the evolution of various insect groups.

That such studies can coexist with the more classical ones is not merely evident, the conviction grows that they are truly interdependent and that the Museum scientist, sharing goals with scientists in other institutions—universities, for example, must seek closer ties with them.

With this in mind, it is heartening to report that an increase in the number of supportive personnel has permitted our professional staff to undertake such significantly broadening activities, among which, perhaps, the most important are those related to education, especially at the graduate or near-graduate level. In summer 1966 numerous college students served as temporary interns, working in the collections. Graduate students are working independently or with members of the staff for the doctorate degree. And several post-doctoral fellows are likewise studying in the collections. These, especially, while solving their own research problems, broaden the understanding and interest of our own people. But educational activities are not confined to non-Smithsonian researchers coming to work with our collections and with our scientists, for a growing number of the research staff are establishing formal and informal educational relationships with universities, both local and more distant. Several members of the staff are conducting seminars at these centers of learning, others have been granted leave of absence from the Institution to teach courses for one or more semesters, and a number are preparing to participate in a pilot program that will integrate the exhibits of the Museum with the curriculum of the District of Columbia secondary schools.

The growing concern of the scientific staff that it relate more closely to the mainstream of science is further attested to by its broad participation in both national and international meetings. Smithsonian policy seeks to have representation at every national or international scientific meeting of significance to the areas of our interest. In consequence, one or another of the scientific staff has journeyed to distant parts of the globe in the past year to interact with his counterparts overseas. In addition, a substantial number of conferences and symposia involving outstanding scholars from this country and from abroad, have been convened at the Museum to discuss mutual problems, to formulate research programs, and to evaluate the progress of organizational units with respect to their ultimate goals.

In biological research, the necessity for studying organisms in their living condition has understandably led to increased scientific travel to the field. It is with the deepest sadness and a sense of irreparable loss that it must be reported that one of the research staff gave his life in the service of science during the past year. Dr. E. Yale Dawson, whose article immediately follows this statement, was drowned in the Red Sea June 22 while studying the kinds, distribution, and ecological relationships of the marine algae there. An incredibly well-organized

and outstandingly productive researcher, Yale Dawson will be remembered equally as a warm, friendly human who always had time for the interests of others. Though he himself is gone, the work he accomplished in research and in building the algological collections in the Museum will stand for a very long time as a monument to the industry and devotion he applied to his every scientific undertaking. To his memory, the following report on the Museum's activities for 1966, a year unparalleled for scientific progress, is dedicated.

Marine Botany at the Smithsonian

Early in its history the Smithsonian Institution recognized the significance to man of a knowledge of the vegetation of the sea. Its *Contributions to Knowledge* in the years 1851 to 1858 included a sumptuous monograph by W. H. Harvey on the seaweeds of North America, a work which has served as a superlative model to marine botany ever since.

During succeeding years the study of marine animals in the Smithsonian's Museum of Natural History far outstripped the study of plants of the sea. The classical collections of Harvey remained, however, in the National Herbarium, and to them were added through the years some 25,000 specimens of seaweeds of the world.

The vast oceanographic enterprise of the International Indian Ocean Expedition in the early 1960s, in which the Museum of Natural History became deeply involved, provided a new impetus. The need for marine botanical studies became sharply evident, and from that need, a plan was developed through the office of the Assistant Director (Oceanography) to renew and to expand the established interests of the Smithsonian Institution in the vegetation of the sea. Activation of these plans was begun in 1963, and they received their most effective encouragement in 1965 with the establishment of an algal research facility in the new west wing of the Museum of Natural History. This facility, its use and application, has expanded rapidly during the past year. Some of the exciting and promising aspects of the program are outlined below.

MARINE BOTANY FOR MARINE STATIONS

The marked advance of higher education in biology in the United States is nowhere better illustrated than by the rapid advances since World War II in the field of oceanography, with all its biological ramifications. Nor has the new emphasis on marine sciences been confined to seaside institutions, for numerous inland colleges and uni-

versities are successfully seeking to provide marine facilities for their students. Yet these advances have not been achieved without growing pains. On the Pacific Coast, in 1940 there were, for example, but five marine laboratories, whereas now there are 22, and at each of these where courses in marine biology are taught, publications describing local faunas and floras are needed to serve teacher, student, and researcher in the identification of the organisms being studied. Yet since 1944, only a single local marine algal manual (designed for use at the Hopkins Marine Station in Pacific Grove, California), has been available for the entire Pacific Coast with its varied and elaborate algal representation.

Recognizing this need, the Smithsonian Institution in 1965 began to encourage the preparation of identification manuals on the marine plants of the Pacific Coast. In cooperation with Humboldt State College at Arcata, California, and the National Science Foundation, a course in marine botany was presented, and, with the help of the class, an identification manual was written for the seaweeds in the vicinity of the new marine facility at nearby Trinidad. Currently, in collaboration with the University of Arizona and the Office of Naval Research, a similar manual is being completed for the algal flora near the new marine facility, on the upper Gulf of California, jointly operated by the University of Arizona and the University of Sonora.

Obviously, the rapid development of marine laboratory facilities of California, of which a major new one is that established on Catalina Island by the University of Southern California, makes imperative a modern and thorough treatment of the marine algae of the entire State. The Smithsonian, through arrangement with the Stanford University Press and with partial support of the Office of Naval Research, is now engaged in preparing such a "Marine Algae of California," coauthored by Dr. Isabella Abbott of the Hopkins Marine Station, Dr. G. J. Hollenberg of the University of Redlands, Dr. Paul C. Silva of the University of California at Berkeley, and the writer. This study involves the treatment and illustration of nearly a thousand species. Many of these, especially the deepwater forms, have remained underscribed to date, and new entities are being discovered regularly as underwater explorations are conducted by diver-botantists. The Smithsonian Institution has been collaborating with the University of California at Santa Barbara in such exploration in the southern California Channel Islands, through Dr. Michael Neushul and his students at the marine laboratory in Goleta.

Another aspect of the rapid expansion of marine stations in this country and the enormous enlargement of student bodies in marine science is the concurrent need for more instruction in marine botany.

Traditionally, the subject has been taught only by highly specialized researchers in marine algae, and no textbook on marine botany, as such, has been available to the less specialized botany teachers. The Smithsonian Institution recently supported the completion of the first such textbook which, in conjunction with the use of local marine floras such as are available or in progress, will make possible the teaching of marine botany at almost any college or university in the nation to which representative marine plants can be brought. Such a course, as part of the Smithsonian's program, will be presented in early 1967 at the University of Arizona, in Tucson, a seemingly unlikely place for the subject, but one at which much marine interest has been aroused by the provision of marine facilities only four hours distant in connection with the experimental desalination plant at Puerto Peñasco, Sonora, Mexico, operated by the U.S. Department of the Interior.

THE HERBARIUM IN FLORISTIC RESEARCH

The conduct of phytogeographic research in the algae, as in any other group of organisms, requires the use of large collections for comparative examination. The more comparative material that is available, the more conclusive can be the taxonomic results and the more reliable the interpretations of specimens of an organism to which a useful name is assigned. The building up of the algal reference collections at the Smithsonian's Museum of Natural History is a major consideration. Although 25,000 specimens had accumulated up to 1965, no concerted effort had been made to develop a useful world representation, nor had adequate provision been made for deposition of liquid-preserved algal materials.

Beginning in spring 1965, fieldwork directed toward assembling an extensive working collections of liquid-preserved algae was undertaken in California, in the Gulf of California, and in the Bahamas. A fortunate circumstance early in this program led to the acquisition by the Smithsonian of the large herbarium of the Beaudette Foundation for Biological Research, containing over 7,300 specimens, including 1500 liquid preparations and 700 microscope slides. This algarium was incorporated into the Museum's herbarium during summer 1965, and to the combined collection nearly 10,000 specimens have since been added through the able assistance of museum technician Charles F. Rhyne. Fieldwork is currently being continued through cooperation with several foreign algologists, who arranged field collecting trips for the writer during the summer of 1966. These include Dr. B. Tözün, University of Istanbul, Turkey; Prof. Joseph Powell, American Uni-

versity of Beirut, Lebanon; Dr. A. A. Aleem, University of Alexandria, Egypt; Dr. T. V. Desikachary, University of Madras, India; Mr. H. M. Burkill, Botanic Gardens, Singapore; Dr. H. B. S. Womersley, University of Adelaide, Australia; and Dr. Valery May, Royal Botanic Gardens, Sydney, Australia.

The conduct of fieldwork and the preparation and identification of specimens for the herbarium are greatly enhanced by collaboration of specialists who know well their own local floras. Thus, much of the field effort planned in the near future is to be conducted at established algological centers where rapid assembly of materials can be accomplished with the help of the most knowledgeable persons. At the same time, these foreign specialists are encouraged to prepare and send sets of their local materials in exchange. A number of such exchanges are already active, and additional agreements are being made from time to time. One of the latest of these is with the herbarium of the Botanisches Museum, Berlin-Dahlem, Germany, which lost its entire algal collection during World War II and is endeavoring to rebuild through exchanges for specimens currently being collected in an area of classical German algal research in the Adriatic Sea.

Another major asset to the program of floristic studies and the preparation of manuals of Pacific American marine algae has been provided by the cooperation of the Allan Hancock Foundation at the University of Southern California. Its director, Dr. Leslie A. Chambers, has agreed to place on 5-year loan to the Smithsonian Institution the 26,000 algal specimens of its herbarium. The availability of these collections, assembled by the writer during 20 years' research in the Pacific, will greatly enhance and speed the current program.

In addition to its herbarium collections of macroscopic algae, the Smithsonian's Museum of Natural History has developed over the years an outstanding collection of carefully prepared slides of diatoms. These, under the care of Paul S. Conger since 1935 now number some 24,000 microscope slides.

A further research facility of considerable value is the Dawson marine algal library of some 5,000 titles which has been installed for use in the Museum's division of cryptogams.

MONOGRAPHIC STUDIES OF CORALLINE ALGAE

The continued development of field manuals and textbooks, and the integration of algological knowledge into a broader understanding of the oceans must ultimately depend upon detailed basic research on particular groups of marine algae. For many algae, even widespread and common species, only superficial information is available. There

Seaweed collecting at Trinidad, California, near the Marine Station of Humboldt State College, one of the institutions with which the Smithsonian is cooperating in marine botany research (see p. 66). Below: Seaweed and sea lions at Bahía Independencia, Peru, in the southern region of the Marine Botany Program.

230-457—66——7

E. Yale Dawson sampling seaweed on a muddy shore in Potrero Bay, Costa Rica. Below: Phycologist at work on the sea floor, Isla Brincanco, Panama.

are few specialists who enter into detailed anatomical, cytological, morphological, biogeographical, and physiological investigations of species and who are able, therefore, to integrate the results into systematic studies of genera and families. Some large and important groups have been studied during the past century by only a handful of specialists the world over.

The "crustose corallines," the calcified benthonic marine members of the red algae, comprise just such a neglected group. They occur from the Tropics to the Arctic; they are the major and, in some cases, even the primary elements of "coral" reefs; they form extensive banks and often control bottom form and benthonic animal populations in northern waters; and, being calcified, they are important fossils, occurring especially abundantly in rocks of Tertiary age. As fossils, they are of much interest to oil geologists because of their potential in dating and in determining paleoecology. Nevertheless, because of a lack of basic information, the crustose corallines are often treated in regional manuals with strong reservations as to accuracy, and in practice they are generally unidentifiable.

Since 1964, Walter H. Adey of the Museum's division of paleobotany has been engaged in a biosystematic-monographic study of the crustose corallines of the North Atlantic—arctic to tropic. Unfortunately, the abundant, well-preserved collections and associated detailed field data needed for such a study have never been assembled, and even in the North Atlantic the necessary field facilities for such work are limited or not available. These difficulties notwithstanding, the area from Long Island Sound to northern Labrador has now been surveyed in some detail by use of small boats and diving gear. During the summer of 1965 the 134-foot freighter *Phykos*, obtained temporarily from the Navy reserve fleet, was used for preliminary study of the region from Sandy Hook to the Florida Keys. This vessel also provided, below diving limits, a dredging and submersible capability for coralline work which cannot be matched with small boats.

Continued extensive field work is planned for the next several years. Stations occupied in Jamaica during February 1966, with the assistance of Thomas Goreau and his staff at the Univeristy College of the West Indies, provided the additional information and collections prerequisite to preparing for the intensive Tropical Western Atlantic program that will begin in 1968–1969. During the summer and winter of 1966–1967 small boats will be used for intensive collecting of crustose corallines in Iceland and Norway, and in the spring and summer of 1967 this program will be extended to France and the British Isles.

Integrated with the field investigations during 1966–1967 will be a "type" search and study program, at European museums, directed

toward providing a firmer taxonomic base for crustose corallines. This is necessary because the literature of coralline algae is largely deficient in the kind of detailed information on type specimens needed for accurate taxonomic interpretations. In many cases the whereabouts or even existence of type specimens is in doubt and must be researched and established.

ALGOLOGY ALONG PACIFIC LATIN AMERICA

The development of the University of Arizona marine station on the Gulf of California has stimulated renewed interest in the marine algae of Pacific Mexico and has shown a need for a revised marine flora of the Gulf of California to serve not only the station but other nascent marine facilities at Bahía de Los Angeles, at La Paz, at Guaymas, and at Mazatlán. In addition, a developing economic exploitation of seaweed resources along the Pacific Coast of Mexico has created need for a more thorough knowledge of the kinds and distributions of Mexican algae. Several important species are currently being harvested along northwestern Baja California, Mexico, and the Smithsonian Institution has recently been instrumental in the birth of a new industry in the Gulf of California. There, through our assistance, Marine Colloids, Inc., of Rockland, Maine, has been successful in finding and initiating the harvesting of *Eucheuma uncinatum*, a seaweed much needed as a raw material for the production of industrial phycocolloids.

A major focal point of biological attention along Pacific Latin America in recent years has been the Galápagos Islands. The American Secretariat of the Charles Darwin Foundation for the Galápagos Islands is now situated in the Department of Botany, and several Smithsonian scientists are currently studying material obtained in 1964 on the expedition of the Galápagos International Scientific Project. Preliminary accounts of the cacti, the marine algae, and several groups of insects have been completed, and work on the amphipods and other animal groups is in progress. Several members of the Department of Botany are participating in the preparation of a new flora of the Galápagos being undertaken by the California Academy of Sciences through support of the National Science Foundation. Marine algal studies are continuing, and the Galápagos marine flora is currently being compared with the marine flora of mainland Ecuador and Peru. Planned collaboration in this program includes phycologists César Acleto of the Universidad de San Marcos, Lima, Peru, and Sylvia E. Taylor of Dunedin, Florida, both research participants on recent Pacific South American cruises of the National Science Foundation's research vessel *Anton Bruun*.

A further objective of the Pacific Latin American marine algal work is the continued preparation of floristic accounts and of illustrated identification keys to the genera and species. These are aimed at stimulating interest and promoting algological studies by resident investigators in the various eastern Pacific republics. Such manuals, in Spanish and English, have been prepared with support of the Office of Naval Research for El Salvador and for Pacific Central America, generally. A Spanish edition of *Seaweeds of Peru* is planned by Sr. Acleto, who is expected as a visiting investigator at the Smithsonian Institution during 1966–1967.

E. Yale Dawson
Division of Cryptogams

Research and Publication

SYSTEMATICS

While the overall objective of the office of systematics is to facilitate systematic undertakings within the entire biological community, its main concern is to help systematists in the Museum of Natural History initiate and extend research projects, especially those with an orientation transcending departmental structure. Externally the office seeks to develop in the entire scientific community an awareness of and appreciation for the stature, intrinsic importance, and intellectual content of systematics.

The Office contracted with the Federal Services Division of the International Business Machine Corporation for a study of how data processing methods techniques can be applied to museum problems. Funds provided by the Office of Systematics enabled the department of invertebrate zoology to purchase equipment with which one operator can catalog all the very large number of collections being accessioned by the department, and which at the same time prints index cards on as many parameters as desired. In addition, the same operation automatically generates paper tape bearing the data from the collections, and these data may then be inserted automatically in a central data center. It has been estimated that as much as a 60 percent increase in the efficiency of the cataloging operation is gained by having this equipment.

A conference of distinguished primatologists was convened to assist in the development of a primatology program for the Museum of Natural History. The implementation of their planning in conjunction with that of the division of mammals is expected in the next fiscal year.

Funds were provided for a joint study of the systematics of fishes of the mackerel assemblage by Tetsuo Matsui of the Institute of Oceanography and Robert Gibbs of the division of fishes. This support enabled Matsui to visit to the Smithsonian Institution for the purpose of studying the Atlantic populations of some of these fishes, on which Gibbs is a recognized specialist; this was especially important since Matsui previously had worked only with Indian and Pacific Ocean materials.

Systematic research is often hampered by a lack of knowledge of Oriental and less familiar languages in which scientific results are sometimes reported. Assistance was provided for the translation of critical research papers which were important to the successful completion of monographic studies.

ECOLOGY

In recognition of the challenges and opportunities in the field of environmental biology, the Smithsonian on July 1, 1965, established an Office of Ecology. This new Office is headed by Dr. Helmut K. Buechner, formerly professor of zoology at Washington State University, Pullman, Washington.

The foundations for a program in ecology at the Smithsonian have existed for some time. Extensive biological collections such as those at the Smithsonian are essential for precise determination of the components of the ecosystems under study; the Smithsonian has long engaged in a variety of ecological and behavioral studies at the Smithsonian Tropical Research Institute on Barro Colorado Island, Panama; and excellent experimental programs on photosynthesis and the effects of radiation on organisms have been developed at the Smithsonian Radiation Biology Laboratory.

Against this background the Smithsonian is now building a program in environmental biology that will extend through all levels of biological organization. At the cellular and subcellular levels, and reaching upward into the organismal level, it hopes to expand the Radiation Biology Laboratory to provide a broad base in environmental physiology. Present research there is concentrated on plants—in studies of the transmittal of solar energy into metabolic responses, storage aspects of photosynthesis, energy conversion, and genetic mutations induced by radiation. Expansion of the program on the animal side in close association with the scientists at the National Zoological Park would provide the physiological foundation essential to an overall program in environmental biology. At the organismal level, ecological approaches contribute to an understanding of phylogenetic relationships and evolutionary biology. At the higher levels of biological organization—population systems, vegetation, and whole ecosystems—the Smithsonian is expanding into new fields. By adding this new dimension effectively, it hopes to develop a broadly conceived, integrated program in ecology of significance both to science and to society.

Within this general framework, the Smithsonian is now in the process of refining objectives to identify those areas in which effective contribu-

tions can be made through its own unique program and through an integration of its efforts with those at universities and other institutions here and overseas. In this connection the Smithsonian is initiating a survey of leading university programs in ecology to determine how and where it can contribute best to the growth of knowledge vital to establishing harmonious adjustments between man and his environment in the years ahead.

One way in which the Smithsonian can collaborate with universities is through its new foreign currency program. Under this program, initiated a little over a year ago, the Institution now has the financial capacity to pursue research in archaeology and anthropology in the countries where foreign currencies have been declared excess. These funds, derived from the sale of agricultural commodities, are made available to the Smithsonian under Public Law 480. Beginning in Fiscal Year 1967 the foreign currency program will be expanded substantially into environmental biology and oceanography. Through the use of these funds the Smithsonian has an unusual opportunity to combine and direct the efforts of anthropologists and ecologists toward developing a more complete history of man's environmental relationships as a basis for understanding his current behavior in various regional ecosystems. Foreign currencies will enable the Smithsonian to develop programs to study the structure and functions of natural ecosystems, with a view toward conservation and the orderly development of natural resources, in countries like India, Pakistan, and Ceylon. Both inventory and descriptive types of ecological investigations will be required, but thorough understanding of ecosystems will depend on studies of energy conversion through primary and secondary trophic levels, of the dynamics of population systems, and of regulatory mechanisms of the system. It will be necessary, however, for the Smithsonian to develop capabilities for handling ecosystem studies at home as well as abroad.

The International Biological Program (IBP), which has a strong focus on environmental biology with a view toward broadening the productivity base for human populations, will provide unprecedented opportunity for ecological research and international conservation efforts during the 5-year period from 1967 to 1972. The Smithsonian will be engaged in the terrestrial conservation program of the IBP. Dr. Lee M. Talbot, an internationally known conservationist on the staff of the Office of Ecology, will work closely with the terrestrial conservation section of the IBP in the establishment of a World Network of Nature Reserves and the development of a world program in conservation. It is highly important that ecological benchmarks be

set aside for scientific research. Some of these may be National Parks, others, Wilderness areas, and still others, small Nature Reserves. They should not be merely set aside for posterity—they should be carefully studied for their contributions to knowledge now and in the future. One of our major contributions to this network of reserves can be in the inventories of the biological components and general descriptions of the ecosystems preserved.

The success of the IBP will depend largely on the rapid training of young people at all educational levels. Through its new division of education and training the Smithsonian can contribute to the educational program of the IBP. On-the-job training with the collections at the Institution and in the field under the guidance of our own scientists and those from cooperating universities will be an essential part of the Smithsonian participation in the IBP.

During 1965 the Smithsonian established the Chesapeake Bay Center for Field Biology on about 700 acres of land about 7 miles south of Annapolis, on the west shore of the Bay. To the original Forrest bequest, known as Java Farm, the southern portion of Ivy Neck has been added through the cooperation of Miss Adelaide Colhoun and a generous grant from the Ford Foundation. The Smithsonian on February 9, 1966, formed a consortium with The Johns Hopkins University and the University of Maryland for cooperation in research and education. It is an open-ended consortium, which may be joined by other universities in the Washington area, in what it is hoped will become an intellectually stimulating venture. Dr. Kyle Barbehenn, Director for the new Center, is now planning a well-rounded research program with the universities, including studies of vegetation change, field and laboratory studies of social behavior of mammals, estuarian ecology, and population regulation.

One of our most important facilities in the developing ecological program is the Smithsonian Tropical Research Institute (formerly the Canal Zone Biological Area). Over the past 20 years an impressive series of studies have emanated from this island station. Recent emphasis, under the excellent leadership of its Director, Martin H. Moynihan, has been on comparative behavior of primates, the evolution of interspecific relations, the significance of social signal systems, social organization and behavior of tropical birds, and isolating mechanisms in marine fishes (a detailed report of this work appears on p. 163). STRI provides a model and a base for expanding ecological research in the New World tropics. Increased activity in tropical research has been initiated under the guidance of Dr. F. Raymond Fosberg, a newly appointed specialist on tropical biology who comes to the Smithsonian

from the Geological Survey with a wealth of tropical experience. The increased emphasis on tropical biology is in recognition of the significance of this region to an understanding of the principles of ecology and evolutionary biology.

A conference on bird life in central and northern Latin America, supported by a grant from The Conservation Foundation, was held at the Smithsonian April 13–15, 1966. The objective was to assess numerical changes in the populations of both resident and migratory birds in relationship to alterations in their habitats. This conference was first proposed by William Vogt, Secretary of The Conservation Foundation, who wondered whether the destruction of rain forests and other changes in vegetation might not have as much influence on recent declines in the numbers of migratory birds as agricultural pesticides.

Most of the seven contributors from the five Latin American countries represented, and approximately a dozen contributors from the United States, agreed that because of their adaptability to wintering habitats, most migratory birds that breed in the north temperate zone can survive considerable environmental changes in their winter ranges. On the other hand, the conservation of resident species, particularly those of the humid tropical forests, is a much more serious problem. These birds, which through a long period of evolution are adapted to rain forests for nesting, are apparently losing ground.

A group of conferees, headed by John W. Aldrich, compiled a list of 21 suggestions for action based on the conference papers and discussions. Among these the principal points covered were: (1) conservation of all renewable natural resources, as a basis for preservation of avifauna; (2) inventories and descriptions of samples of ecosystems; (3) control of illegal traffic in live birds and turtles and in cayman skins; (4) international fellowships for training Latin American technicians; (5) translations into Spanish of bird guides, of examples of successful conservation efforts, and of digests of books and articles on conservation; (6) the organization of bird-banding programs; (7) the development of intergovernmental studies on changes in the abundance of migratory birds; (8) international exchange of information; and (9) research, education, and publicity.

The results of this conference may assist greatly, not only in the preservation of bird life, but in the overall conservation of renewable natural resources in northern Latin America.

In summary, the Smithsonian plans to form a small group of some of the best research scholars in the country who will integrate their efforts (1) to contribute to theory in population biology and ecosystem science and (2) to provide information essential to the Federal Govern-

ment in the evolution of our society in the critical years ahead. In this challenging new era of ecological orientation the Smithsonian can serve as a point of focus for both national and international programs in basic research and education. The Smithsonian is in a position to play a major role in the IBP—the outgrowth of which it is hoped will be a continuing emphasis on environmental biology as the background for harmonious relationships of human societies within the world's ecosystems.

As opportunities for making contributions to ecosystem science and conservation emerge, the Smithsonian stands ready to accept its responsibilities in the firm conviction that the survival of human societies at high standards of living in quality environments depends on what is accomplished in environmental biology within the next decade.

OCEANOGRAPHY

As has been the case in recent years, the Smithsonian plays a key role in biological oceanographic operations at the federal level. We are the national center for the identification and study of whole marine organisms. Although complementary studies of commercial and sports fisheries are made by the Department of the Interior, the Institution provides basic information on the kinds, distributions, and populations of organisms in the world ocean.

The principal work of the oceanography program is the support of specimen-oriented research that leads to the preparation of monographs of groups of marine organisms, showing their relationships and describing their ecology.

The Institution's staff members participated during the past year in 74 cruises of 14 ships belonging to 10 organizations.

The oceanography effort was expanded to include marine sedimentology. Cores and sediments have been given to the Institution by the Navy, the Coast Guard, the Coast and Geodetic Survey, the Army Engineers, the Geological Survey, and other organizations. A new constant low temperature storage facility has been constructed and cores from the National Science Foundation's deep coring project will be transferred soon from their temporary storage area to our facility. Rocks from the mid-Atlantic ridge and from other oceanic areas have been collected and sent from other sources to the Institution for study by our active petrology group.

In cooperative project undertaken with the U.S. National Academy of Sciences and the Government of the Republic of China, Assistant Director I. E. Wallen spent four weeks in Taiwan advising on oceanography development. The Institution, with support from the

Department of State, sent Wallen to the meeting of a special panel of the Intergovernmental Oceanographic Commission on Mutual Assistance to Developing Countries.

The Smithsonian Oceanographic Sorting Center continued to expand its operations: the shipment of specimens increased, with 2,844,941 being sent to 190 specialists from 27 countries during the year, as contrasted to 2,260,949 to 70 specialists in the prior 2½ years of its existence. The total of specimens sorted during the year was 3,527,415, against 4,924,210 for the previous 2½ years. The involvement of specialists from 27 countries emphasized the point that there does not exist in any one country the capability to identify all marine organisms. Biological oceanography as practiced in the Smithsonian Institution is as international as the seas themselves.

During the year the surplus oceanographic vessel *Phykos* was used for 2½ months before being laid up. The small sailing yacht *Ellida*, acquired as a gift, was reconditioned at modest cost and was used for research in the Chesapeake Bay area during May and June 1966.

ANTHROPOLOGY

Two additional senior research scientists joined the office of anthropology this year, John C. Ewers, formerly Director of the Museum of History and Technology, and T. Dale Stewart, formerly Director of the Museum of Natural History. Both had accomplished substantial amounts of research and writing during past years, in spite of the demands of their administrative duties; they will now be able to devote much more time to their scholarly activities.

During the year, John C. Ewers completed seven papers on the ethnohistory of the Great Plains and on the artists who recorded or interpreted its Indians. He also began work on an historical introduction to a centennial edition of George Catlin's *O-kee-pa*, the famous artist's major descriptive contribution to ethnology, to be published by the Yale University Press. He served as chairman of the planning committee of the Smithson Bicentennial Celebration, held at the Institution from September 16 to 19, 1965. On June 5, 1966, The University of Montana awarded Ewers the honorary degree of Doctor of Laws, in recognition of his contributions to museology and to the history and ethnology of the Plains Indians.

T. Dale Stewart worked on his report on the archeological site in Stafford County, Virginia, known as Patawameke, from which Pocahontas was kidnapped in 1613 and taken to Jamestown. He edited portions of the volume on physical anthropology of the *Handbook of Middle American Indians*, being published by the University of Texas

Chesapeake Bay Center for Field Biology. Grants (see pp. 14 and 45) have enabled the Smithsonian and its associates in the consortium—The Johns Hopkins University and the University of Maryland—to add two key parcels of land to the recently established Center. The three peninsulas that make up the southern half of Ivy Neck Farm are shown in the foreground while the B-shaped Corn Island is in the upper right. Hog Island, lying beyond Corn Island, and the forest to the right of that Island are part of the original Forrest bequest of 368 acres, acquired in 1962. The Center now contains 700 acres, including mature forest, second growth, old fields, cultivated fields, and salt marsh. With control of over 10 miles of shoreline, it is the largest undeveloped expanse on the western shore of the Chesapeake Bay. It lies a mere 7 miles south of Annapolis and an hour's drive from Washington or Baltimore, making it a convenient site for the use of biologists in the region. As the facility develops, it should attract students of ecology and behavior from around the world. (Official U.S. Navy photo.)

Etruscan amphora of the late 6th century B.C. before and after cleaning in the anthropology conservation laboratory. Below: Example of thickening in Neolithic skulls from Turkey (see p. 85) caused by anemia, probably the result of chronic malarial infection: Top one is normal, middle (cremated) and bottom ones are thickened.

Press, and he outlined exhibit scripts for the section of the hall of physical anthropology concerned with ancient man.

Waldo R. Wedel was in the field in the summer of 1965, assisted by museum specialist George S. Metcalf and five university students, excavating an early historic Indian village in central Kansas. Believed to have been inhabited by a Wichita Indian group about A.D. 1500–1700, the site consists of refuse heaps scattered around an elliptical pattern of shallow oblong depressions placed end-to-end around a low earth mound. Excavations in 1940 had disclosed two long narrow curving pithouses inside the ring of surface depressions. In 1965, two more such pithouses were found; with those opened previously, they formed a subrectangular pattern around the mounded center and within the ring of depressions or "borrow pits." No similar structures or arrangement of structures have yet been reported from the Plains region or elsewhere. From their floors, beneath a thick layer of burned roof and wall material, were taken much pottery, and stone, bone, and shell artifacts generally like those found elsewhere on the site in storage pits and refuse mounds. From their central location in the village and their unusual construction and arrangement, it is tentatively inferred that these earth-covered pithouses probably represented the dwellings of the village leaders.

At two other village sites lying about 800 and 2,100 yards east and south of the circle excavated, similar circles of depressions occur around a central mound. The line connecting their centers runs 30° south of due east, and, projected to the eastern horizon, corresponds exactly with the sunrise position at the winter solstice. Local observers on December 21–22, 1965, verified the alignment of these two circles with the rising sun. Since no obvious topographical or other reason appears for such an alignment, and in light of other alignments and orientations of sites and features, the location of these circles and their unique character argues for an intentional or planned placement on a recognized axis. These findings suggest strongly that the Wichita Indians of the 16th and 17th centuries, like their contemporaries among the upper Rio Grande pueblos, had a ceremonial calendar based on an astronomical year beginning with the winter solstice, instead of a descriptive calendar like most of their Plains neighbors in which the time reckoning began with some event of particular importance to the Indian.

Scattered and disarticulated human bones found in the four pithouses, some of them charred or burned, suggest the possibility of enemy action or that human sacrifice was practiced. Ethnographic data indicate that winter solstice rituals in the Southwest were somehow connected with human sacrifice. Further examinations at other of the known

circles in central Kansas are urgently needed to determine more accurately the relationships between these specialized structures and astronomical points, and the possibility that rituals of human sacrifice were directly involved.

As a result of widespread newspaper publicity given the dig, visitors came in ever-increasing numbers, averaging 30 to 50 a day during the last few weeks, so that a total of about 3,000 persons, including many foreign visitors, saw Smithsonian research in progress at the site.

Henry B. Collins continued his Eskimo research, supervising the preparation of two volumes issued by the Arctic Institute of North America: volume 6 of the series, *Anthropology of the North: Translations from Russian Sources*, a translation of A. P. Okladnikov's "The Soviet Far East in Antiquity, An Archaeological and Historical Study of the Maritime Region of the U.S.S.R.," and volume 12 of *Arctic Bibliography*, a series which summarizes and indexes the contents of publications in all fields of science, and in all languages, pertaining to the Arctic and sub-Arctic regions of the world.

Robert M. Laughlin continued his work on a Tzotzil-English, English-Tzotzil dictionary (Tzotzil, a Mayan language, is spoken by approximately 100,000 Indians in the state of Chiapas, southeastern Mexico). The dictionary now contains some 20,000 entries. This is the most complete dictionary compiled since the 16th century for any American Indian language.

As part of the Archbold-Bredin-Smithsonian Biological Survey of the Island of Dominica, in the British West Indies, Clifford Evans and research associate, Betty J. Meggers conducted an intensive archeological survey on Dominica during January 1966. After field reconnaissance located 22 different sites, many of which are early French and English colonial rather than Indian, it was determined that the ecological conditions for Indian occupation were so poor in comparison to nearby Guadaloupe and Martinique and other lesser Antilles that Indians must have used the island as a "stepping stone" without long occupation at any one spot.

Supported by a Smithsonian research award, a long-range program of archeological research was begun in Brazil with Evans and Meggers as principal investigators. Nine Brazilians trained by them in 1964 under the auspices of the Fulbright Commission have carried on the collaborative research efforts in the field. Official negotiations and agreements were arranged between the Smithsonian Institution and the Conselho Nacional de Pesquisas of Brazil, which named as their official representative in Brazil the Museu Paraense Emilio Goeldi, in Belém. The program was assisted by Artur Hehl Neiva of the Fulbright Commission who served as liaison.

At the close of the fiscal year, Evans and Meggers were in Brazil inspecting each project to be sure that all participants were conducting their work according to standardized procedures of note-taking, classification, record-keeping, etc. so that at the close of the 5–8 year program all interpretations from all sites are comparable. The nine Brazilian archeologists have conducted field work to date in the States of Rio Grande do Sul, Santa Catarina, Paraná, São Paulo, Guanabara, Rio de Janeiro, Bahia, Rio Grande do Norte and Matto Grosso. Already some extremely important data have been secured, including deep stratified Paleo-Indian deposits in Rio Grande do Sul, and pottery-bearing sites in the State of Bahia, from which pottery had not previously been recorded.

Using the hydration thickness technique of dating, Evans analyzed and interpreted the obsidian artifacts from Easter Island for inclusion by Thor Heyerdahl in volume two of the history and archeology of Easter Island.

The reliability of an aspect of glotto-chronology is being questioned in an article now in preparation by William H. Crocker. Two Canela vocabularies taken from the same group and collected by different people in the same decade have been found to contain enough noncognates to account for one thousand years of geographical separation. These noncognates are generally either synonyms or words with similar meanings, or attributable to errors of the field workers concerned. Newly collected data on the Canela messianic movement were prepared for presentation at the Symposium on the Biota of the Amazon, in Belém, Brazil, in June 1966.*

For the 37th Congress of Americanists, being held in Argentina in September, Crocker has prepared an acculturative history of the Canela Indians since 1900. The early monograph on the Canela, *The Eastern Timbira*, by Curt Nimuendajú, was utilized as a midpoint base to assure the reliability of the information and the trends. Groups of informants of different age-grades were used to reconstruct the conditions of each of their adolescent initiation periods as the tribe moved from one old village site to another. As a result of the efficacy of this technique, a fairly full history of innovations, losses, and trends has been reconstructed, with the maximum error for most items being about plus or minus two years since 1900. In order to continue his acculturation study of the Canela and to obtain informa-

*As reported in *Smithsonian Year 1965* (pp. 40–42) a prophetess among the Canela Indians of Brazil predicted that the traditional culture hero would come to earth to save his people and turn them into *civilizados*. They believed her and danced continuously and stole cattle to facilitate the festivities until they were attacked and driven out of their lands by the neighboring Brazilian hinterlanders.

tion between field visits, Crocker has trained three Canela Indians to record information on certain daily events. They write from 40 to 60 pages a month, and these manuscripts have been received regularly by mail. It is expected that at least one autobiography can be edited from these materials, and since one of the Indians makes his contribution partly in his own language using phonemic script, his texts will serve to facilitate the linguistic analysis of the language. A system for coding the Canela ethnographic materials has been worked out, and a collection of about 12,000 Keysort cards is now ready for utilization in the analysis of specific topics.

Gus W. Van Beek concentrated his research on the pre-Islamic pottery chronology of Hajar Bin Humeid, the longest continuously occupied pre-Islamic site as yet excavated in southern Arabia. In addition to the ongoing descriptive work, technical studies of certain types of pottery were initiated. One of these, in collaboration with William Melson of the department of mineral sciences, involves the petrographic analysis of representative pottery types to permit a more accurate description of the composition of the pottery. The other, in collaboration with Edward V. Sayre of the Brookhaven National Laboratory, utilizes neutron activation analysis to investigate the composition of one type of pottery, sand-tempered ware, with a wide distribution at a number of sites stretching in a belt from northeastern Ethiopia to Hadhramaut in southern Arabia; this analysis of trace elements should show whether sherds from all sites are identical and these data will indicate whether examples of this ware were made at one or more centers and whether direct trade was involved in its distribution.

During the year, Van Beek also studied the enigmatic monolithic stele at Axum, Ethiopia, and presented before the African Studies Association, meeting in Philadelphia, October 27–30, 1965, a paper entitled "The Monuments of Axum in the Light of South Arabian Archeology," in which it was shown that these gigantic granite stele probably belong to the beginning of the Christian era in Ethiopia (A.D. 327), and must be interpreted in the light of the then rapidly developing Christian symbolism. He also prepared a survey and annotated bibliography on the archeology of Arabia during the period from 1960 to 1965 for the Council on Old World Archaeology.

William C. Sturtevant continued his research on the culture of the Seminole Indians and related topics, in Washington and through visits to museums and archival collections elsewhere. He also initiated a long-term project aimed towards an exhaustive catalog of all illustrations of Northeastern Indians done before 1860 and having any claim for ethnographic accuracy.

Research on the collections, in conjunction with preparation of materials for exhibition in the hall of the cultures of Africa and Asia, was continued by Gordon D. Gibson.

At the Peabody Museum and at Essex Institute, both in Salem, Massachusetts, Saul H. Riesenberg abstracted ethnographic and historical materials from the collections of ship's logs and journals in connection with his research in Micronesian ethnohistory. With the aid of a native Ponapean in this country, a student at Princeton, he carried forward the task of translating an important Ponapean manuscript which he and John L. Fischer of Tulane University, are annotating and preparing for publication.

A sourcebook of Korean anthropology being prepared by Eugene I. Knez, in collaboration with Chang-Soo Swanson and assisted by Willie Song, will include, in translation, a selection of articles pertaining to Korean life and culture written by Korean and Japanese scholars and scientists representing the major subdivisions of anthropology. A selected and annotated bibliography of 500 articles, monographs, and books has been completed and will constitute the other half of the sourcebook. Most of the Asian articles and the bibliographic items have appeared in print since 1900, but are from many sources not well known here, or from out-of-print journals.

Kent V. Flannery and his field party left in December for Mexico to begin their study of the prehistoric human ecology of the Valley of Oaxaca. Geomorphologists Michael and Anne Kirkby began by mapping the land forms and geological strata of the Valley, which is in the shape of a capital T, 70 miles from north to south and 30 miles east to west. It is now clear that the region was cut by the upper tributaries of the Atoyac River, and is, in effect, a river valley with at least three definable terraces; there never was a "giant lake" in central Oaxaca as suggested by earlier investigators. The distribution of archeological sites, and even the different types of soils accompanying them, make it clear that the prehistoric rise to prominence of the Valley of Oaxaca was not a product of any "lush, fertile, well-watered" aspect attributed to the Valley by earlier writers; in fact, its rise was a tribute to the ingenuity of the prehistoric Indians in making use of its scanty surface water and alluvial soil. No great "irrigation civilization," with centralized bureaucratic control of water resources was possible here, because no single stream in the valley could be used to irrigate more than a square mile; rather, there are at least 15 types of irrigation going on all over the valley, with intensively local adaptations. Some regions produce 10 alfalfa crops a year, while others can grow only maguey (*Agave* sp.). Preliminary indications are that early farmers here clung desperately to the alluvial areas with a 3-meter

water table and spread only later into the vast stretches of marginal land upstream. The oldest prehistoric phase excavated dates to roughly 5000–3500 B.C. and resembles the Coxcatlán phase in the Valley of Tehuacán, 160 miles to the north.

These early agriculturalists hunted deer and rabbit in the mountains near Mitla, and in the rock shelters where they camped have been found occupation floors containing hundreds of plant specimens preserved by dessication. The presence of acorns and hardened deer antler suggests that these were autumn encampments by groups who were harvesting both wild and domestic plants as well as doing some hunting. Also during Early Formative times, in the Valley, villages were being built with houses having partial stone foundations and walls of wattle and daub. The pottery decoration, figurines, and other artifacts clearly show that important strides had already been made toward the craft specialization and urbanization that mark the growth of civilization in Mexico as elsewhere.

Four main vegetational (and faunal) zones have been located in the Mitla area. One is the valley floor itself, at 1,600 meters, characterized by mesquite and prickly pear. A lower zone, the canyons east of Mitla, at 1,300 meters, is arid tropical, with iguanas and kapok trees (*Ceiba* sp.). A higher zone, on the lower mountain slopes at 1,900 meters, has oak, organ cactus, maguey, copal (*Bursera*) and guaje (*Lucaena*). This is the richest zone in wild plants and was intensively used for collecting and hunting, while the valley floor was intensively used for agriculture. The fourth and last zone, the surrounding mountain tops at 2,200 meters or more, has oak, pine, manzanita, and madroño. Caves have been located in all four of these zones, and it is hoped to excavate one in each this season in order to establish use of wild resources in prehistory. The definition of vegetation zones will be made easier by the 800 specimens of plants collected in January and February by Wallace Ernst of the department of botany.

Tie-ins between the ethnographic work of Aubrey Williams, University of Maryland, and the archeological work have been numerous. For example, working near Mitla at a purely dry-farming village, Williams discovered that farmers there plant one crop a year of yellow corn, black beans, and squash, in the same field, as well as a crop of small black beans which are cultivated on marginal land. Four miles away, at "Guilá Naquitz" cave, in levels dating to A.D. 900, the archeologists uncovered a series of storage pits which contained exactly the same four food products.

In February 1965, Robert L. Stephenson began a sabbatical leave from his duties as Acting Director of the River Basin Surveys. Before and during this leave he worked on reports on his archeological research

in the Whitney Reservoir area of Central Texas, on the Blue Blanket Island Site, on the Potts Village Site and on the Sully Site, all of Oahe Reservoir, South Dakota.

Richard B. Woodbury and research associate, Nathalie F. S. Woodbury, in collaboration with Watson Smith, Peabody Museum, Harvard University, completed a report on the 1917–1923 excavations at the Zuni ruin of Hawikuh, New Mexico, which were directed by Frederick Webb Hodge, formerly Director of the Bureau of American Ethnology. The excavations were sponsored by the Museum of the American Indian, Heye Foundation, New York, which is publishing the report. Hodge's voluminous field notes and the extensive room plans and drawings of pottery designs were used in the compilation. In addition, the pottery was reclassified and new type definitions were prepared in accordance with current archeological practice, although Hodge's own stratigraphic study was discovered in manuscript form and is included in the report.

In August 1965, the Smithsonian Institution and the Georgia Kraft Company of Rome, Georgia, entered jointly into a research contract for the salvage of archeological sites, near Cottonton, Alabama, along the Chattahoochee River, which would otherwise be lost forever through the construction of a new paper mill and its supporting services. Research associate C. G. Holland, conducted field work for six weeks in areas ahead of the construction and as the work continues additional archeological investigation will be carried out. The salvage archeology is being conducted in an early to middle 18th-century Indian village producing gunflints, Indian pottery, kaolin pipes, trade beads, and iron artifacts.

Olga Linares de Sapir continued archeological research in Senegal as an honorary collaborator. She made extensive excavations in shell mounds that unfortunately are being destroyed rapidly in the wanton excavation of the shell for paving primary and secondary roads. In addition to the work in Senegal she was able to travel into the Cameroons, Nigeria, and Ivory Coast and compare the status of archeological research in these areas with Senegal. Interesting comparative information was obtained, but only in Nigeria is there a fully developed research program in archeology through the University in Ibadan.

Museum specialist George S. Metcalf, in collaboration with Kent Flannery, prepared a report on an Olmec "were-jaguar" from the Yucatan Peninsula. He also collaborated with Stephen de Borhegyi on a study of an inscribed celt from Guatemala.

J. Lawrence Angel, in Greece and Turkey in summer 1965, studied more than 500 human skeletons from sites ranging from Paleolithic

to 19th century A.D. The Early Neolithic material from Çatal Hüyük (N=34) in the marsh-edged Konya plain and from Nea Nikomedeia (N=104) in the marshy Macedonian plain near the old coastline shows a high incidence (20–30 percent) of fully developed porotic hyperostosis in adults (healed) and children. This overdevelopment of blood-forming diploë of skull and bone marrow (children) indicates anemia, probably sicklemia or thalassemia occurring in response to chronic severe infestation by malarial *Plasmodium falciparum.* Later Neolithic skeletons from Kephala (51) on rocky Kea and bones from Early Bronze Age Karataş (155) in mountainous Lycia show little or no hyperostosis. Angel is synthesizing results from about 150 later skeletons combined with his 1,200 from the Greek mainland to analyze the interaction between such health factors as malaria, arthritis, level of nutrition and age at death, and historical change.

Lucile E. Hoyme directed a Howard University student, Walker B. Moore, in the identification of juvenile skulls in the collections of the Division of Physical Anthropology, in terms of physiological age at death. A precoded form for automatic data processing was designed, with the help of museum technician Donald J. Ortner, on which were recorded stage of tooth eruption, tooth wear, caries, and suture closure. Approximately 4,000 Eskimo and Aleut crania were examined, of which 291 proved to be juveniles. A method was also worked out for establishing the sequence of tooth eruption, and W. B. Moore used this as the basis for a prize-winning exhibit at the 100th annual meeting of the District of Columbia Dental Society.

Donald J. Ortner developed methods for microprobe study of mineral concentration in bone, and in a pilot study found probable aging differences in Haversian systems.

Hoyme also continued research on the geographical distribution of various human cranial characteristics, to determine whether patterns of distribution corresponding to climatic regions would suggest the mode of action of natural selection. Certain predicted correlations between cranial form and climatic factors proved absent, but it appears that natural selection maintains and even increases individual variation. Preliminary analysis of the American Indian and Siberian crania studied suggests other internal correlations, which will be tested as the research proceeds.

Organizing and filing the data sheets of the Human Relations Area Files was completed during the year. There are now files of information (mostly photocopied from published sources, but also using unpublished material) on 266 ethnic or political groups, representing the entire inhabited world. Use of the files by the Smithsonian staff and by visiting scholars and other government agencies has increased

markedly. About 50 outside research projects made use of the files, compared to 30 the previous year.

River Basin Surveys

In February 1966, Warren W. Caldwell was appointed Director of the River Basin Surveys, succeeding Robert L. Stephenson, who had been serving as Acting Director.

The Smithsonian River Basin Surveys participated in a wide range of archeological projects during the year, concentrating on the Missouri Basin as in previous years. Field investigations totaling 13, of which 9 were active in July and August 1965, were focused primarily upon the major enclave of horticultural communities extending along the axis of the Missouri River in the two Dakotas; however, reconnaissance and excavation parties worked in Iowa, Wyoming, and elsewhere in North Dakota as well.

1. The Sommers site, upper Big Bend Reservoir, South Dakota, continuing investigations begun in 1964 at what is perhaps the largest of the early villages in the Middle Missouri area. In addition to the clearing of several deeply buried houses, the 1965 excavations demonstrated that at least part of the village was defended by a deep ditch or dry moat.

2. The Cattle Oiler site, a small, isolated village in the upper Big Bend Reservoir where for the first time evidence was found of contemporary or closely subsequent occupations by peoples of the Initial Middle Missouri and Extended Middle Missouri Traditions.

3. The Ketchen site, just downstream from the Cattle Oiler village appears to have been occupied by peoples of the Middle Missouri Tradition. Although architectural features are abundant, other evidences suggest that the occupation was of short duration, or possibly, that the village was never completed.

4. The eastern shore of the upper Big Bend Reservoir just downstream from Pierre, South Dakota, where five sites were tested. For the most part, architectural remains were few and indeterminate; however, enough evidence was found to indicate that the principal occupations fell within the generic "La Roche" category.

5. The Thomas Riggs site, in the Oahe Reservoir just upstream from Pierre, South Dakota. Prior investigators had concluded that the village was unfortified; however, aerial photographs suggested the presence of a complex, bastioned defensive perimeter. Test excavations using heavy earth-moving machinery proved the existence of a moat and palisade and indicated that further, intensive work is necessary.

6. The Fort Manuel site, in the upper Oahe Reservoir of north-central South Dakota, an important but short-lived trading establishment of 1812–1813.

7. The Medicine Crow site, near Fort Thompson in the lower Big Bend Reservoir where a renewed excavation exposed a fire hearth attributable to the early preceramic occupations.

8. The Fort Yates area, upper Oahe Reservoir, south-central North Dakota, excavating at the Ben Standing Soldier and Battle Creek Sites where remains of the Extended Middle Missouri Horizon ("Archaic Mandan") were found. In addition, tests at the Porcupine Creek Site produced good evidence of the early period of settlement on the Standing Rock Reservation.

9. The Arpan site, in the middle Oahe Reservoir near Mobridge, South Dakota, where a low mound was excavated that contained secondary human burials within a sub-floor pit. The remains were culturally related to others in the immediate vicinity and are assumed to date within a few years of A.D. 1200.

10. The Stelzer site, a Plains Woodland camp area near the Arpan Mounds that has produced significant Plains Woodland remains in the past. Continued excavations here added no new evidence, however, remains of early-day "homesteader" activities were found.

11. Some 47 sites were recorded in reservoir and canal rights of way within the Garrison Diversion Project of eastern North Dakota. At least 12 of these, including mound groups and Woodland camps seem to be important enough to warrant continued investigation.

12. A number of sites were found during a reconnaissance of the Bowman-Haley Reservoir on the upper Grand River in southwestern-most North Dakota. Two camp areas, both of McKean affiliation, will require intensive excavation.

13. A brief shoreline survey of the Angostura Reservoir, southwestern South Dakota, assessed the effects of bank erosion.

In June of 1966, 6 additional parties began field investigations as follows:

1. Additional work at the Sommers site to trace the defensive ditch discovered during previous excavations.

2. Continued excavation at the Cattle Oiler and Ketchen villages in order to establish relationships between the sites and to clarify the sequence of occupation.

3. The Durkin site, a large, early village in the Big Bend Reservoir that is assumed to be important to the interpretation of the adjacent Sommers Site.

4. The lower Cannonball site, a large village in the upper Oahe Reservoir that seems to mark a crucial point in the putative transition from the Extended to the Terminal Middle Missouri Horizon.

5. Excavation of one or more sites of McKean affiliation within the Bowman-Haley Reservoir.

6. Mummy Cave, near Cody, Wyoming, where a combined Whitney Gallery of Western Art-National Geographic Society-Smithsonian Institution party was excavating deep deposits containing a long sequence of human occupation.

In addition to the field parties of the River Basin Surveys, a number of other institutions worked within the Missouri Basin under cooperative agreement with the U.S. National Park Service. At the beginning of the year, the cooperators included: the University of Missouri, the University of Kansas, the Kansas State Historical Society, the State Historical Society of North Dakota, and the University of Nebraska. At the end of the fiscal year, cooperative agreements had been concluded with four institutions for investigations within the Basin: the University of Missouri, excavating in the Stockton and Kaysinger Bluff reservoirs of Missouri; the State Historical Society of North Dakota in the Oahe Reservoir of North Dakota; the University of Kansas, excavating in the Clinton Reservoir, northeast Kansas; and the University of Nebraska in the Glen Elder Reservoir, north-central Kansas.

New Programs

Towards the end of the fiscal year, the Smithsonian Office of Anthropology was engaged in preliminary planning for several major new research programs under the stimulus of Professor Sol Tax, of the University of Chicago, who on January 1, 1966, was appointed special advisor on anthropology to the Security of the Smithsonian Institution.

As part of a substantial long-range research program of the Office of Anthropology on ancient technology, Precolumbian metal artifacts excavated from the Milagro Culture of Ecuador by Evans and Meggers in 1961 have been submitted to the Battelle Memorial Institute of Columbus, Ohio, for metallographic and spectrochemical studies. The reports received to date are so significant that the study is being broadened for the next several years to include the testing of artifacts from both New and Old World archeological cultures such as Arabia. Field research to rescue data on traditional crafts ahead of the rapidly changing cultures brought on by western industrialization is being organized in such areas as Iran and will be extended to other parts of the world.

In April 1965, the Office of Anthropology decided to begin work towards a multi-volume "Handbook of North American Indians" to update the encyclopedic *Handbook of American Indians North of Mexico* (Bureau of American Ethnology Bulletin 30, 2 vols., 1907–1910), which has been the most widely useful of the 200 Bulletins and 48 large Annual

Reports of the Bureau. William C. Sturtevant agreed to serve as editor of this new Handbook, and planning as to its content and format began. The aim is to produce a reference work for scholars and the interested public, which will summarize and systematize anthropological and historical knowledge of the cultures, languages, and physical form of the Indians north of Mexico, and outline the course and results of their relationships with the later European and African settlers of the continent.

VERTEBRATE ZOOLOGY

Research activities in the division of fishes included a broad range of studies by the staff and the approximately 160 visiting investigators who came to the division to consult with the staff on their research projects and to study the extensive fish collections.

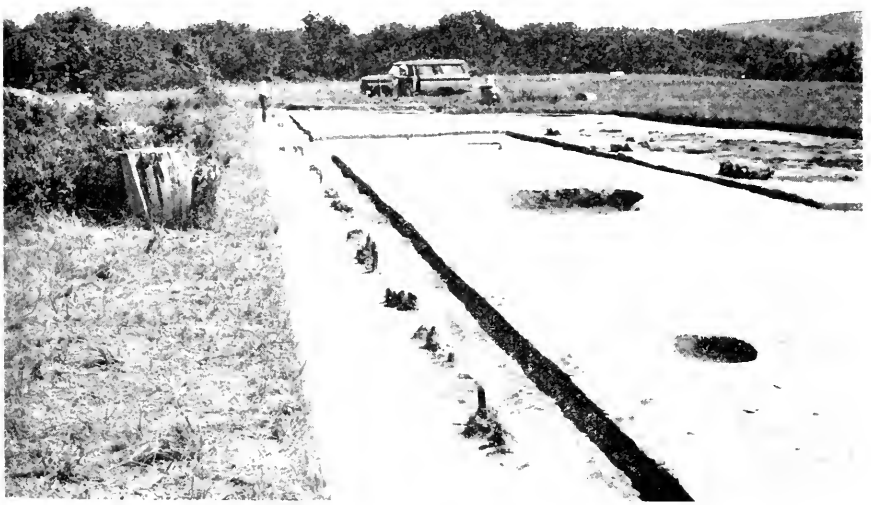
Ernest A. Lachner's studies of eastern North American barbeled nest-building chubs (Cyprinidae) have resulted in a comprehensive synthesis of their systematics, morphology, and distribution. His field studies contributed to the understanding of the biology and biogeography of the species and species groups. His ichthyological data have been correlated with the geology and physiography of the area, resulting in a comprehensive summary of the origins of the upland freshwater fish fauna of the eastern United States.

The systematic studies by Robert H. Gibbs, Jr., with Bruce Collette, U.S. Fish and Wildlife Service, of the giant-sized tunas of the world will have broad application in the fishery industry, and will be used by the industry and by fishery management organizations in many countries of the world where a tuna fishery is part of the economic income of the nation. It is the first real analysis of the specific identity of the several populations found in the oceans of the world.

William A. Gosline, Professor of Zoology, University of Hawaii, was appointed senior postdoctoral research associate for the year beginning September 1965. The subject of his investigation was the arrangement and classification of the major groups of the order Perciformes, which with several thousand species, is the largest single order of living fishes. His approach to the problem is primarily through comparative osteology.

Victor G. Springer completed a revision of the circumtropical blennioid fish genus *Entomacrodus*. One of the few intensive studies of tropical marine shore fishes, this research has resulted in a broader concept of fish speciation, distribution, origin, and evolution than has existed heretofore. A major advance in the zoogeography of this

Many surviving village sites along the Big Bend Reservoir are in danger of destruction. Much of the Cattle Oiler Site here (see p. 87) has already collapsed into the lake. Below: Remains of defensive stockade at Fort Manuel (see p. 88), a fur-trade post of 1812–13 in the central Oahe Reservoir, north-central South Dakota.



Collecting macaroni penguins on Elephant Island, off the Antarctic Peninsula (see p. 92), are Smithsonian scientists George Watson and J. P. Angle. The site is that where Shackleton's party wintered during his 1914–16 expedition. Below: Robert H. Gibbs, Jr., dissecting a marlin during cruise 14 of RV *Anton Brun* in the Southeast Pacific (see p. 90).

area has resulted. He is continuing his studies of the osteology, phylogeny, and relationships of the Blenniidae.

Stanley H. Weitzman's osteological studies of numerous families and groups of fishes contributed to a recent classification of fishes, published in 1966, which he wrote in collaboration with P. H. Greenwood, D. E. Rosen, and G. S. Myers. This classification collates for the first time in many years the abundant nomenclature of the higher categories of fishes and presents tentative phyletic arrangements of families and orders.

A new service to the science of herpetology was inaugurated in the division of reptiles and amphibians with the appearance of the first issues of the Smithsonian Herpetological Information Services. These are intended to provide multilithed copies of translations, indexes, bibliographies, lists, and similar material for distribution to herpetological laboratories. It is common for an investigator to prepare as a useful adjunct to his own work an index or translation which would be equally useful to his colleagues if available but is generally not suitable for formal publication. This is the type of material which the Information Services distribute, and the scope of the project is indicated by the items currently available:

A list of the herpetological publications of the United States National Museum, 1853–1965. 12 pp., issued December 10, 1965.

On the biology of the giant Indonesian monitor lizard; by Darevsky and Kadarsan [translated from the Russian]. 6 pp., issued December 10, 1965.

A list of institutions offering course work and degree programs in herpetology. 9 pp., issued December 18, 1965.

Considerations concerning the variability of amphibians and reptiles, by Stugren [translated from the Rumanian]. 10 pp., issued May 6, 1966.

Curator Doris M. Cochran and her collaborator Coleman J. Goin submitted for publication their monograph on the frogs of Colombia. In this study, 27 new species and subspecies of frogs are described.

James A. Peters pursued his long-term work on Ecuador, with current emphasis on the zoogeographical and taxonomic problems of the fauna of the higher altitudes of the Amazonian slopes of the Andes. He spent October on the coastal plain investigating the transition zone between the dry, almost desert conditions of southwestern Ecuador, which lie under the influence of the Humboldt Current, and the dense tropical rain forests of northwestern Ecuador, which show greatest relationships with the Caribbean slopes of Central America. Work was begun on a list of the snakes of the family Typhlopidae for *Das Tierreich*, to be included in the *Liste der rezenten*

Amphibien und Reptilien. An annotated list of rare and endangered species of reptiles and amphibians in the United States was prepared for the Department of the Interior's "Redbook," written by the Committee on Rare and Endangered Species, of which Peters is a member.

Curator George E. Watson continued work with J. P. Angle on an identification manual of Antarctic birds, participating in a joint U.S. Antarctic Research Program oceanographic research cruise on USCGC *Eastwind* to the Antarctic Peninsula, South Shetland and South Orkney Islands, from the end of December until early March. He also continued research on the birds of Greece, visiting seabird colonies throughout the Aegean islands, under the sponsorship of the National Geographic Society.

Paul Slud concluded his field work in Costa Rica, where he collaborated with an ecological team working on a project sponsored by the Army Research Office. During the dry season, Slud conducted a survey of birds and environments on Barro Colorado Island, Canal Zone, and at the Area de Pesquisas Ecologicas do Guama, Belém, Brazil.

Richard L. Zusi, continuing his studies of functional anatomy, locomotion, and feeding behavior in shorebirds by means of laboratory and field studies, obtained 1,300 feet of motion picture film of feeding shorebirds in California, including species of the rocky coast, mud flats, and ocean beach, to be analyzed by stop-motion projector. He studied the definition and interaction of functional complexes of the skull and the skeletal proportions of the trunk and limbs. He found that variations of the neck, wing, and pectoral girdle proved useful in the classification of plovers. As an outgrowth of the work on shorebirds he began a functional analysis of the schizorhinal skull in diverse orders of birds. With David Bridge, he obtained data at Assateague Island, Maryland, for a study of the unique pupillary mechanism of the black skimmer.

Charles La Rue, a Smithsonian pre-doctoral intern and graduate student from the University of Maryland, under Zusi's direction worked on a functional-anatomical study of the head in certain Ciconiiformes, with emphasis on variations in functional complexes. Useful in these anatomical studies are the newly installed X-ray machine and darkroom facilities of the division of birds.

As honorary curator of North American birds, Lester L. Short, Jr., continued his research on hybridization and intergradation in birds of the Great Plains. New material for these investigations totalled 800 specimens taken in Nebraska during summer 1965. He continued investigations of hybridization among three ecologically and morpho-

logically divergent species of southwestern North American woodpeckers (*Dendrocopos*) and described other interesting hybrids. Fossil (Tertiary) hawk and stork bones from Nebraska were studied, and a new genus and species of stork were described. Work progressed on a zoogeographical analysis of North American birds, being conducted jointly with Ernst Mayr of Harvard University, and on a review of woodpeckers of the world, the latter in cooperation with Walter J. Bock of Columbia University.

The first volume of Alexander Wetmore's *Birds of Panama* was issued in December. Dr. Wetmore conducted field work in southwestern Chiriquí (Panama) from January until March.

S. Dillon Ripley continued to work closely with his associate Sálim Ali on the "Handbook of Indian Birds," to be published in India. The first volume has been completed and is scheduled to appear in late 1966. The publication of this and subsequent volumes represents a long cherished desire on the part of both authors to bring up to date information on the bird fauna of India, Pakistan, Ceylon, and Nepal, and related islands and small territories and countries such as Sikkim and Bhutan. Ripley also continued his work on a projected monograph of the rails of the world, and completed, with research assistant Gorman M. Bond, a study of the birds of Socotra and Abd-el-Kuri.

As part of the mammals of Panama project, directed by Charles O. Handley, Jr., systematic collections were made at opposite extremes of the Pacific coast of the Republic, near Jaque and near Puerto Armuellas, by Francis M. Greenwell and Theodore H. Fleming. Fleming stayed on in Panama to conduct an all-seasons study, supported in part by the National Science Foundation, of mammalian population dynamics.

During the first year of the Smithsonian Venezuelan project, also under the direction of Charles O. Handley, Jr., about 8,000 specimens of mammals, their associated ectoparasites, and a large body of ecological and biological data for each were collected. In cooperation with Instituto Venezolano de Investigaciones Científicas (IVIC) and Middle American Research Unit (MARU), collection of blood sera to establish a virus antibody profile for the wild mammal population was begun. Altogether 20 scientists (parasitologists, virologists, mammalogists, and ecologists) in 5 countries are participating in this project, which enjoys the support of the Consejo de Bienestar Rural, the Museo de Ciencias Naturales, and Universidad Central de Venezuela, in Caracas. It is financed by the Office of the Surgeon General, Department of the Army.

Also with the support of the Office of the Surgeon General, Henry W. Setzer's studies of the mammals and their ectoparasites in the

African fauna continued in the southern part of the continent, particularly in the Bechuanaland Protectorate and South-West Africa, and they were extended to Nigeria and Senegal in West Africa. A preliminary synopsis of the Hyracoidea, by J. Bothma, was issued as the first part in a projected identification manual for African mammals, being prepared under the direction of J. Meester, University of Pretoria.

Steps were taken in the division of mammals toward development of a center for study and identification of subhuman primates. Particularly significant was a conference of prominent primatologists that considered the Smithsonian's assets and potential in this field and produced a plan for development of a center.

Through the support of Helmut K. Buechner, Office of Ecology, the department of vertebrate zoology in January 1966 participated in the establishment of the Area de Pesquisas Ecologicas do Guama (APEG), Belém, Brazil. The APEG was established through a series of official announcements by Director José Maria Conduru, of the Instituto de Pesquisas e Experimentacão Agropecuarias do Norte (IPEAN). One of the primary objectives of the APEG is the establishment of a broad program of basic research on the ecology of the Amazonian forest, one which will also serve as a means of offering scientific training directly related to regional needs. Both the Smithsonian and the IPEAN are collaborating in the development of a scientific program for the APEG through the provision of grants from the Smithsonian and facilities, personnel, and equipment from the IPEAN. As a result of this support, research programs are already under way on soils, botany, entomology, and epidemiology.

Several members of the department of vertebrate zoology have already participated in the research program of the APEG. In August 1965 Handley made a significant collection of bats in the APEG bringing the known bat fauna of the Belém area to a record total of over 60 species. He also gathered data on the vertical distribution of the bat fauna in the tropical forest making use of canopy mist nets.

Philip S. Humphrey, in collaboration with the Belém Virus Laboratory and supported by the Rockefeller Foundation, continued his studies on the ecological distribution and epidemiology of birds in the APEG. His field work was made enormously productive through the enthusiastic assistance of Thomas Lovejoy, David Soleau, and Stephen Humphrey. The emphasis of the summer's field work was on intensive banding of tropical forest birds, an approach never before attempted in the Amazon region.

INVERTEBRATE ZOOLOGY

On July 1, 1965, three new divisions—of Crustacea, of echinoderms, and of worms—were formed from the old division of marine invertebrates and were joined with the existing division of mollusks to form the department of invertebrate zoology. It is one of the largest departments of its kind in the world with specialists in many of the groups of invertebrate animals. Staff members concentrate primarily on basic research in systematics, and their interests include classical taxonomy, embryology, population dynamics, ecology, and oceanography.

Raymond B. Manning concluded a monographic study on the stomatopod Crustacea of the western Atlantic. He also furthered his studies on decapod Crustacea during field and study trips to Dominica, the Institute of Marine Science, University of Miami, and to the Rijksmuseum van Natuurlijke Historie, Leiden, Netherlands. J. Laurens Barnard completed an illustrated handbook for the identification of families and genera of marine gammaridean amphipods. In addition he continued studies on the abyssal and bathyal antarctic amphipods.

The origin of cave faunas is a fascinating study for the systematist because it so often divulges what appear to be direct evidences of evolutionary processes upon animals. Thomas E. Bowman completed three reports on cave isopods from Mexico and Cuba.

John C. McCain carried out studies on caprellid amphipods of the southeastern United States. To supplement existing study material, McCain made collections at several localities in the northern Gulf of Mexico. In addition he completed a manuscript on a new deep-water genus and species of caprellid from the eastern Pacific.

Louis S. Kornicker conducted research on the taxonomy and distribution of the myodocopid ostracods of the Atlantic Shelf, the Bay of Naples, and the Red Sea, and he studied collections at the British Museum, London, and the Naples Zoological Station.

David L. Pawson completed studies on the bathyal holothurians and other echinoderms of the New Zealand–Australian region. He and Donald F. Squires participated in an expedition to the Antarctic Peninsula, during which large collections of invertebrates were obtained. Earlier in the year, Pawson studied holothurian and echinoid specimens in European museums.

With the assistance of Joseph C. Britton, Joseph Rosewater completed a catalog of the more than 500 species of mollusks collected during Cruise "A" of the International Indian Ocean Expedition. Rosewater

continued studies on the littorinid snails of the Indo-Pacific region, and the periplomatid clams of the western Atlantic.

Joseph P. E. Morrison continued his research on brackish-water mollusks of the world and on the hydrobiid snails of American waters. He carried out field work in Dominica, Antigua, Montserrat, and Guadeloupe in an attempt to determine which of the mollusk species are endemic and which had been dispersed by artificial means.

Studies on the composition and relationships of the Polynesian molluscan fauna were continued by Harald A. Rehder who completed for publication a number of reports on his research. He made progress on his monographic study of the gastropod family Harpidae, and in connection with his interest in Indo-Pacific mollusks examined museum collections in Europe.

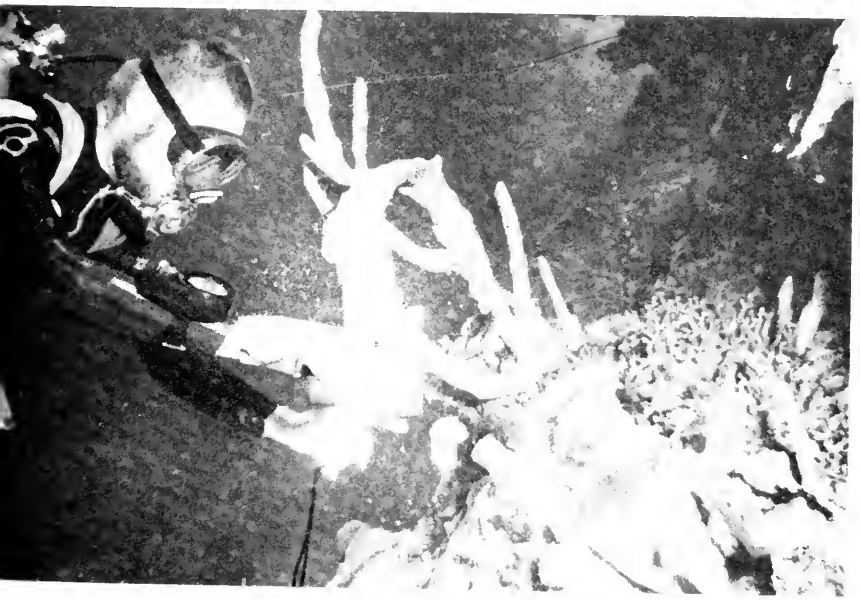
Meredith L. Jones carried out field work in the tropical western Atlantic in search of the marine polychaetous annelids upon which his systematic work is focused. He participated in an expedition to the Gulf of Mexico and Caribbean Sea; he was joined by T. Peter Lowe in making collections on Santa Catarina Island, Brazil; and he also acted as scientific leader of an expedition to Andros Island, Bahamas, sponsored by H. J. Bowen, of Wilmington, Delaware. Jones also continued his monographic study of the magelonid polychaetes of the world.

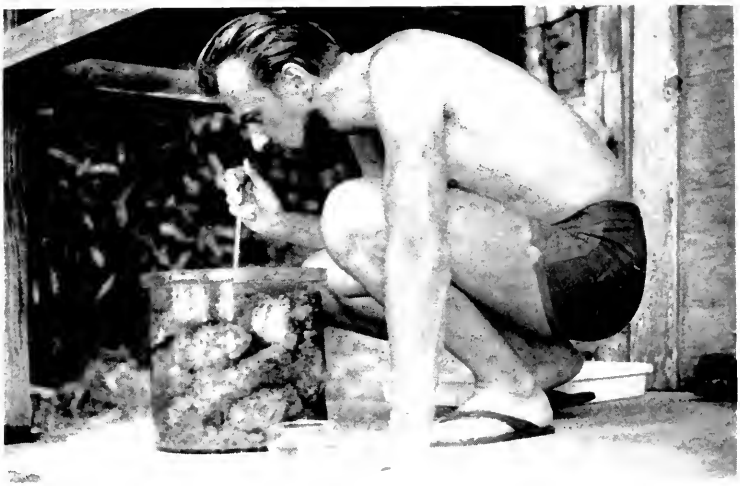
Studies on the fauna of northern waters were continued by Marian H. Pettibone, who specializes in the systematics of polychaete worms of the New England region. Her work continues on a revision of genera of polynoid polychaetes and on deep-water collections made by the Bureau of Commercial Fisheries off the mouth of the Columbia River, Oregon.

In addition to administering the Bredin-Archbold-Smithsonian Biological Survey of Dominica, Horton H. Hobbs, Jr., continued his monographic work on the freshwater crayfishes and their associated entocytherid ostracods. He engaged in field studies on Dominica, and also collected decapod Crustacea during a field trip through southeastern Virginia, South Carolina, and Georgia. During part of the year Hobbs examined crayfish collections in a number of European museums.

The classification of collections of freshwater and terrestrial decapod crustaceans from Dominica was the object of a collaborative study by Hobbs and Fenner A. Chace, Jr. In addition, Chace began preliminary work on the marine caridean shrimps collected by the Bredin-Smithsonian expeditions to the Caribbean in 1956, 1957, 1959, and 1960.

Aboard the RV *Anton Brun* off the coast of Chile, curator Roger F. Cressey (foreground) aids in the capture of a shark from which he will remove the parasitic copepods as a part of his studies on host-parasite relationships (see p. 97). Below: Photographed by curator Klaus Rützler, a diver collects sponge specimens at a depth of 120 feet from the coral reef slope of northern Jamaica during the Bredin-Archbold-Smithsonian survey of Dominica. The specimens are being studied by Rützler.





Ernst Kirsteuer, from the American Museum of Natural History, examines pieces of coral rock for its microfauna as a participant in the Bredin-Archbold-Smithsonian biological survey of Dominica, Lesser Antilles. Below: Cataloguer in the division of crustacea typing labels on an SCM typewriter assembly which produces a master tape from which any number of individual specimen labels may be prepared.

An interesting facet of evolutionary biology concerns the systematic problems arising from parasite-host relationships and the interpretation of host specificity. Roger F. Cressey, who is studying the copepods parasitic on fishes, has found indications that where host specificity occurs, it may provide new information relating to the phylogeny of the fish host. In carrying out his studies during the past year he participated in three expeditions, to the Gulf of Mexico and to the southeastern Pacific, during which sharks, tunas, and billfishes were examined for parasitic copepods. Cressey completed a revision of the Pandaridae, a family of copepods parasitic on sharks.

Studies on community structure of animal populations were carried out by Thomas E. Bowman, involving distribution of planktonic marine Crustacea. J. Laurens Barnard was engaged in a study of the benthic fauna of Bahía de San Quintín, Baja California; and Meredith L. Jones is completing an analysis of a community of benthic invertebrates from San Francisco Bay, California.

Donald F. Squires, former chairman of the department and now Deputy Director of the Museum of Natural History, continued his research on solitary corals. While on shipboard during the recent expedition to Antarctica, he made observations on living deep sea corals and he succeeded in returning several of the living corals by air to Washington for further study.

W. Duane Hope has continued a monographic study of the freeliving marine nematode genera *Deontostoma*, *Thoracostoma* and *Pseudocella*. In winter 1965 he completed the field work for a study of seasonal changes in the populations of marine nematodes in Hadley Harbor, Massachusetts, and a survey of the marine nematodes for the Cape Cod area.

Klaus Rützler, who came from Austria to join the division of echinoderms in fall 1965, has gained, through wide field experience, an understanding of the ecology as well as the systematics of Porifera, for ecology is often the key to classification of sponges. Since his arrival he has continued investigations on Caribbean and Adriatic sponges, and during the first half of 1966 carried out an ecological survey of the marine sponges of Jamaica and Dominica.

Mary E. Rice has conducted a comparative study of the reproductive biology and development of three species of sipunculids from the San Juan Archipelago in the State of Washington. In addition she continued her study of the taxonomy of sipunculids collected from the Maldive Islands in the Indian Ocean.

Honorary research associates of the divisions contributed substantially to the furtherance of research in their several disciplines. Waldo L. Schmitt carried out a monographic study of the pinnotherid

crabs and began compilation of the field notes covering his extensive collecting trips in the past, aided by his former secretary, Lucile McCain. Mildred S. Wilson continued her studies on the diaptomid copepods, which ultimately will lead to a revision of the North American species. Ailsa M. Clark proceeded with her work on the shallow-water Indo-West-Pacific echinoderm fauna, and Elizabeth Deichmann completed a study of collections of holothurians from the Gulf of Guinea and continued her studies on the sea cucumbers of Florida and the West Indies. Roman Kenk studied the systematics, life cycles, and distribution of freshwater planarian flatworms. He has established a series of laboratory cultures which allow him to observe food habits, reproduction, and the behavior of planarians. Gilbert L. Voss, University of Miami, continued his research on the Cephalopoda of the Atlantic.

Supported by a Guggenheim Fellowship, Dr. Jayme de Loyola e Silva, Universidad do Paraná, Curitiba, Brazil, was in residence in the division of Crustacea studying the collections of sphaeromatid isopods. NAS–NRC visiting research associate F. J. S. Maturo, from the University of Florida, continued his systematic studies in the division of echinoderms on the bryozoans of the Atlantic continental shelf in general, and of the southeast coast of the United States in particular. Also, during the past year, Dr. I. Canet was in residence in the division of Crustacea. She has nearly completed a revision of the economically important western Atlantic species of penaeid shrimps.

This year an histology laboratory was established under the responsibility of the division of worms to serve the needs of staff members. Equipment, supplies, and technical assistance are now available for making routine histological preparations for light microscopy.

Under agreements reached with a number of universities making it possible for graduate students to carry on research projects in the department of invertebrate zoology, seven students were associated with the department under the guidance of five staff members.

ENTOMOLOGY

Oscar L. Cartwright continued his research on the Scarab beetle family Scarabaeidae, especially the Aphodiinae. Many hundreds of additional specimens of *Ataenius* including additional types have been studied. A revision of two allied genera, *Euparixia* and *Rhyparus*, also received some attention. Cartwright participated in the Smithsonian-H. J. Bowen expedition to Andros Island in the Bahamas,

obtaining undescribed species in several orders of insects as well as new distributional records for many other species. He also collected winter and early vernal forms of Aphodiinae in several areas along the Gulf Coast in Florida, Alabama, and Mississippi.

Paul J. Spangler actively continued his research on several families of water beetles. Identifications and ecological data for an additional 3,800 specimens were added to his monograph of the hydrophilid genus *Tropisternus*. A manuscript on the Haliplidae of Mexico and Central America was advanced by the preparation of about 500 specimens for critical study and the completion of 38 illustrations. The study of a collection of Hydrophilidae from southern Argentina was undertaken at the request of the Hungarian National Museum; another study, on the water beetles of Puerto Rico and the U.S. Virgin Islands, was begun; and a revision of the hydrophilid genus *Enochrus* from Mexico, Central America, and the West Indies was undertaken as a joint project with Ralph Gunderson. These and other taxonomic studies were forwarded by 2 months of museum study in England, Belgium and France, and by 12 weeks in Mexico and Central America, where 99,100 insects and 1,375 miscellaneous specimens, including 46,200 water beetles for his various research projects, were collected. His field work was completed by 10 days of collecting in the Virgin Islands to obtain material for one research project.

Research associate Doris H. Blake continued work on her review of the chrysomelid beetle genus *Glyptoscelis* of the Western Hemisphere. Mrs. Blake collected for 10 days in Puerto Rico.

Much of Richard C. Froeschner's research time was devoted to the completion or continuation of several projects begun by the late research associate Carl J. Drake: two papers have been submitted for publication with Drake's name as sole author; a paper on the Galapagos lacebugs was rewritten and will be submitted with Froeschner as coauthor; and some work was done on an important revisionary study of the American lacebug genus *Corythuca*, on which Drake had made only some preliminary plans. Froeschner completed a paper on the burrower bugs (Cydnidae) collected by the Danish Noona Dan expedition to the Philippines and New Guinea. He also commenced work on an illustrated manual of the known genera of lacebugs as a complementary volume to the Drake and Ruhoff *Lacebugs of the World, a Catalog* (U.S. Nat. Mus. Bull. 243, 1965); it will be based on Drake's remarkably complete collection of lacebugs. Sorting, preliminary examination, and determination was begun of some of the hemipterous insects collected on the Bredin-Archbold-Smithsonian Biological Sur-

vey of Dominica; preparation of actual reports will be started after the survey teams complete their activities in 1966.

Karl V. Krombein began a revisionary study of a new Oriental genus of myzinine wasp which is parasitic on cerambycid larvae boring in trees. He received proofs of a large volume on the biology, nest architecture, and associates of trap-nesting wasps and bees, and also of his section in the second supplement to the *Hymenoptera of America North of Mexico*, of which he is also co-editor.

Research associate Carl F. W. Muesebeck completed a manuscript describing two new reared species of the diapriid genus *Trichopria*. He has also made considerable progress on his revision of the braconid genus *Orgilus*, an important parasite of caterpillars.

J. F. Gates Clarke continued his studies of the Meyrick types of Microlepidoptera with preparations for volumes 6, 7 and 8; completion of this monumental contribution is scheduled for 1968. Clarke has also made significant progress on the Microlepidoptera of the Pacific Islands and Neotropical Region.

Donald R. Davis almost completed the second part (subfamily Incurvariinae) of his revision of the New World Incurvariidae; work was intiated on the third (last) part treating the subfamily Adelinae. Revisionary studies were also begun on the New World Carposinidae, North American Acrolophidae, and North American Tineidae. Davis conducted field work for four months on five major islands of the Philippines, accompanied during the first three months by Julian Jumalon of San Carlos University. Ecological information and material collected on this trip will form an integral part of Davis' long-term project on Indo-Australian Psychidae.

W. Donald Duckworth continued his long-term study of the New World Stenomidae by conducting field investigations in Venezuela, Trinidad, Puerto Rico, and Jamaica. He also completed his study of the Amsel types of Venezuelan Stenomidae in Munich, and continued similar studies on stenomid types in Berlin and Vienna.

William D. Field completed research on a new genus of thecline butterflies, and is preparing a manuscript for publication. He has also continued his investigations on a world revision of the butterfly genus *Vanessa*, and on the butterflies and larger moths of Dominica. During June, Field made a 10-day field trip into the New England mountains to collect rare and localized species of butterflies.

Everett D. Cashatt, predoctoral associate, made considerable progress on a revision of the North American moths of the subfamily Chrysauginae. He also prepared a catalog of the Chrysauginae of the world, listing 174 genera and 532 species. Cashatt also completed investigations on the taxonomy and distribution of *Oidematophorus*

balanotes (Pterophoridae) and initiated studies on the Neotropical chrysaugine genus *Hyperparachma.*

The Southeast Asia Mosquito Project (SEAMP), started in 1964 as a cooperative endeavor between the Smithsonian and the Department of the Army and now, in its second year, has in preparation monographic studies on the mosquitoes of the area concerned. SEAMP has issued an informative field manual on the mosquitoes of Vietnam.

Ralph E. Crabill, Jr., continued research on several projects initiated earlier. Several articles on the dolichocephalic Geophilomorpha were almost completed. Considerable work was done on revisions of the Mecistocephalidae and the genus *Strigamia.*

Oliver S. Flint, Jr., continued his studies on the Trichoptera of the New World. In working on new collections from Mexico, Central America, and Chile, he found many species new to the collection as well as many new to science. During the summer Flint collected for two and a half months in Mexico and Guatemala. Later in the year he spent two months collecting in Chile and in the Palmer Peninsula area of the Antarctic; this trip provided much valuable new material as well as first-hand information on the habitats of many exotic species.

Research associate K. C. Emerson identified large collections of Mallophaga from birds and mammals of Africa and Thailand, and of Anoplura from Africa.

Research associate Thomas E. Snyder nearly completed the second supplement to his *Annotated Subject-Heading Bibliography of Termites;* to aid in the publication of this volume he obtained a grant from the National Science Foundation.

Research associate Robert Traub and several assistants from the University of Maryland School of Medicine have been working on fleas (Siphonaptera) and trombiculid mites on collaborative projects with the Smithsonian, dealing primarily with specimens collected in Pakistan, Iran, and Mexico. The Pakistani material, which raises the number of fleas known from that country from 10 to 67, includes 3 genera, 1 subgenus, and 21 species new to science; this constitutes probably the richest single collection of fleas ever made. The need for further research in the field is illustrated by the genus *Macrostylophora* which parasitizes squirrels in South Asia; 16 species have been described to date, but 11 new species are at hand mainly from the Philippines and North Borneo.

In December 1965, J. F. Gates Clarke was appointed senior scientist in recognition of his outstanding contributions to the development of the Department, and Karl V. Krombein transferred from the Department of Agriculture to become the new chairman.

BOTANY

Plant species and populations are often identified today, by joint studies of ecology, cytology, phytochemistry, physiology, and other nontaxonomic disciplines. The overall activities of the department of botany are directed toward such an integrative approach to problems in plant systematics. For example, a comparative study of the philodendron family has recently been completed by systematist Dan H. Nicolson and plant anatomist Richard H. Eyde. This horticulturally important, pantropical family is characterized by a peculiar arrangement of tiny flowers around a columnar floral stalk which often protrudes from the base of a cuplike, expanded, or strapshaped appendage. This appendage, or spathe, may be highly colored, as in the anthuriums of commerce and the jack-in-the-pulpit. The subject of their joint investigation was the anatomical structure of the flowers themselves and its possible bearing upon intrafamilial alignment, since no modern treatment was available. Their work was facilitated by Miss Priscilla Sherwin who, as a participant in the Smithsonian summer research assistant program, prepared the microscope slides upon which the study was based and assisted with the observations. Among other findings, their research showed that the genus *Lysichiton* was not evolutionarily primitive; that the genus *Philodendron* did not arise from the *Pothos* subfamily, as advocated by some botanists; and that *Acorus* (sweet flag), is unique in the family and should probably be segregated and recognized in a new subfamily. These conclusions, which could not have been reached on the basis of the systematic or anatomical evidence alone, demonstrate the value of an interdisciplinary approach to problems in systematic botany.

Kleinodendron, a new genus in the poinsettia family, was recently described from southern Brazil by Lyman B. Smith. He was anxious to know the closest relatives within this family but his own observations on floral structure and external morphology were insufficient to reach a conclusion. With the collaboration of William L. Stern, the anatomical structure of the wood was examined to establish, if possible, the nearest relatives of this Brazilian plant. Investigation and comparative study of related forms indicated that Smith was correct in his tentative interpretation that *Kleinodendron* could be assigned to the *Cluytia* tribe of the poinsettia family.

Phytochemistry is playing an increasingly important role in systematics. The presence of chemical substances is utilized by Mason E. Hale, along with data on morphology, geographic distribution, and habitat, in the identification and characterization of lichens. In an effort to complete world-wide studies of the important lichen genus

Mason E. Hale of the department of botany finds lichens in many habitats (see p. 102), including Japanese rooftops, here near Biwako. Below: Foreign students are shown laboratory of grass anatomy (see p. 103) by T. R. Soderstrom (right) and Dr. Cleofé E. Calderón (far left), visiting Argentinian scientist. At the microscope is former Neighborhood Youth Corps girl Diana Newman, who works for Smithsonian research associate.

Student of Lyman B. Smith holding plant of *Tillandsia oerstedii* in Costa Rica, where Smith taught course on epiphytes with the Organization for Tropical Studies. Below: Smith's class in the field. Here botany combines with entomology in the study of orchid pollination.

Parmelia, Hale during the past year undertook explorations in Hawaii and in western and southeastern United States to supplement previous wide-ranging excursions in southeastern Asia and Japan under the United States-Japan Cooperative Science Program. This research exemplifies a combined chemical, morphological, and field approach to the solution of taxonomic problems in a large genus.

Chromosome morphology and number in plants of the melastome family are being investigated jointly by John J. Wurdack and collaborator Peter H. Raven of Stanford University. Kittie F. Parker, honorary research associate, is working with biochemists at the University of Texas on a study of chemical variation and taxonomy in *Hymenoxys scaposa*, a member of the composite family. Thomas R. Soderstrom is combining the taxonomic and anatomic methods in his continuing investigations of the primitive tropical olyroid grasses. His work is being aided by Cleofé E. Calderón who is concentrating on the anatomical phases of the research, while further assistance with studies of leaf epidermises was provided by Jerold Grashoff, a Smithsonian summer research assistant.

Traditional phases of plant taxonomy continue to receive paramount attention notwithstanding some of the newer lines of research in which botany staff members are involved. Of major importance has been the establishment this year of the Index Nominum Genericorum Project in facilities provided by the department of botany. This project, initiated in 1954 at Utrecht, Netherlands, in association with the headquarters there of the International Association for Plant Taxonomy, has the aim of preparing a comprehensive card catalog of all plant genera which have been validly published according to the "International Code of Botanical Nomenclature." Each card carries the name of the author of the genus, the exact reference to the publication in which the name appeared, and the name of the type species when available. Information on each card is verified by actual examination of the original publication as well as other publications pertinent to the establishment of a type species. This work is carried out insofar as possible by botanical monographers who volunteer their services, but where these are not available, the project staff undertakes to perform the necessary studies. To date 23,000 cards in sets of 1,000 have been issued and distributed by subscription to botanical institutions throughout the world. The work is directed by botanical bibliographer Ida K. Langman with the assistance of Mary F. Southwell. Support is through a grant to the International Association for Plant Taxonomy by the National Science Foundation; botanist Richard S. Cowan, director of the Museum of Natural History, acts as administrator.

A conference to explore the feasibility of preparing a flora of North America, sponsored by the American Society of Plant Taxonomists, with Stanwyn G. Shetler as the local representative and organizer, was held during two days in May 1966. The meetings were attended by a select committee of ten botanists from the United States, Canada, and Mexico, as well as by members of the department of botany. The committee recommended that a flora be initiated and that the Smithsonian Institution act as host institution for the production of the work. Shetler was suggested as secretary of the editorial committee.

Each year the department is privileged to entertain distinguished visiting botanists who come for counsel, to examine the collections, and to use the library in pursuit of their research. Armando Dugand, Universidad del Atlántico, Barranquilla, Colombia, and Juan V. Pancho, University of the Philippines, College, have spent the year at the National Herbarium under the auspices of the John Simon Guggenheim Memorial Foundation. Dugand's work concerns the systematics and ecology of the flora and vegetation of the arid lands of Colombia bordering the Caribbean Sea. At the same time he is engaged in monographic studies of the catalpa family, in which he needs our extensive holdings in order to make proper comparisons and sound judgments. Pancho is studying the floristics of Mt. Makiling, which stands astride the borders of the provinces of Laguna and Batangas on the Island of Luzon. Several attempts have been made to prepare a flora of this extinct volcano and surrounding countryside, and there exists a manuscript, which is incomplete, prepared in the 1920's by an American botanist, the late A. D. E. Elmer. Pancho is checking literature citations, examining critical specimens, and reorganizing Elmer's identification keys for the plants of the region.

Julián Gonzalez Patiño (Hermano Daniel), Rector of the Colegio de San José, Medellín, Colombia, with the assistance of a fellowship from the Pan American Union, is studying the medicinal plants of Colombia and the flora of the Departamento de Antioquia.

John H. Beaman of Michigan State University spent the academic year in residence as a Smithsonian senior postdoctoral fellow continuing his studies on the alpine floras of Central America and Mexico. He is also collaborating with Thomas R. Soderstrom on a monographic treatment of the Central American bromegrasses. It is through assistance to such visiting botanists as these, by providing them with specimens and other facilities, that the department of botany is able to make contributions to science above and beyond the direct research of its own staff.

PALEOBIOLOGY

Research by G. Arthur Cooper was devoted largely to preparation of illustrations for his monograph on the Permian of West Texas (Glass Mountains) with Richard E. Grant of the U.S. Geological Survey. All but 17 genera have been photographed for his manuscript, which totals about 4,000 pages.

With members of the U.S. Geological Survey, Cooper made much-needed collections from significant Ordovician localities in Utah and Nevada in an effort to determine the age and correlation of some poorly known formations. In May and early June, aided by Thomas Phelan, Cooper carried on a field investigation of the Cedar Valley and related Devonian formations of Iowa and Missouri. The purpose of this trip was to collect fossils and data for a study on the correlation of the Cedar Valley, for presentation at a 1968 symposium on the Devonian, to be held in Calgary, Canada.

Research on various elements of the Lower Devonian fossil flora of eastern Canada by Francis M. Hueber has been delayed for want of laboratory facilities in the new quarters of the division of paleobotany in the west wing of the Natural History Museum. On the other hand, some progress was made in the research project through additional fieldwork. Important petrifactions of plant material from northern New Brunswick and the Gaspé Bay area of Quebec, Canada, were obtained during a 2½-week collecting trip. During another 2 weeks of fieldwork, fossil plant material for comparison with the Canadian fossil flora were obtained from Lower Devonian sediments at Beartooth Butte and Cottonwood Canyon, Wyoming.

Investigation of the crustose corralline algae of the North Atlantic was continued by Walter H. Adey through use of the vessel *Phykos*, received from the Navy reserve fleet and remodeled for the coralline program. Collections were made along the shelf areas extending from Long Island Sound south to the Florida Keys. The *Phykos* was found to be well suited to the task, for it provided space and stability not available on the smaller vessels used earlier. The specimens obtained during the summer of 1965 form a nucleus collection for the southeastern North Atlantic. Collections were made during February from land-supported stations along the coast of Jamaica at the invitation of Thomas Goreau, University of the West Indies.

As a part of a more general investigation of the early Tertiary mammals of North America, C. Lewis Gazin has continued his detailed study of the morphology, systematics, and environment of the Eocene condylarthran mammal *Hyopsodus*, a companion piece to his earlier

study of the coordinal, and in part contemporary, *Meniscotherium.* A study trip to the Carnegie Museum in April permitted him to extend his statistical analysis of speciation in *Hyopsodus* to the upper Eocene and to an important middle Eocene occurrence in the Green River formation of Utah. At the request of the Wyoming Geological Association, Gazin contributed a paper on the early Eocene mammalian faunas related to the Rock Springs uplift for the guidebook to their field conference during the latter part of the summer.

David H. Dunkle concentrated his studies on the poorly known and widely scattered Middle Devonian fish faunas of North America, with emphasis on a better understanding of the "*Dinichthys*" *tuberculatus–pustulosus* complex of coccosteiform arthrodires. Based on new and underscribed specimens in the national collections and other materials generously loaned for study by the Cleveland Museum of Natural History, the University of Michigan Museum of Paleontology, the Ohio University, and Bowling Green State University, a revisionary manuscript on the fishes of the Silica Shale of Ohio is near completion.

In addition he collaborated with Dr. Habib-ur Rahman, Geological Survey of Pakistan, in a report, in press, concerning the stratigraphy of occurrence of a recently discovered fauna of marine Eocene fishes in the Dera Ghazi Khan District, West Pakistan.

Nicholas Hotton III has been studying the functional morphology of therapsid reptiles and the field occurrence of reptilian fossils in the Beaufort series (Permo-Triassic, South Africa), in preparation for a systematic revision of the dicynodont reptiles. Approximately 100 dicynodont fossil skulls from South Africa were prepared superficially during the summer of 1965, with volunteer assistance. About half of these have been tentatively identified. Functional morphologic studies completed since this material was prepared indicate that additional features of palate and jaws must be exposed before the specimens will be useful in the projected taxonomic revision of the group.

Osteological variation in living lizards is being studied by Hotton from the viewpoint of their taxonomy, which is based on soft parts in these forms. The primary purpose of this study is to establish a model for determination of systematic patterns in the dicynodonts, but, if successful it will also provide information on the relationship between taxa established by neozoological techniques and taxa established by paleontological techniques.

Petrographic studies of Beaufort sediments begun by research assistant Ruth O. Hotton, are showing increasing promise as technical problems, due chiefly to induration and fine grain of the material, are solved. About 350 rock samples, collected in 1961 to 1963–64 over an

area more than 600 miles long and about 150 miles wide, are being studied. In about 10 percent of the collection, quartz and feldspar percentages have been determined by grain count in thin section, and an extensive heavy-mineral suite, as yet undescribed, has been extracted.

Clayton E. Ray continued work on Quaternary mammals, in particular on materials from the southeastern United States, Mexico, the Antilles, and Venezuela. Progress made on his comprehensive study of the fossil musk oxen of North America resulted in two small manuscripts in press and a third nearing completion. The work of sorting and identification of the Ladds, Georgia, fauna has continued as field parties from Shorter College, Rome, Georgia, continued collecting and shipping materials. One paper resulting from this project, the description of a new, giant chipmunk, was published during the year.

Ray spent approximately two months in Mexico during the latter part of the year, doing fieldwork and examining museum collections. The field work, in collaboration with personnel of the Peabody Museum of Archaeology and Ethnology, Harvard University, is concentrated in late Pleistocene deposits of the Puebla Valley where the faunas are associated with early man. In June intensive fieldwork was begun at Saltville, Virginia, in collaboration with Virginia Polytechnic Institute.

Research associate Remington Kellogg continued his study of the extinct whalebone whales, particularly those occurring in the Miocene Calvert, Choptank, and St. Marys formations of Maryland and Virginia. Progress was made on the allocation to better preserved specimens of the unsatisfactory fossil mysticete vertebrae and mandibles which served as types for the genera and species proposed by E. D. Cope. A description was completed of a previously unknown large odontocete from the Calvert formation of Maryland.

Richard S. Boardman was charged with the organization and part authorship of a complete revision, for the *Treatise of Invertebrate Paleontology*, of the volume on Bryozoa, which will deal with the entire phylum down to the genus level, averaging a plate of illustrations per genus. At present, nine scientists from this country and Western Europe are contributing to this large undertaking.

The identification and use of bryozoan fragments in subsurface well cuttings in oil exploration was the subject of an investigation by Boardman and Jesse Merida, a graduate student at George Washington University. The fragments are generally identifiable and should prove useful in future exploration for oil. Boardman also, as a part of a training program established between the Smithsonian Institution and the Geology Department of Yale University, gave three lectures at New Haven this year.

230-457—66——10

The study of Recent and Pleistocene podocopid ostracodes by Richard H. Benson continued as a new laboratory including the most advanced photomicrographic equipment was being completed. A general examination of the history and present status of research on the living marine descendants of this important fossil group was completed early in the year and submitted for publication. Two studies concerned with the stratigraphic and ecologic aspects of the Pleistocene freshwater ostracodes of Texas and Kansas were also completed. One of these examined the feasibility of using muscle-scar patterns for classification, and developed a simple quantitative method for comparison of the relative position of individual scars among different taxa. A fourth area of study concerned the description and biogeographic evaluation of the ostracodes of the Indian Ocean collected by Benson and others during the International Indian Ocean Expedition. He and his associate Rosalie Maddocks, who made extensive collections in Madagascar before coming to the Smithsonian on temporary appointment, have been documenting many new species from a portion of the world's ostracode faunas previously unknown. A new technique for removing fossil ostracodes from abyssal muds yielded a very large population of ostracodes from depths of more than 12,000 feet in the Madagascar Basin and Mozambique Channel. The ability to examine these abyssal faunas has great promise in the understanding of similar forms recovered from future drill cores taken from the ocean floor. Another study in progress was concerned with the evaluation of the Bering Strait as an effective barrier to migrant benthonic animals of microscopic size, of which the ostracodes are a good example because of their abundant fossil record. Examination of large faunas from the Arctic and the northern Pacific is made possible by application of computers and numerical taxonomic methods applied to biogeography.

Martin A. Buzas completed a study which utilizes a multivariate statistical model called canonical analysis for comparison of biofacies. Computation of canonical axes on the IBM 7094 simultaneously compared abundances of 45 species of Foraminifera distributed in 182 samples off the Texas coast. Data concerning the spatial distribution of Foraminifera from Rehoboth Bay, Delaware, are currently being analyzed by use of the binomial, Poisson, and negative binomial distributions. In the Choptank River, Buzas is taking four foraminiferal samples monthly at each of three stations distributed across a faunal gradient. The temperature, salinity, oxygen, chlorophyll, phosphate, and nitrate are also measured at each station each sampling time. The study is unique in that its design will permit a statistical analysis of the relationship of the fauna to several environmental variables.

Richard Cifelli continued his studies of planktonic Foraminifera in the North and Equatorial Atlantic regions. In conjunction with K. Norman Sachs of the U.S. Geological Survey, a study of the abundance relationships between planktonic Foraminifera and Radiolaria showed the two groups to occur in roughly equal numbers over much of the western North Atlantic. This is rather surprising, as Radiolaria appear to be mostly rare or absent in sediments over most of the North Atlantic, while planktonic Foraminifera are prolific. This implies that the siliceous radiolarian test is chemically less stable than the calcitic foraminiferal test in the oceanic environment, and that most radiolarian tests are dissolved and recycled into the sea water. Interesting results were obtained from a study, in conjunction with R. K. Smith, of the distribution of planktonic Foraminifera in the waters east of the Grand Banks. The distributional patterns of the Foraminifera appear to substantiate Worthington's hypothesis of a two gyred circulation in the North Atlantic.

Additional samples of Tertiary consolidated foraminiferal ooze were dredged and cored from the Mid-Atlantic Ridge. It has been postulated by Cifelli, V. T. Bowen of the Woods Hole Oceanographic Institution, and R. Siever of Harvard University that consolidation of the oozes is a consequence of uplift of the Mid-Atlantic Ridge.

Two major research projects were undertaken by Erle Kauffman during the past year. A detailed study of the Mesozoic bivalve family Inoceramidae revealed for the first time the morphology and evolution of interior shell features and provided a basis for a radically new taxonomy. In connection with this Kauffman spent a month diving in the Florida Keys studying the mode of life and habitat of living counterparts of the inoceramids, the Isognomonidae. A second study dealing with the ecologically unique cool-water bivalve *Thyasira* was completed. The ancestral Cretaceous thyasirids from North America were monographed for the first time. A detailed comparative study of living and Cretaceous *Thyasira* provided a means of interpreting paleoanatomy and equating the ecology of living and fossil representatives; it revealed major evolutionary trends in the group.

Porter M. Kier spent the year researching on the fossil echinoid order Oligopygoida. He studied all the available specimens, excavated many lanterns, made a crystallographic analysis of the plates, and redescribed all the species. After a collecting trip to Jamaica to obtain more specimens, he is now completing a monograph of the order. Kier also gave three lectures this year at Yale University as a part of a training program established between the geology department of the University and the Smithsonian Institution.

During the year 1966, Kenneth M. Towe completed installation of the electron microscope facilities housed in the department of paleobiology. Cooperative work is now underway with several staff members.

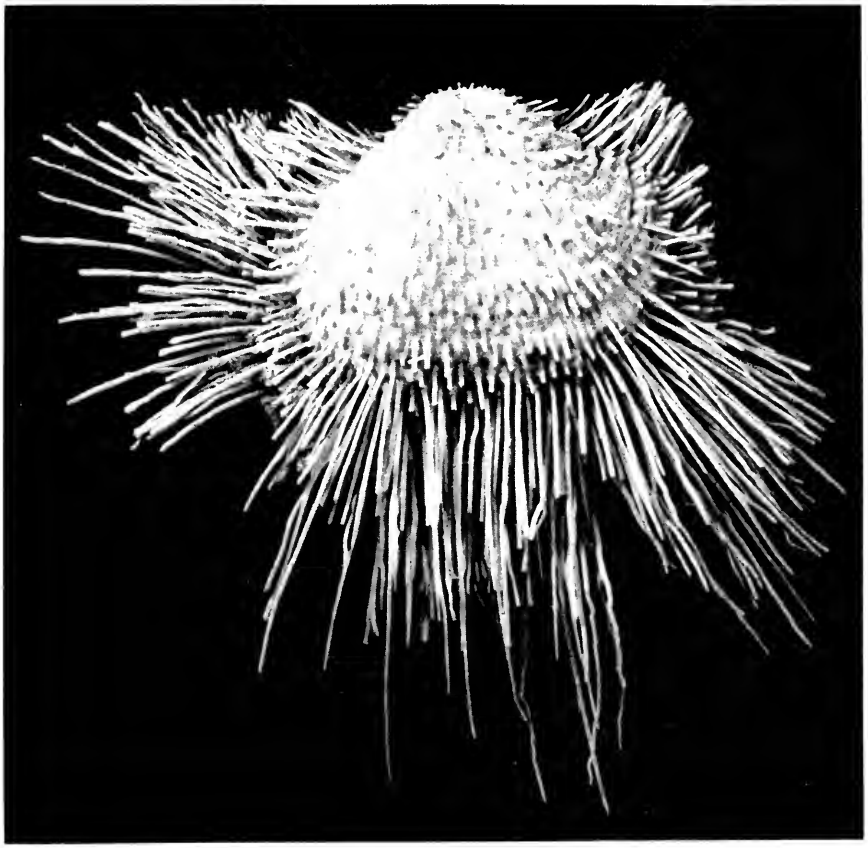
At the semicentennial meetings of the American Association of Petroleum Geologists held in St. Louis, Missouri, Towe and Cifelli presented findings dealing with shell-wall ultrastructure in the calcareous Foraminifera which clarified some misconceptions and inconsistencies in the studies of earlier workers. Their paper demonstrated that the so-called "radial wall" is not necessarily constructed of fibrous or prismatic crystals of calcite oriented perpendicular to the shell surface, and also that the lamellar character of the walls of several of the Foraminifera is not in agreement with the models suggested for this group. This work, being prepared for publication, will have a strong influence on existing systems of classification of the Foraminifera, which have been heavily weighted by patterns of wall structure.

In the application of the electron microscope to the study of bryozoan shell material, Towe and Richard S. Boardman made promising progress in interpreting patterns and mode of calcification of zooecial wall structure. It was found that in some Recent species of heteroporoid Bryozoa an interpretation of edgewise addition of calcite crystals within the zooecial wall, as seen in the electron microscope, helps to explain the origin of the reverse lamellar structures seen in the light microscope. Continued work is providing more insight into this problem.

In addition to these studies, Towe has projects underway dealing with the mineralogical composition of colloidal iron oxides of both organic and inorganic origin, the morphology of clay minerals, as well as studies of shell structure in molluscs and brachiopods.

Thomas R. Waller, who joined the staff in April, completed a study (Columbia University Ph.D. dissertation, 1966) of the evolution of a common group of bivalves, including the western Atlantic Bay and Calico scallops and their fossil ancestors. The application of population systematics, utilizing automated data processing, has revealed a picture of species forming and evolving on the Atlantic coast relatively rapidly, so that within a period of about ten million years parallelism, convergence, and extinction can be demonstrated at the species level. In contrast, related scallops in the eastern Pacific have evolved relatively slowly and today are morphologically primitive and ecologically generalized.

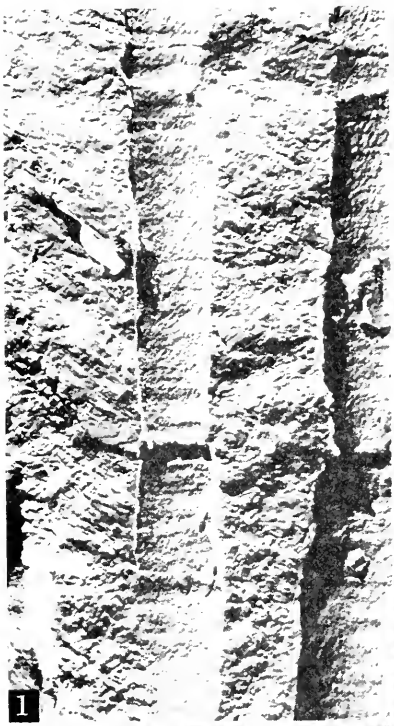
Richard A. Robison, a specialist in trilobites and Cambrian stratigraphy, joined the Museum staff in mid June after five years on the geology staff at the University of Utah.

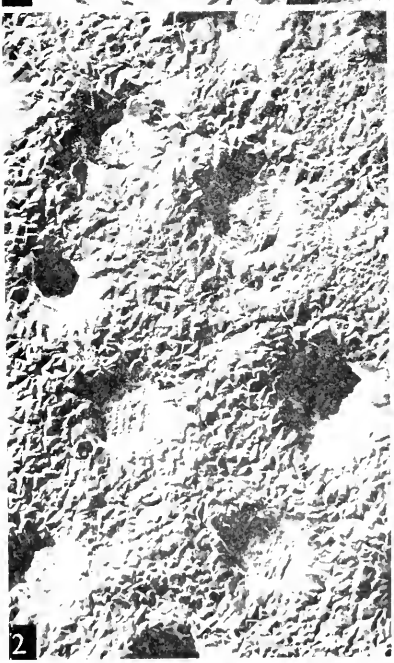


This silicified Permian brachiopod *Waagenconcha abichi*, in an unusually fine state of preservation, was obtained by R. E. Grant of the U.S. Geological Survey from the Khisor Range in West Pakistan.

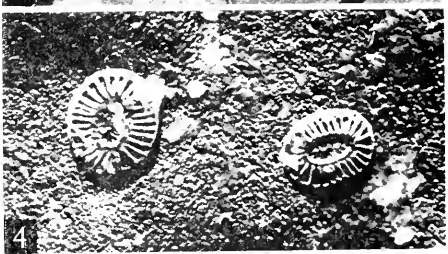
Electron micrographs of skeletal calcite of marine organisms (see p. 110): 1, Cross-sectional view of pore canals and microcrystals in the wall of *Cibicides refulgens* (Foraminifera) ×3,200. 2, View of the pores and microcrystals in the ventral wall of *Ammonia beccarii* (Foraminifera); the various microcrystalline arrays in these minute animals may prove useful in their classification, ×4,500. 3, Calcite crystals lining the zooecial wall in *Heteropora pelliculata* (Bryozoa); the crystals point in the direction of growth, ×6,000. 4, Microscopic unicellular marine algal coccoliths (*Coccolithus huxleyi*) useful to geologists for dating ocean sediments, ×5,000. 5, Aragonite crystals in a portion of the nacreous layer in the shell of *Brachiodontes recurvus* (Mollusca), ×5,000.

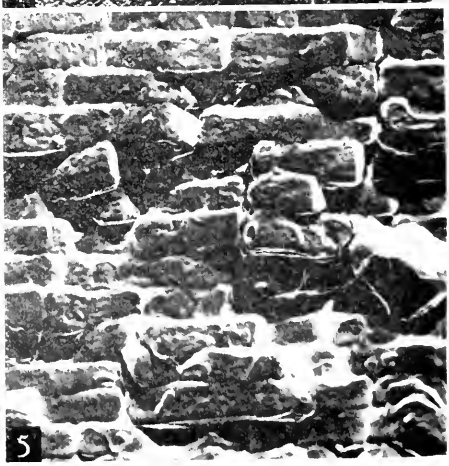
Overleaf ——————→


1


2


3


4


5

Honorary research associate J. T. Dutro, U.S. Geological Survey, continued his research on Paleozoic brachiopods, concentrating on a biostratigraphic analysis of the fossils from the Redwall limestone in Arizona. Field work included a 3-week trip to Nevada with G. A. Cooper and R. S. Boardman, R. J. Ross, Jr. (U.S. Geological Survey), H. B. Whittington (Harvard University), Fred Shaw (Mt. Holyoke College), and Brian Norford (Canadian Geological Survey) for the purpose of examining the regional stratigraphy of the Ordovician and making pertinent collections of fossils.

Honorary associate curator Franco Rasetti, continued his work on the Cambrian trilobite faunas of the Taconic region of New York. Discovery of a Middle Cambrian fauna in addition to the previously recognized Lower Cambrian trilobites resulted in the preparation of several manuscripts of major importance to an understanding of the paleogeography and tectonics of the region during that period.

Research associate W. P. Woodring continued his study of the Tertiary Mollusca of the Canal Zone and adjoining parts of Panama. A paper on the Panama land bridge as a sea barrier was prepared for publication.

Working as a predoctoral intern under the direction of Woodring, Carmen Perrilliat is completing a study of Miocene mollusks from Santa Rosa, Veracruz, Mexico.

Charles W. Harper, in residence under a visiting research associateship sponsored by the National Academy of Sciences, has been studying the brachiopod collections as prelude to the preparation of manuscripts that include studies of Llandovian to Eifelian Chonetacea, of Middle Devonian North American chonetids, and of Middle Ordovician brachiopods from Venezuela; a monograph on the family Stropheodontidae; and a memoir on the Brachiopods of the Arisaig series of Nova Scotia.

Under its new curator, Jack W. Pierce, the recently established division of sedimentology, of the department of paleobiology, completed its first year. During this formative period, space was remodeled for division laboratories and storage areas, equipment was acquired for a basic laboratory, and some field equipment was procured. Arrangements were made to start, in June, a feasibility study and initial sampling leading toward a research project treating the sedimentation and geochemical processes of the continental shelf and coast of Argentina. This is a joint venture between Pierce, Frederic Siegel (George Washington University), and Argentine scientists. His work on the evolution of the North Carolina Outer Banks is continuing.

M. Grant Gross who agreed to join the staff in August 1966, will continue his work on the cores obtained from Midway Island in conjunction with J. I. Tracey and H. S. Ladd of the U.S. Geological Survey.

MINERAL SCIENCES

Research in meteorites was concentrated on phase analysis in chondrites and in several unusual iron meteorites. For the second year this work was to a large extent supported by the National Aeronautics and Space Agency. Under an Air Force contract a number of rare, so-called unequilibrated chondrites were analyzed chemically.

Kurt Fredriksson completed a study of some 30 L— and LL— group (amphoterites) chondrites and demonstrated that these two groups can be clearly separated on the basis of olivine and pyroxene compositions, although bulk analyses may show overlap. An intensive study of the Sharps meteorite showed that this is one of the few H— group chondrites that has variable olivine and pyroxene composition. Furthermore, it contains fragments of a carbonaceous chondrite and secondary chondrules, thus three igneous and three "sedimentary" cycles can be recognized. This demonstrates that chondrites are products of very complex extraterrestrial rock-forming processes that took place early in the development of the solar system.

Research by Brian Mason during the year was directed toward investigation of the chemical and mineralogical composition of stony meteorites. Specimens of special research interest from the Museum's collection are being chemically analyzed, and their mineralogy studied by microscope, x-ray diffraction, and electron microprobe techniques. A detailed examination of meteorites collected at Wolf Creek crater in Western Australia in 1963 resulted in the discovery of two new minerals. Descriptions of these were to be presented at a meeting of the International Mineralogical Association in Cambridge, England, in September 1966.

During July 1965 Mason collected tektites in central Australia and mapped their distribution. In August he was joined by E. P. Henderson and together they carried out similar field work on the Nullarbor Plain, a limestone plateau 500 miles from east to west and 100 miles north to south, extending across South and Western Australia. As a result of this and previous expeditions to Australia the museum now possesses the finest collection of well localized tektites in any institution. These are being intensively studied in cooperation with scientists from the NASA Ames Research Center, Moffett Field, California.

Roy S. Clarke, Jr., continued his research on tektites cooperatively with colleagues at the Corning Glass Works and the U. S. Geological Survey. Studies in progress on the potassium-argon ages of artificial glasses made from natural materials may have important implications for the presently accepted interpretation of the potassium-argon experiment as applied to tektites.

Eugene Jarosewich analyzed 12 new meteorites, and a paper presenting the results of these analyses is in press. In addition the pyroxenes from the Chainpur, Clovis, and Coolidge meteorites were analyzed, and a series of separate chemical determinations performed on the meteorites Knyahinya, Mangwendi, and Bjurböle.

Installation of an X-ray fluorescence analyzer in the chemical laboratory was completed. Jarosewich and Joseph Nelen are developing a method for analyzing stony meteorites by this technique. The fact that these meteorites have a silicate matrix containing finely dispersed metallic inclusions presented a problem, and the first objective was to obtain a fine, homogeneous powder. Various fusion techniques were tried but with disappointing results; however, acid attack to decompose the metal phase, followed by neutralization and low temperature ignition to oxides, seems to offer promise.

After spending a month in Australia collecting tektites, E. P. Henderson continued his studies of hexahedrites. On December 31, 1965, he retired and was appointed honorary research associate.

George Switzer continued his work on the garnet group of minerals, and with William G. Melson completed a study of plagioclase-spinel-graphite xenoliths in iron-bearing basalts from Disko Island, Greenland. In November 1965 he was re-elected Secretary of the Mineralogical Society of America and appointed U.S. member of the Museums Commission of the International Mineralogical Association.

Paul E. Desautels completed a morphological study of mckelveyite and continued his studies of radioactive minerals from Mexico and lead oxychloride minerals from Greece.

John S. White completed his description of plattnerite and with Brian Mason worked on the descriptions of two new mineral species from the Wolf Creek, Australia, meteorite.

Peter B. Leavens joined the staff in November 1965 as an NAS-NRC postdoctoral research associate. His primary interest is the mineralogy and geochemistry of iron-manganese phosphates in pegmatites, and he has been studying suites of these minerals in the Museum collections. He has finished a reexamination of the incompletely described manganese phosphate bermanite. In cooperation with T. A. Simpson of the Alabama Geological Survey, he is preparing a paper on the iron-manganese phosphates found in a pegmatite in Coosa County, Alabama.

Among other research projects undertaken by Leavens are a paper completed on the calcium oxalate mineral whewellite; another in preparation on the OH:F ratio in the beryllium phosphate, herderite; and one co-authored with C. S. Hurlbut of Harvard University on the lithium silicates bikitaite and eucryptite. The specimens used in this

study were collected by Leavens and John White at the Foote Mineral Company mine, King's Mountain, North Carolina.

William G. Melson continued his investigations of oceanic rocks. Studies centered on the Mid-Atlantic Ridge and include greenstones, basalts, and dolerites from lat. 22°N.; ultramafic and alkali-rich mafic rocks from St. Paul's Rocks; and an alkali "basalt" (olivine nephelinite) and numerous other rock types dredged from the St. Paul's Rocks area. Melson in November 1965 participated in cruises to the 22°N. area (cruise 1 of the R.V. *Thomas Washington*) and in March 1966 to St. Paul's Rocks and the Romanche Trench in the equatorial Atlantic (cruise 20 of the R.V. *Atlantis II*). This work is part of cooperative investigations of the Mid-Atlantic with Tj. H. van Andel of the Scripps Oceanographic Institution and Vaughan T. Bowen of Woods Hole Oceanographic Institution.

The cruises were extremely successful from a petrologic standpoint. Dredging produced very large and complex suites of rocks which will be examined into and perhaps through 1966.

Studies of greenstones from the R.V. *Chain* cruise 44 (1964) were completed and the results are in press. In addition, several short notes were submitted for publication on oceanic rocks and minerals that include montomorillonites (mainly saponite) in hydrothermally altered basalts from the 22°N. area, and an olivine nephelinite dredged near St. Paul's Rocks during cruise 20 of the R.V. *Atlantis II*.

The Collections

CARE AND CONSERVATION

SPECIMENS ACCESSIONED, IDENTIFIED, AND DISTRIBUTED – FISCAL YEAR 1966

Departments	*Accessions (transactions) 1966 (new)*	*Received on loan*	*Exchanged with other institutions*	*Transferred to other Government agencies*	*Lent for study to investigators and other institutions*	*Specimens identified*
Anthropology . .	76	1, 226	81	9	559	2, 228
Invertebrate Zoology	460	4, 388	1, 802	0	14, 506	38, 578
Vertebrate Zoology	191	9, 648	6, 751	6	16, 114	25, 438
Entomology . . .	477	6, 141	2, 243	1, 500	75, 507	31, 547
Botany	337	3, 229	7, 876	37, 701	32, 160	18, 172
Paleobiology . .	138	341	2, 579	0	13, 706	46, 794
Mineral Sciences .	298	8	1, 188	151	613	437
TOTALS . .	1, 977	24, 981	22, 520	39, 367	153, 165	163, 194

ANTHROPOLOGY

Creation of the anthropological conservation laboratory, which replaces and incorporates the previous preparatory service, represents a major step forward. In August 1965, the laboratory was set up in its new quarters, and considerable progress was made in the acquisition of basic supplies and equipment. The staff includes A. Joseph Andrews, who remains chief preparator, and Bethune Gibson, who joined the staff as a technician specializing in conservation, under the immediate supervision of Gus W. Van Beek. During the year, a total of 1,313 specimens, ranging from fish-oil-saturated wooden bowls, from the Northwest Coast of the United States, to African iron weapons, to ancient Greek and Italic pottery, to bark paintings from Australia, have been cleaned and given conservation treatment. The laboratory personnel have also experimented with various materials in their search for solutions to problems of conservation. Noteworthy discoveries include development of processes for the removal of noncarbonate encrustations on pottery, and ubiquitous black "ink blot" and root deposits that occur on ancient pottery from various environmental situations.

In conjunction with the conservation laboratory, museum technicians have begun to reorganize the storage of all the ethnological specimens from the Northwest Coast of North America, the Philippines, and Korea and Japan. In the process it was determined that the U.S. National Museum has one of the finest collections from the Northwest Coast made in the late 1800s—as yet unstudied except for an occasional piece which has attracted attention because of its esthetic qualities. Reorganization of the Old World archeological collection was also completed.

Further progress was made in the storing of the Old World archeological collections. The Asian anthropological collections are being systematically reviewed, and the orderly rearrangement of the skeletal storage was completed.

During the year the archives of anthropology, which, under the management of Margaret C. Blaker continues to serve a large number of anthropologists, linguists, and other scholars, received and answered an increasing number of inquiries and orders for photographs.

The archives, formerly a part of the Bureau of American Ethnology, are old, extensive, and well organized. The contents include ethnographic, linguistic, archeological, historical, and some physical anthropological manuscript material, large collections of personal papers of a few anthropologists, and a very extensive collection of photographs. The restrictions which limited the BAE archives to materials on the New World having been removed, and being by no means limited to materials gathered by the Smithsonian staff, the archives now may receive anthropological manuscript and photographic material relating to all parts of the world, as well as the personal papers of anthropologists. The collection thus becomes a national archive of anthropology, serving the needs of ethnohistory, culture history, ethnology, comparative linguistics, and the history of anthropology.

Important additions to the manuscript and photographic collections received during the year include the personal papers of James Owen Dorsey, ethnologist with the Bureau of American Ethnology, 1878–1895, a gift from J. O. Dorsey's granddaughter, Mrs. Fitzhugh McLean of Takoma Park, Maryland. These papers, consisting of diaries, correspondence, autobiographical notes, lectures, and a volume of notes on Siouan ethnography and language, have been listed in detail and fill three manuscript boxes. The original manuscript which was printed as *Ojibway Texts* by William Jones (Truman Michelson, ed., Publications of the American Ethnological Society, vol. 7, pts. 1, 2, 1917, 1919), but was previously uncatalogued in the archives, was identified and arranged by comparison with the published texts. The originals include partial interlinear translations as well as the full English translations that were published. About

5,000 prints have been made from glass negatives in the collection of the former Bureau of American Ethnology and copied on safety film. However, about 15,000 glass negatives remain uncopied, as well as nearly 10,000 nitrate film negatives which are in an unsafe, deteriorating condition. Copying will continue as funds become available.

VERTEBRATE ZOOLOGY

The completion of the west wing of the natural history building enabled the division of fishes to move its collections into the new quarters during the summer of 1965. This move, accomplished in about three months through the cooperation of all staff members of the ichthyological laboratory, U.S. Fish and Wildlife Service, involved the transfer of approximately 300,000 jars of specimens in alcohol. Simultaneously, the collection was rearranged and preservative was restored. All identified but uncataloged collections were placed in their proper family along with the cataloged material. The collection of large preserved specimens is gradually being transferred to 300 monel-metal-lined tanks in the west wing.

The collections of reptiles and amphibians, moved into new quarters in FY 1965 and for the most part arranged in taxonomic order, are now more easily accessible. The program of relabeling and rebottling continued.

In the division of birds over 400 new cases were added to the specimen storage area. With a few exceptions, anatomical specimens of birds preserved in fluid are no longer accessioned into the collections, as they are intended for dissection and replacement rather than for permanent reference. To encourage their use by qualified investigators, a catalog of the anatomical collections is being prepared, to be available on request. During the year Mrs. Julian Stein, Jr., volunteered her services towards rearranging the egg data file, and Mrs. John W. Boyd volunteered her services for working on maps of the distribution of Antarctic birds and for translating Russian articles.

In the division of mammals, by the end of the year, the bulk of the collections were housed in permanent quarters that place major groups in areas which combine storage and research facilities. This is particularly significant for certain groups like the rodents and primates for which special plans have been made for identification and service facilities.

The osteological collections of cetaceans (whales, porpoises, and the like) are still scattered in various temporary storage areas, and plans are under consideration to centralize them in separate warehouse and research facilities outside of the Natural History Museum.

INVERTEBRATE ZOOLOGY

During the year the department acquired a typewriter system designed to reduce cataloging and processing time by providing replicate labels and/or catalog cards from a single typing. The system features macro- and micro-typewriter units that can be operated from a punched-paper tape. The data typed on the label with the microtypewriter is automatically reproduced on the catalog cards, and as many cards as needed can be made up from the tape.

For most of the newly-established divisions of the department, curatorial activities centered around rearrangement of the collections in the new storage areas of the west wing. In the division of mollusks, largely through the diligence of Museum technician, Florence Ruhoff, 15,736 lots were cataloged, a total higher than that during any of the past 6 years and three times the number produced last year. As a result, nearly all the large number of new accessions received during the year are processed and incorporated into the collections. A program initiated to sort the large backlog of uncataloged mollusk accessions to systematic and geographic groupings is expected to make this material more available to the researcher interested in obtaining representatives of various families of mollusks from particular faunal regions.

Museum specialist H. B. Roberts began to identify the backlog of American crabs, particularly those from the Gulf of Mexico and the Caribbean, in a program designed not only to physically reduce the backlog but also to diversify the collections by arranging exchanges of excess material with other institutions. Also by providing routine identifications of specimens of crabs forwarded to the museum for examination, Roberts has materially reduced the burden of routine work formerly assumed by the professional staff.

ENTOMOLOGY

Under grants from the National Science Foundation, more than 20,000 specimens of Central and South American Lepidoptera were sorted and labeled; a catalog of New World Stenomidae was prepared; a photographic file of Stenomidae was initiated; about 5,000 specimens of *Ataenius* were mounted and labeled; some 54,000 miscellaneous insects were counted, sorted to order, and placed in fresh alcohol; 46,000 aquatic beetles were sorted to family and placed in fresh alcohol; and 5,100 water beetles were prepared for critical study by extraction of the male terminalia and by pinning, labeling, and sorting to genus.

Summer student intern Judith Ann Holland sorted, determined to

genus, and placed in the working collection about 12,000 miscellaneous, unidentified Scarabaeidae. Pre-doctoral associate Robert Gordon studied, identified, and revised our collections of *Hydroporus* (Dytiscidae). Another pre-doctoral associate, E. D. Cashatt, segregated and studied 3,000 American Chrysauginae, and prepared over 800 genitalic slides.

Museum aid Gloria House sorted to family nearly 84,000 beetles, mostly alcoholic material from Bolivia; she also mounted and labeled nearly 2,500 specimens, and mounted an additional 500. Mrs. Joan Ledbetter labeled, sorted and distributed over 97,000 miscellaneous insects, of which some 25 percent was Lepidoptera and Diptera. Mrs. Sophie Lutterlough restored, relabeled, and rehoused thousands of ticks, most of which had dried out, as well as great numbers of dried myriapods and arachnids; and cleaned and sorted many microscope slides. Mrs. Mary Ann Floyd completed rearrangement of the Odonata collection by working over the Oriental and North American sections.

J. F. Gates Clarke continued his reorganization and classification of the Neotropical Microlepidoptera with the incorporation of over 4,000 specimens into the working collection. William D. Field transferred and reclassified several families of Lepidoptera, formerly housed in non-standard drawers; among the families transferred were the Amathusiidae, Brassolidae, and our extensive collection of Old World Papilionidae. Ralph E. Crabill found and verified the status of some dozen type specimens of the C. H. Bollman myriapod collection; he continued remounting O. F. Cook's microscopic slides, mostly typical, and he restored, relabeled, and rehoused large numbers of dried myriapods and arachnids, some of which turned out to be unsuspected type specimens. Research associate K. C. Emerson transferred and expanded the Mallophaga collection into new slide boxes; during this process he added the material from the Carriker collection. Miss Helle Starcke, assistant to research associate Robert Traub, began the transfer and arrangement of the Siphonaptera collection into new slide cabinets.

Over 5,000 microslides of small Diptera were prepared for the collection by student aids at Radford College under a contract grant administered by the Department of Agriculture. This contract, initiated in 1961, has resulted in the addition of more than 30,000 microslides of specimens to the national collection. Agriculture contracts with other universities and individuals have resulted in the mounting and labeling of an additional 30,000 insects during the current year; for the several years during which these contracts have

been in effect the national collection has benefited by the preparation of some 115,000 specimens.

BOTANY

The addition of 363 new all-steel herbarium cases represents a major advance in specimen storage in the National Herbarium. Of these, 214 were incorporated into the phanerogamic segment of the herbarium, allowing for the much needed expansion of a small portion of the collections. The lichen collections are now completely housed in new steel cases as is a portion of the grass herbarium. Other steel cases were moved into the offices of curators to replace the wooden cases in which their study specimens had been kept. Over 2,000 more steel cases, however, will be needed to convert the entire herbarium to modern steel storage cabinets.

During the year E. Yale Dawson, working with Charles F. Rhyne, curated and added to the research collections the entire accumulated backlog of algae. These totaled 14,931 specimens. In addition, a "wet stack" storage facility was established to house fluid-preserved specimens of algae. These specimens are represented by dummy sheets inserted in taxonomic sequence among the dried and pressed collections making the total collection available to users through consultation of a single file.

Integration of New World and Old World type specimens into a continuous series was completed by Velva E. Rudd who has also transferred the formerly separate fruit collection into the general herbarium. Bulky fruits are now to be found taxonomically arranged in cases near the appropriate genus or family, a great convenience in systematic studies.

PALEOBIOLOGY

In the division of paleobotany, nearly all of the primary and secondary type specimens of fossil plants have been segregated from the main body of the paleobotanical collections. There remain only certain elements of the Tertiary collection that require checking and relocation. The main body of the reference collection is being organized by Arthur D. Watt of the U.S. Geological Survey staff and placed in its permanent arrangement in the main storage area of the division's new quarters.

In consequence of the lengthy period during which the laboratory of vertebrate paleontology has been concerned with exhibition, a very considerable backlog of preparation for the study series and general

attention to the condition of the study and reference collections has accumulated. Much of this backlog pertains to preparation of plaster-encased blocks included in field collections acquired during the past several years.

General arrangement of the reference and study collections of fossil vertebrates has been completed, since their move from the old part of the building to the east wing, except for the rather large collection of Oligocene titanotheres, including several type specimens which together with certain large fish and reptile specimens, are temporarily laid out on case tops pending construction of covered storage racks.

The curatorial activities in the division of invertebrate paleontology centered on processing type specimens. More than 5,000 types were checked against published literature, cataloged, and placed in the collection. Carding of more than 500 type specimens representing a large number of publications furthered the preparation of the planned published list of types on deposit in the Museum. Also, the Tertiary and Ordovician stratigraphic collections were moved to facilitate storage of tens of thousands of specimens and make them more accessible to the scientists directly involved with their use. The Ordovician material was sorted geographically and stratigraphically during the move.

The U.S. National Museum has been a repository for approximately 16,200 sediment samples, some of which were collected as early as 1840 by the U.S. Coast Survey. The division of sedimentology is making a detailed inventory of these samples, the usefulness of which has been limited by lack of an adequate inventory and of a single storage place. An attempt is also being made to collate the samples with any published or unpublished sample data and with available station information. A preliminary tabulation discloses that 10,343 of the samples are from the Atlantic continental shelf of the United States, including 815 from the recent U.S. Geological Survey - Woods Hole Oceanographic Institution project; 1,772 off the West Coast of the United States; 400 from Alaskan waters; 2,000 from the *Albatross* cruises; and 1,571 which can not be associated with any available station information or for which no information has been found. The remaining few samples are from the Caribbean Sea, the southeast Pacific Ocean, and the Arctic Ocean.

230-457—66——11

GIFTS AND ADDITIONS

SPECIMENS IN THE NATIONAL COLLECTION MAY 31, 1966

ANTHROPOLOGY		1,005,034
Cultural Anthropology	967,217	
Physical Anthropology	37,817	
INVERTEBRATE ZOOLOGY		12,149,941
Crustacea	1,477,157	
Worms	651,097	
Echinoderms	80,244	
Mollusks	9,941,443	
VERTEBRATE ZOOLOGY		2,845,582
Mammals	336,825	
Birds	520,338	
Reptiles and Amphibians	166,778	
Fishes	1,821,641	
ENTOMOLOGY		17,345,519
(Former Division of Insects total, 1963 (divisional totals are shown from this date)	15,978,513)	
Coleoptera	306,477	
Hemiptera	233,879	
Lepidoptera	261,428	
Myriapoda and Arachnida	405,544	
Neuropteroids	159,678	
BOTANY		3,238,876
Phanerogams	2,009,269	
Ferns	256,568	
Grasses	394,317	
Cryptogams	533,758	
Plant Anatomy	44,964	
PALEOBIOLOGY		13,233,558
Invertebrate Paleontology	13,179,878	
Vertebrate Paleontology	49,104	
Paleobotany	4,576	
MINERAL SCIENCES		427,655
Mineralogy	121,648	
Meteorites	7,351	
Petrology	298,656	
TOTAL NATURAL HISTORY COLLECTIONS		50,246,165

ANTHROPOLOGY

Among the several collections of ethnological materials from Africa received during the year, especially noteworthy were a complete costume of a Tuareg man, acquired from Sgt. Mohamed Ali Ag.

Mamatal, of the Mali army; and a collection of artifacts from the Mandara Mountain area of northern Cameroon, collected for the Smithsonian by Paul Hinderling. Darius Thieme, a musicologist, has been engaged for over a year in making a collection of Nigerian musical instruments for the Smithsonian, and two shipments of these have arrived.

About 600 artifacts of the Canela Indians (Brazil) were collected in the field. Including items as varied as life-size ceremonial masks and maroon chalk ear plugs, they constitute the largest and most complete assemblage of South American tribal material in the Museum.

An exceptionally well selected and documented collection received directly from Asia in recent years is the Province Henry collection of 201 Taiwan tribal objects consisting of clothing, religious paraphernalia, utensils, weapons, woodwork, and other items. An outstanding collection of 255 purchased and donated textiles was assembled mostly in India and Thailand by Mrs. Elizabeth Bayley Willis. Other valuable collections received were a Burmese collection of 600 objects from William C. Sturtevant, 125 Korean masks of folk drama from Professor Duhyun Lee, and 135 items of Iranian costumes from Mrs. Ethel Jane Bunting. From Mrs. Mary Slusser in Nepal came jewelry, clothing, toys, and games.

A cast of the Niah Cave skull (North Borneo Paleolithic) as reconstructed by Don R. Brothwell, was received in exchange through Kenneth P. Oakley of the British Museum (Natural History) and placed on exhibit.

VERTEBRATE ZOOLOGY

Major and significant additions to the vertebrate zoology collections of the Department were made through Smithsonian expeditions and surveys parts of the world, particularly in Latin America, the Pacific, and Africa, as well as by gift and exchange.

Two outstanding collections of fishes, totaling approximately 10,000 specimens, are the several thousand fishes from the western Atlantic, Gulf of Mexico and Caribbean Sea, received from the Exploratory Program of the U.S. Fish and Wildlife Service, and a large collection of bathypelagic fishes, made during a survey of the fauna of the California Current, received from the Scripps Institution of Oceanography, La Jolla, California.

More than 5,000 specimens of reptiles and amphibians were cataloged, including 122 specimens as types or paratypes of new taxa. Donald Broadley of the Umtali Museum, Rhodesia, sent a carefully selected series of specimens, including paratypes of many new species

and also representatives of species not previously in the collections. Bernard Martof, of the University of North Carolina, gave his synoptic collection of 2,154 salamanders of the genus *Leurognathus*, which formed a basis for his recent review and revision of the genus. Gustavo Orcés-Villagomez, Quito, Ecuador, deposited his extensive collections of Ecuadorian reptiles and amphibians in the Museum, admirably supplementing the locality-oriented specimens obtained in Ecuador by Dr. Peters. The Pacific Ocean Biological Survey Program of the Smithsonian has continued to add to the lizard collections from all parts of the Pacific.

Outstanding accessions of birds include a specimen of *Pterodroma baraui*, received by exchange through Dr. Jouanin, and a specimen of *Wetmorethraupis sterrhopteron* and two of *Conioptilon mcilhennyi*, by exchange through Dr. Lowery. Both of these latter two genera are newly described tropical American passerines and as such represent exciting additions to the national collections. Among the anatomical specimens received were major collections from Chile, the Indian Ocean, and North America. Other valuable acquisitions included two skeletons of the lesser flamingo donated by John G. Williams and skeletons of the cahow and black-capped petrel presented by David B. Wingate.

More than 11,000 specimens of mammals were accessioned. Approximately 8,000 of these result from major field operations in Venezuela and Africa, funded by Defense Department contracts. Important collections of bats were received from Belém, Brazil, through a collaborative relationship with the Belém Virus Laboratory (Instituto Evandro Chagas); from Peru, from A. L. Tuttle; and from Colombia, sent by C. J. Marinkelle. In addition, an important collection of 387 mammal specimens from West Pakistan was received from Col. Robert Traub.

INVERTEBRATE ZOOLOGY

One of the most significant of the additions to the collections of invertebrate zoology was a series of over 9,000 lots of leeches and an extensive library of books and reprints on the Hirudinea, received as a bequest from the late J. Percy Moore.

Mollusks accessioned during the year include nearly 15,000 specimens from the southeastern Pacific, acquired through the studies of Harald A. Rehder. Joseph P. E. Morrison arranged the transfer of 4,000 mollusks and 3,000 radula slides left by the late J. A. Weber of Miami. Also added to the collection were over 9,000 marine mollusks from southeast Asia, collected by Joseph Rosewater while participating in the International Indian Ocean Expedition.

On Philippine expedition of Donald R. Davis, the rare butterfly *Troganoptera trojana* was sought. Here, Julian Jumalon of San Carlos University sets out a damaged male, which is deep velvet black, except for a brilliant red collar and metallic green patches along both wings, as bait to lure the more valuable female. Below: a perfect female specimen, of which very few have ever been obtained.

On a Smithsonian collecting trip, Paul J. Spangler with Malaise insect trap at campsite in Costa Rica (see p. 99), near Esparta, July 1965.

Spangler aspirating water beetles from his net after collecting in a pond at Puntarenas, Costa Rica.

Transfers of specimens from the U.S. Fish and Wildlife Service added two large series of decapod crustaceans from the Gulf and Caribbean area, and also a large collection of caprellid amphipods. Two large collections of decapod crustaceans were received through the Institute of Marine Science, University of Miami, and an extensive collection of freshwater crustaceans was donated by Northeast Louisiana State College.

Representatives of over 60 species of echinoderms, many not previously represented in the collection, were received on exchange from the British Museum. More than 50 species of echinoids taken during the International Indian Ocean Expedition were also added to the collection during the year.

ENTOMOLOGY

Over 856,000 insects and allies were accessioned during the year, the second highest total in the history of the department of entomology. The tremendous F. C. Bishopp collection of ticks accounted for more than a third of this total. Holotypes of 1,122 species were accessioned during the year.

The largest and most important gift of Coleoptera was the C. H. Dieke library and world-wide collection of 24,468 specimens of Coccinellidae. Various members of the departmental staff added materially; P. J. Spangler collecting 72,825 specimens and O. S. Flint 10,234. The Dominican survey produced 7,244 specimens, with many more to be counted and accessioned. The African survey, under H. W. Setzer of the division of mammals, added 17,174 insects, a very important acquisition because our African material is so limited.

Upon the death of research associate Carl J. Drake, full custody of the outstanding Drake Hemiptera collection passed to the Smithsonian and to the care of the division of Hemiptera. A small but critically important lot of 236 bedbugs from R. L. Usinger established our total holdings as the world's richest collection of species and types in the family Cimicidae. Other important acquisitions include 2,617 miscellaneous insects from various parts of the world, from K. W. Cooper; 2,567 from the American tropics, collected by W. D. Duckworth; 2,202 from various parts of the world, from N. L. H. Krauss; and 1,045 North American aphids from J. O. Pepper.

Lepidoptera and Diptera received include 7,305 specimens collected on Dominica by J. F. G. Clarke and his wife; 18,850 Lepidoptera and Diptera collected in the Philippines and Dominica by D. R. Davis; 12,778 moths and flies from Dominica and Central America, by O. S. Flint; 16,928 Central American Lepidoptera and Diptera

collected by P. J. Spangler and his wife. From non-staff members came 487 butterflies from Greece, from J. C. Coutsis; 786 New Zealand moths collected by T. H. Davies; 848 North American Lepidoptera and Diptera presented by G. F. Edmunds; 5,205 flies from North America, by K. Khalaf; and 3,841 moths from North America, from F. W. Stehr. The largest single accession was 43,160 flies collected by W. W. Wirth in Dominica, probably one of the finest representations of Diptera ever assembled from any of the islands of the Lesser Antilles.

In addition to the Bishopp tick collection, the Myriapoda and Arachnida holdings were augmented by several lots of critical importance: G. E. Ball presented over 600 chilopods mostly from previously unsampled parts of Mexico; Smithsonian and Department of Agriculture colleagues collected an impressively sizeable assortment of myriapods and arachnids on Dominica; through W. Engelhardt was obtained an exchange of 29 chilopods from the K. W. Verhoeff collection, including a number of paratypes, an acquisition of critical importance because of Verhoeff's position as a pioneer in myriapod studies.

Among neuropteroids received were important synoptic collections of Finnish Trichoptera from M. Meinander; Czechoslovakian Trichoptera from J. Sykora; North American Hydroptilidae from R. L. Blickle; and North American Plecoptera and Trichoptera from S. G. Jewett. The single most important accession was the collection of mostly South American Mallophaga assembled by the late research associate M. A. Carriker; it contains 17,882 specimens mounted on 7,830 slides and included 653 holotypes. K. C. Emerson was responsible for the transfer from the Department of Defense of over 2,000 slides of Anoplura and Mallophaga.

A. B. Gurney of the Agriculture staff donated some 4,500 specimens of insects and allies collected by him in Ethiopia. H. W. Setzer and J. Neal of the division of mammals transferred more than 8,000 insects collected incidentally during their mammal survey in Iran. Both of these accessions were most welcome because previously these areas were virtually unrepresented in our collection.

The U.S. Department of Agriculture transferred over 76,500 insects, many of them of considerable importance because of associated host data. One important acquisition in this transfer was the Alfieri synoptic collection of Egyptian Hymenoptera, Coleoptera, Lepidoptera, and Neuroptera, consisting of about 7,400 specimens representing some 3,500 species and including several hundred types or cotypes. The tremendous value may be appreciated when it is noted that of the 531 species of wasps and bees identified specifically in the Alfieri

collection, over 70 percent were not represented previously in the Museum collection by identified specimens. Two other welcome lots were nearly 4,400 Diptera from Arizona collected by C. W. Sabrosky; and 800 Hymenoptera from North and South America, collected by D. R. Smith.

BOTANY

The inception of an algal research program has stimulated an increase in the botanical materials that are so important for staff activities. Holdings of algae have been appreciably enhanced by acquisition of the herbarium of the Beaudette Foundation for Marine Biology, comprising 7,677 specimens of dried and fluid-preserved seaweeds. E. Yale Dawson donated over 1,600 specimens of algae from his personal collections and more than 600 algal specimens were received on exchange from the Museum National d'Histoire Naturelle, Paris.

The Plitt lichen herbarium of 21,564 mounted specimens was transferred to the Museum from the national fungus collections in Beltsville, Maryland. Mason E. Hale contributed 5,833 specimens of lichens resulting from his field work in Southeast Asia and the University of Iowa donated its lichen herbarium of 3,000 specimens.

Under a research project supported in part by the National Science Foundation, Conrad V. Morton deposited 16,174 photographs of type specimens of ferns from European herbaria, greatly augmenting the fern type collections. An outstanding collection of 622 ferns of Assam, India, collected by Walter M. Koelz, was received on exchange from the University of Michigan. Added to the already rich collections of grasses from Brazil were 1,216 collected for the museum by Lyman B. Smith and 1,035 specimens received on exchange from the Royal Botanic Gardens, Kew, collected by the British agrostologist W. Derek Clayton. These grass collections from Brazil together with the others in the U.S. National Herbarium form part of the basis for Thomas R. Soderstrom's continuing research on the luxuriant grass flora represented in this country.

Recent botanical activities on the Island of Dominica in conjunction with the Bredin-Archbold-Smithsonian Biological Survey have resulted in the accessioning of 22,560 flowering plants collected by staff members Wallace R. Ernst and Dan H. Nicolson and by Grady L. Webster of Purdue University and Kenton L. Chambers of Oregon State University. The Dominican plants form the basis, in part, for a forthcoming flora of the island being undertaken by staff members of the department of botany in collaboration with botanists at other institutions.

Accessions of woods from the Juan Fernandez Islands represented many new taxa for the national collections, including *Lactoris fernandeziana*, sole species of the Lactoridaceae, a family endemic on these Pacific islands. A rare, historically important collection of woods, received in exchange from the museum of the V. L. Komarov Botanical Institute, Leningrad, came from plants, grown in the former imperial botanical gardens of St. Petersburg, which were brought into cultivation through the efforts of early Russian plant explorers. Over half of the 64 specimens represent plants for which there had been no previous examples in the wood collections of the Museum. A collection of 138 wood specimens gathered by Kenton L. Chambers, Oregon State University, were the first to result from the Bredin-Archbold-Smithsonian Biological Survey of Dominica.

PALEOBIOLOGY

As a gift from J. Harlan Johnson of the Colorado School of Mines, the division of paleobotany received 76 slides containing 18 primary and 80 secondary types of fossil algae from Guatemala. Fieldwork by Francis M. Hueber and James P. Ferrigno under support from the Roland W. Brown fund for paleobotanical research brought to the collections about 329 specimens of Lower Devonian plant fossils from the Beartooth Butte formation at Beartooth Butte and Cottonwood Canyon, Wyoming. Noteworthy specimens in the collection include a series of excellent examples of *Bucheria ovata* Dorf, *Drepanophycus spinaeformis* Goeppert and representative examples of *Psilophyton wyomingense* Dorf. From fieldwork in eastern Canada, 1,255 specimens of Lower and Middle Devonian plant remains were added to the collections. A large number of anatomically preserved plants comprise the significant element of this collection.

Outstanding among accessions of fossil vertebrates is a collection of approximately 473 specimens of early Tertiary mammals from various localities in the Green River Basin of southwestern Wyoming, principally from the lower member of the middle Eocene Bridger formation, made by C. Lewis Gazin and Franklin L. Pearce under funds provided by the National Science Foundation. The collection is rich in remains of the smaller mammals, including the condylarth *Hyopsodus;* various primates, rodents, insectivores, and carnivores; and the ungulates *Orohippus* and *Helaletes*. Among the larger mammals represented are *Tillotherium* and the perissodactyls *Hyrachyus* and *Palaeosyops*.

A particularly noteworthy acquisition, made by purchase through the Walcott fund, is an unusually well represented skeleton of a Miocene cetothere whale from the Choptank formation of Maryland. The

specimen was collected by Richard Warren of Robert, Louisiana, from the Calvert Cliffs south of Flag Pond. In addition to skull portions, ribs, and chevrons, the specimen includes an articulated series of 20 vertebrae from the first cervical to the first lumbar and 14 vertebrae from the eleventh lumbar to the twelfth caudal, only the second to tenth lumbars missing. Not only is the specimen remarkable for its completeness but it is the first cetothere to be discovered in the Choptank formation.

Other notable accessions of vertebrate fossils include a collection of well over 100 specimens, principally fossil mammals, from a fissure filling near Ladds, in Bartow County, Georgia, acquired by purchase through the Walcott fund from Shorter College in Rome, Georgia, and approximately 100 specimens of late Pleistocene vertebrates from the Puebla Valley of Mexico collected by Clayton E. Ray, under funds provided in part by the National Science Foundation.

The most notable addition to the invertebrate fossil collections was a gift of more than 30,000 specimens given by Johns Hopkins University. Included was a valuable identified, biologically arranged series of Tertiary mollusks, one of the most complete reference collections known of these organisms from the East Coast of North America. Many of the specimens were collected from localities no longer available because of construction activities. In addition, more than 500 type specimens previously deposited at the University were transferred to the Museum.

The Walcott bequest provided funds for several other major additions to the collections: Robert B. Neuman collected more than 1,000 Cambrian and Ordovician specimens in Newfoundland; E. G. Kauffman and N. F. Sohl collected an important silicified fauna from the Mesozoic of Trinidad and additional Tertiary and Mesozoic specimens from the West Indies.

More than 15,000 Tertiary mollusks were accessioned from the American Museum of Natural History including the specimens on which a major study of Tertiary and Recent pectinids was based.

A gift of Triassic brachiopods from the Academy of Sciences of the USSR is considered of great value. Arranged through A. Dagis of the Institute of Geology and Geophysics, the gift will provide reference information for distributional studies of several genera.

Most of the accessions made during the year involved type specimens sent to the Museum, and a sizeable increase over previous years has been noted in the number of types deposited.

MINERAL SCIENCES

The past year has been an important one for the growth of the meteorite collection. Specimens were added from 26 meteorites not previously represented and an additional 17 new meteorites are now represented in the form of thin-sections. The total number of meteorites added to the collection was 137, and the total thin-sections was 85. Over 1,800 tektite specimens from various localities were also added. The Carl Bosch collection of nearly 600 meteorites was acquired. A number of these will be important additions to the collection.

The University of Minnesota agreed to place their meteorite collection, comprising approximately 120 specimens, on deposit in the Museum. Some are of great scientific value. In return an educational exhibition of representative meteorites will be prepared and put on display at the University. It is hoped that similar agreements can be reached with other universities possessing a few unrepresentative but scientifically important meteorite specimens.

The rate of growth of the mineral and gem collections remained high. Quantities of scientifically important type specimens were obtained from various sources. Also, excellent specimens were obtained from all the newly discovered occurrences of any importance noted during the year. Considerable time and effort was spent in negotiating for and obtaining the Carl Bosch collection of minerals and meteorites (approximately 28,000 specimens including almost 600 meteorites), which is the most important collection acquired since the Roebling and Canfield additions in 1926. The collection will be described more fully in the next annual report. It is estimated that it represents a 20 percent increase in the total mineral collection.

Among several important gifts by individuals to the mineral collection were a fine large tourmaline crystal from Madagascar, presented by Randolph Rothschild; a superb specimen of torbernite from France, by the Lester Barrer family; an extraordinary specimen of the new mineral francevillite from Gabon, by Mr. Bernard T. Rocca; and an exquisite suite of fine specimens of Mexican agate, by Colonel E. M. Barron. Other fine specimen material and much research material was obtained, as usual, through exchange. Numerous new and rare species were added including dellaite, moctezumite, sonoraite, coalingite, rosenhahnite, sakuralite, marokite and gaudefroyite.

The usual program of planned addition of specimens through use of the Roebling and Canfield endowments continued. The Roebling fund this year provided an extraordinarily beautiful specimen of vivianite from near Richmond, Virginia; a large and striking speci-

men of barite from the mines of southern Illinois; excellent specimens of vanuralite and francevillite from Gabon; arsenopyrite from Portugal; silver from Mexico; amethyst from Ontario; and epidote from Baja California. Outstanding among additions from the Canfield fund are specimens of rubellite from Brazil, large sphene and spinel crystals from Madagascar, arsenopyrite from Portugal, and an unusually large and rare classic twin crystal of cumengite from Baja California.

As in all recent years, the gem collection has received additions of great value and importance. Chief among the gifts was a 138.7-carat star ruby. This magnificent gem, the largest and finest star ruby on record, came as a gift from Rosser Reeves. Two very large faceted gems of topaz purchased through the help of the Chamberlain fund: one, weighing 7,725 carats is golden yellow; the other, weighing 2,680 carats, is colorless. Through the Roebling fund a 55-carat faceted and flawless gem of petalite, the largest of its kind on record, was obtained. The suite of carvings was enriched by a series of 13 jade carvings given by Mrs. Mildred Taber Keally and 9 carvings of various materials given by Sidney Krandall.

Many interesting and described suites of rocks containing chemically analyzed specimens added to the petrology collections came from the U.S. Geological Survey, the British Museum, Cambridge University, and from several independent researchers through transfers, exchanges, and gifts. The number of oceanic rocks in the collections was greatly increased by a gift from Woods Hole Oceanographic Institution, through Vaughn T. Bowen, of a large suite of rocks dredged from the Mid-Atlantic Ridge at lat. 22° N.

Through Professor H. H. Hess of Princeton University was received the Mayagüez, Puerto Rico, serpentinite core, one of the National Science Foundation's preliminary Mohole Project cores. The core is unique in furnishing a nearly 1,000-foot section of a serpentinite body, much of which has been unusually well described.

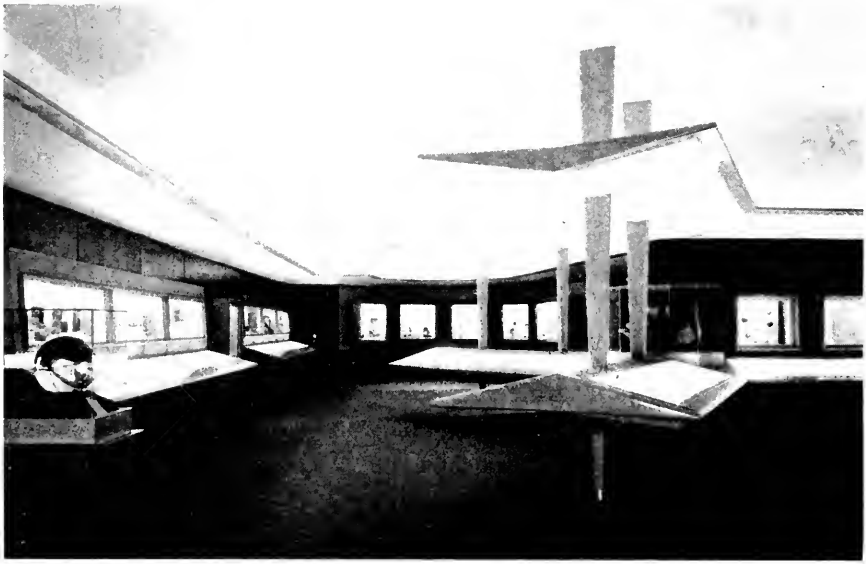
Exhibits

Although the new hall of physical anthropology was opened last year, work continued on some of its exhibits. The most important addition is a mural painted by Alton S. Tobey reconstructing in detail the performance of a prehistoric surgical operation, trephination, by the Incas in Machu Picchu. Reconstructions of varieties of australopithecines and of *Oreopithecus* by Jay Matternes are in preparation.

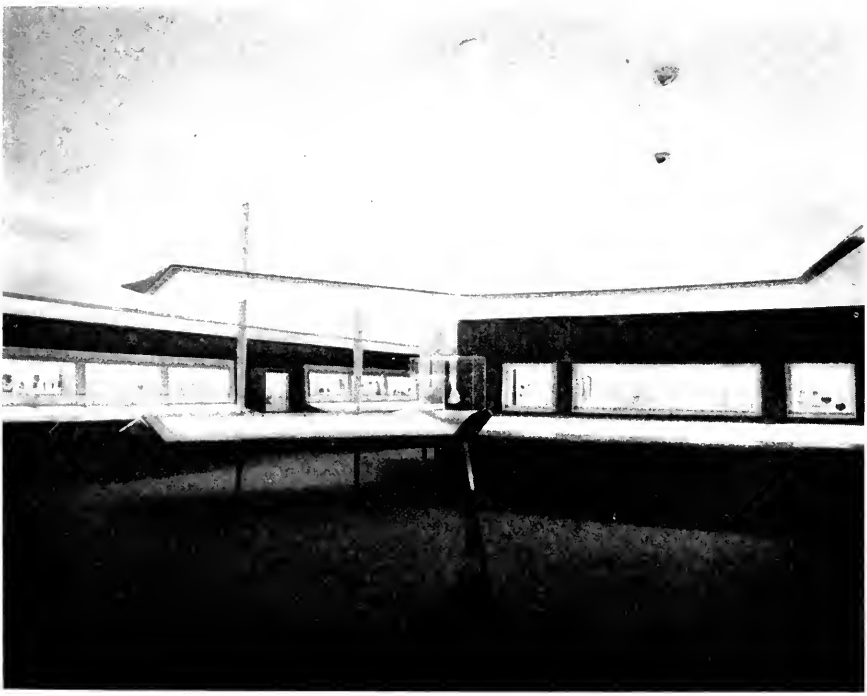
The preparation of exhibit scripts by Gus W. Van Beek for the hall of Old World archeology, continued. The first of several murals planned for this hall—this one of Egyptian mourning women—was completed in the Egyptian alcove by artist Laurinda Gupta. A new mold and plastic cast was made from the plaster cast of the monumental statue of the Semitic storm-god Hadad for use in the Syro-Palestinian alcove.

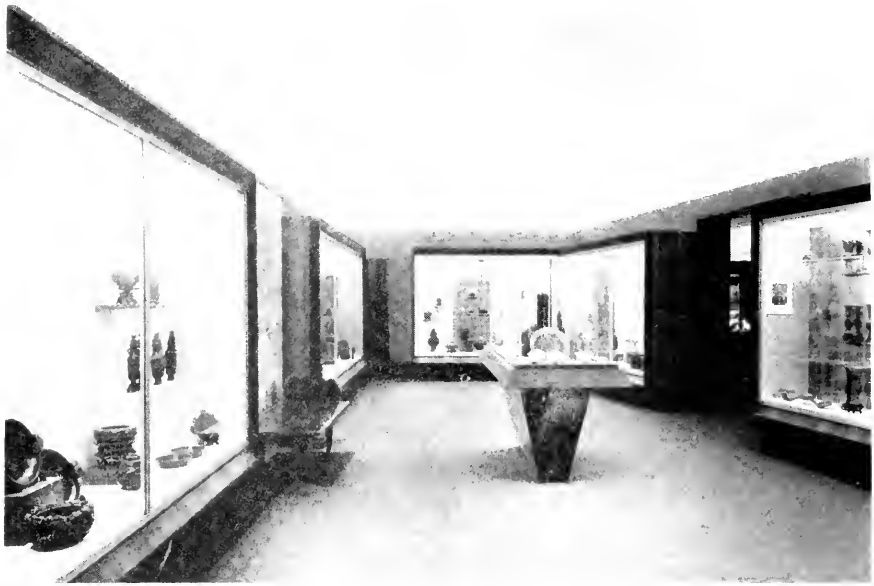
The African hall progressed significantly during the year with the completion, under the scientific direction of Gordon D. Gibson, of several exhibits on the cultures of Central and East Africa. A push-button program of African music was installed to illustrate with sounds several African instruments; the musical selections are correlated with color slides showing the manner in which the instruments are played. Additional units on East Africa and a section on southern Africa remain to be installed.

Advice on the preparation of particular exhibits was received from several regional experts: Roger Summers, curator of the National Museum of Rhodesia at Bulawayo, consulted at length with the staff on the preparation of a diorama to represent the building of Zimbabwe; Barrie Reynolds, Director of the Livingstone Museum, Zambia, provided advice, pictures, and specimens for use in the preparation of a life group to illustrate an episode in an initiation ceremony; Alan Jacobs of the University of Illinois assisted very significantly in the preparation of plans for an exhibit on the Masai; Conrad Reining, Priscilla C. Reining, Walter Deshler, and Irving Kaplan advised with respect to several other exhibits dealing with East Africa; and the Voice of America staff assisted in supplying an appropriate recording for the Chinese opera exhibit in the East Asian hall.



The popular gem hall was remodeled to approximately twice its former size, most of the exhibits were redesigned, and new gems were added to the displays.





The newly opened jade hall, adjacent to the gem hall, displays the Maude Monell Vetlesen jade collection of Chinese jade carvings of the 16th through 19th centuries.

In the department of vertebrate zoology the preparation of cases in the hall of osteology and of models and cases for the hall of cold-blooded vertebrates continued.

Through the efforts of Joseph Britton, who joined the staff as an exhibits specialist during the year, development of exhibits for the hall of life in the sea progressed rapidly. The alcove on reproduction and parental care, illustrating the diversity of these activities in marine invertebrates, and a special exhibit featuring a random access slide projector designed to demonstrate a variety of marine organisms, neared completion. Specifications were completed for 32 models needed for other alcoves and 15 of these are in varying stages of production. Work continued on the coral reef group and on cases illustrating defense and methods of feeding.

Considerable progress was made in the laboratory of vertebrate paleontology in the restoration and mounting of new skeletons and the remounting and repairing of previously displayed materials to be used in the new hall of Quaternary vertebrates. Mounts of the skeletons of the saber-tooth cat *Smilodon*, the four-horned antelope *Stockoceras*, and the dire wolf *Aenocyon* were completed, as were restorations and repairs to the previously displayed mastodon skeletons, and the Cumberland Cave wolverine *Gulo* was remounted. Mounting of the skeletons of the giant ground sloth *Eremotherium* from Panamá and the smaller *Paramylodon* from Rancho La Brea, involving extensive use of heavy but essentially concealed steel supports, was well along toward completion.

A diorama illustrating terrestrial life of the Triassic period, the first of four scheduled for the balcony of the dinosaur hall, was installed after completion of the background by Jay Matternes.

The new exhibit hall of gems was completed and opened in September 1965, and the new exhibit of the Maude Monell Vetlesen collection of carved Chinese jades of the 16th to 19th centuries was opened in January 1966. Paul E. Desautels wrote the scripts for these new exhibits and the design was by Mrs. Dorothy Guthrie. Construction work was completed and installation of cases was begun on the new exhibits of physical geology and meteorites.

Further details concerning the construction of exhibits in the Museum of Natural History are to be found in the report of the U.S. National Museum, Office of Exhibits, pages 52–53.

230-457—66——12

Staff Publications

ANTHROPOLOGY

The Smithsonian Office of Anthropology in December 1965 inaugurated a new series, "Smithsonian Contributions to Anthropology," replacing the "Bureau of American Ethnology Bulletins," which will be closed out with the appearance of numbers 196–200. The new series introduces a larger (quarto) size, double-column page, with higher quality printing and better reproduction of halftones and line drawings, and it has no geographical restrictions on subject matter.

ANGEL, J. LAWRENCE (with Paul T. Baker). Old age changes in bone density: sex and race factors in the United States. Human Biology, vol. 37, pp. 104–121, 1965.

COLLINS, HENRY B. Pre-Eskimo cultures in Alaska. Pp. 374–396 *in* Japanese Archaeology, no. 1, Pre-Ceramic Age, Sosuke Sugihara, ed., Tokyo, 1965. (In Japanese.)

———. Foreword (as Chairman of Directing Committee) to volume 12, Arctic bibliography, p. v, 1965.

CROCKER, WILLIAM H. A preliminary analysis of some Canela religious aspects. Revista do Museu Paulista, n.s., vol. 14, pp. 163–173, 1963.

———. Ethnology: South America. Pp. 112–152 *in* Handbook of Latin American Studies, no. 27. University of Florida Press, 1965.

EVANS, CLIFFORD. The dating of Easter Island archeological obsidian specimens. No. 18 *in* Reports of the Norwegian Archaeological Expedition to Easter Island and the East Pacific, vol. 2: Miscellaneous reports. Monographs of the School of American Research and the Kon-tiki Museum, no. 24, part 2, pp. 469–495, 1965.

EVANS, CLIFFORD, and MEGGERS, BETTY J. Cronologia relativa y absoluta en la costa del Ecuador. Cuadernos de Historia y Arqueología, Año XI, vol. 10, no. 7, pp. 3–8, 1961. Casa de la Cultura Ecuatoriana, Núcleo del Guayas, Guayaquil, 1965.

———. Guia para prospecção arqueológica no Brasil. Museu Paraense Emilio Goeldi, Guia no. 2, 57 pp., Belem, 1965.

——— (contributing editors). Archaeology: South America. Pp. 56–75 *in* Handbook of Latin American Studies, no. 27. University of Florida Press, 1965.

EWERS, JOHN C. Artists of the Old West. Garden City, N.Y.: Doubleday & Co., 240 pp., 164 plates (35 in color), 1965.

———. The emergence of the Plains Indian as the symbol of the North American Indian. Ann. Rep. Smithsonian Inst. for 1964, pp. 531–544, 1965.

———. Last of the Buffalo Indians. The American West, vol. 2, no. 2, pp. 26–31, 1965.

———. Iroquois Indians in the Far West; Literate fur trader among the Upper Missouri tribes; and The Medicine Rock of the Marias. Chapters (pp. 129–136, 137–148, 165–168) *in* The Red Man's West, ed. Michael S. Kennedy. New York: Hastings House, 1965.

———. Plains Indian reactions to the Lewis and Clark Expedition. Montana, the Magazine of Western History, vol. 16, no. 1, pp. 2–12, 1966.

———. The museum historian as scholar. Smithsonian Year 1965, pp. 105–109, 1966.

———. Chiefs from the Missouri and Mississippi, and Peale's silhouettes of 1806. Smithsonian Journal of History, vol. 1, no. 1, pp. 1–26, 1966.

HOLLAND, C. G. Migration in a late archaic horizon. Quarterly Bulletin, Archeological Society of Virginia, vol. 19, no. 3, pp. 65–68, March 1965.

———. An archeological survey of the Oakley Reservoir. Illinois State Museum, Preliminary Reports, no. 5, 1965.

HOYME, LUCILE E. The nasal index and climate: A spurious case of natural selection in man. Amer. Journ. Phys. Anthropol., n.s., vol. 23, pp. 336–337, 1965.

MEGGERS, BETTY J. Ecuador. Vol. 49 in Ancient peoples and places, 220 pp., London and New York, 1966.

MEGGERS, BETTY J., and EVANS, CLIFFORD. A transpacific contact in 3000 B.C. Scientific American, vol. 214, no. 1, pp. 28–35, January 1966.

MEGGERS, BETTY J.; EVANS, CLIFFORD; and ESTRADA, EMILIO. Early formative period of coastal Ecuador: the Valdivia and Machalilla phases. Smithsonian Contributions to Anthropology, vol. 1 (whole vol.), xxi+234 pp., 196 pls., 115 figs., 30 tables, December 1965.

METCALF, GEORGE S. The barbed wire fence. Corral Dust, vol. 10, no. 3, pp. 4–6, 1965.

———. Archeology: Western Hemisphere. Pp. 69–70 *in* Americana Annual, 1966.

RIESENBERG, SAUL H. Table of voyages affecting Micronesian Islands. Oceania, vol. 36, no. 2, pp. 155–170, 1965.

STEWART, T. D. The problem of analyzing the height of the cranial vault. *In* Homenaje a Juan Comas en su 65 aniversario, vol. 2 (Antropología física), pp. 359–366. Mexico, 1965.

———. The scapula of the first recognized Neanderthal skeleton. Bonner Jahrbuch, vol. 164, pp. 1–14, 1964.

———. Some problems in human palaeopathology. Chapter (pp. 43–55) *in* "Human Palaeopathology," ed. Saul Jarcho. New Haven: Yale University Press, 1966.

STURTEVANT, WILLIAM C. Report of the Book Review Editor. American Anthropologist, vol. 67, no. 3, pp. 768–771, 1965.

———. Preliminary annotated bibliography on eastern North American Indian agriculture. Proceedings of the 21st Southeastern Archaeological Conference, Southeastern Archaeological Conference Bulletin no. 3, pp. 1–24, Cambridge, Mass., 1965.

———. Historic Carolina Algonkian cultivation of *Chenopodium* or *Amaranthus*. *Ibid.*, pp. 64–65, 1965.

———. Ethnographic details in the American drawings of John White, 1577–1590. Ethnohistory, vol. 12, no. 1, pp. 54–63, 1965.

———. Couvade: Toward the resurrection of Father Schmidt's stillbirth. American Anthropologist, vol. 67, no. 5, p. 1287, 1965.

———. Ethnological collections and curatorial records. Museum News, vol. 44, no. 7, pp. 16–19, 1966.

———. Duration of graduate study for the PhD. Fellow Newsletter (American Anthropological Assoc.), vol. 7, no. 6, pp. 3–4, 1966.

INVERTEBRATE ZOOLOGY

BOTHMA, J. DU P. Preliminary identification manual for African mammals, pt. 1, Hyracoidea, 15 pp., 1965.[1]

CORBETT, G. B. Preliminary identification manual for African mammals, pt. 2, Menotyphla, 10 pp., 1966.[1]

GIBBS, ROBERT H., JR., and WEITZMAN, STANLEY J. *Cryptostomias psychrolutes*, a new genus and species of astronesthid fish from the southwestern Pacific Ocean. Vidensk. Medd. Dansk. Naturh. Foren., vol. 128, pp. 265–271, 2 figs., 1965.

——— and WILIMOVSKY, NORMAN J. Family Alepisauridae. *In* Fishes of the Western North Atlantic. Sears Found. Mar. Res., Mem. 1, pt. 5, pp. 482–497, 4 figs., 1966.

[1] These are the result of a part of the Smithsonian Institution's effort for the International Biological Program, and were instituted by H. W. Setzer.

GREENWOOD, P. HUMPHRY; ROSEN, DONN E.; WEITZMAN, STANLEY H.; and MYERS, GEORGE S. Phyletic studies of teleostean fishes with a provisional classification of living forms. Bull. Amer. Mus. Nat. Hist., vol. 131, art. 4, pp. 341–455, 425 figs., April 1966.

HANDLEY, CHARLES O., JR. [Review], Bats, by G. M. Allen. Atlantic Naturalist, vol. 20, no. 3, pp. 165–166, 1965.

———. [Review], Aves Brasileiras, by S. Frisch and J. D. Frisch. Auk, vol. 83, no. 1, p. 144, 1966.

———. [Review], Songs of Brazilian birds, by J. D. Frisch. Auk, vol. 83, no. 1, p. 144, 1966.

———. A synopsis of the genus *Kogia* (pygmy sperm whales). *In:* Whales, dolphins, and porpoises, ed. K. S. Norris, pp. 62–69, 1 fig. Berkeley: Univ. Calif. Press, 1966.

HUMPHREY, PHILIP S. Auks, Murres, and Puffins. *In* A. Wetmore, et al., Water, prey, and game birds of North America. Washington: National Geographic Society, 1965.

KANAZAWA, ROBERT H. The fishes of the genus *Osteoglossum* with a description of a new species from the Rio Negro. Icthyologica, the Aquarium Journal, vol. 37, no. 4, pp. 161–172, 7 figs., May 1966.

KRUEGER, WILLIAM H., and GIBBS, ROBERT H., JR. Growth changes and sexual dimorphism in the stomiatoid fish *Echiostoma barbatum*. Copeia, no. 1, pp. 39–43, 4 figs., March 1966.

LACHNER, E. A. Family Echeneidae. *In* Fishes of the Marshall and Marianas Islands. U.S. Nat. Mus. Bull. 202, vol. 3, pp. 74–80, pl. 131, March 1966.

PARADISO, J. L., and HANDLEY, CHARLES O., JR. Checklist of mammals of Assateague Island. Chesapeake Sci., vol. 6, pp. 167–171, 1 fig., 1965.

PETERS, JAMES A. Miscellaneous notes on lizards from Ecuador. British Journ. Herp., vol. 3, no. 8, pp. 195–197, 1965.

———. Liste der rezenten Amphibien und Reptilien: Colubridae (Dipsadinae). Das Tierreich, lieferung 81, pp. 1–18, 1965.

———. A note on the concept of subspecies. Bull. Virginia Herp. Society, no. 45, pp. 3–4, 1965.

——— and ROBERT MULLEN. Electrocardiography in *Caecilia guentheri* (Peters). Physiological Zoology, vol. 39, pp. 193–201, 1966.

RIPLEY, S. DILLON. Saving the nene, world's rarest goose. National Geographic Magazine, vol. 128, no. 5, pp. 744–754, November 1965.

———. Le Martinet pale de Socotra (*Apus pallidus berliozi*). L'Oiseau et la Revue Française d'Ornithologie, vol. 35 (Berlioz Jubilee Number), pp. 101–102, April 6, 1966.

———. A notable owlet from Kenya. Ibis, vol. 108, no. 1, pp. 136–137, January 1966.

——— and Heinrich, Gerd H. Additions to the avifauna of Northern Angola II. Postilla no. 95, pp. 1–29, February 1966.

———. Comments on the avifauna of Tanzania I. Postilla no. 96, pp. 1–45, March 1966.

———. Anatidae, parts 1, 2, and 3. *In* A. Wetmore, et al., Water, prey, and game birds of North America. Washington: National Geographic Society, 1965.

Schultz, Leonard P. *Pseudochalceus kyburzi*, a new characid fish from Colombia. Ichthyologica, The Aquarium Journal, vol. 37, no. 1, pp. 25–30, 3 figs., January 1966.

———. A new anemone fish, *Amphiprion calliops* from the Indo-Pacific Oceans. Ichthyologica, The Aquarium Journal, vol. 37, no. 2, pp. 71–76, 3 figs., February 1966.

———. *Parapercis kamoharai* (family Mugilodidae), a new fish from Japan with notes on other species of the genus. Smithsonian Misc. Coll., vol. 151, no. 4, pp. 1–4, 2 figs., May 1966.

———. *Pseudorhegma diagramma*, a new genus and species of grammistid fish with a key to the genera of the family and to the species of the subfamily Pseudogramminae. Ichthyologica, The Aquarium Journal, vol. 37, no. 4, pp. 185–194, 4 figs., May 1966.

——— and Collaborators: Woods, Loren, P., and Lachner, Ernest A. Fishes of the Marshall and Marianas Islands. Families Kraemeriidae through Antennariidae. U.S. Nat. Mus. Bull. 202, vol. 3, 176 pp., figs. 133–156, pls. 124–148, March 1966.

Short, Lester L., Jr. Hybridization in the flickers (*Colaptes*) of North America. Bull. Amer. Mus. Nat. Hist., 129: pp. 307–428, 1965.

———. Variation in West Indian flickers (Aves, *Colaptes*). Bull. Florida State Mus., vol. 10, pp. 1–42, 1965.

———. [Review], The silent sky, the incredible extinction of the passenger pigeon, by A. W. Eckert. Atlantic Nat., vol. 20, pp. 245–246, 1965.

———. A melanistic pileated woodpecker specimen from Georgia. Wilson Bull., vol. 77, pp. 404–405, 1965.

———. Some spring migrant and breeding records from northern Nebraska. Nebraska Bird Rev., vol. 34, pp. 18–20, 1966.

———. A new Pliocene stork from Nebraska. Smithsonian Misc. Coll., vol. 149, no. 9, pp. 1–11, 1 pl., 1966.

——— and PHILLIPS, A. R. More hybrid hummingbirds from the United States. Auk, vol. 83, no. 2, pp. 253–265, 1966.

——— and BANKS, R. C. Notes on the birds of northwestern Baja California. Trans. San Diego Soc. Nat. Hist., vol. 14, pp. 41–52, 1965.

——— and BURLEIGH, T. D. An intergeneric hybrid flycatcher (*Contopus* X *Empidonax*) from Idaho. Proc. Biol. Soc. Washington, vol. 78, pp. 33–37, 1965.

——— and SIMON, S. Additional hybrids of the slate-colored junco and the white-throated sparrow. Condor, vol. 67, pp. 438–442, 1965.

SLUD, PAUL. Report on the ornithological portion of the WNRE ecological investigation in Costa Rica. Chapt. 7, *in* Research on bioecological classification for military environments found in tropic latitudes, Wilson, Nuttall, Raimond Engineers, Inc., Chestertown, Maryland, 1965.

SPRINGER, V. G. *Medusablennius chani*, a new genus and species of blennioid fish from the Tuamotu Archipelago: its implication on blennioid classification. Copeia, no. 1, pp. 56–60, 3 figs., March 1966.

SUTTKUS, ROYAL D., and TAYLOR, WILLIAM RALPH. *Noturus munitus*, a new species of madtom, family Ictaluridae, from southern United States. Proc. Biol. Soc. Washington, vol. 78, pp. 169–178, 3 figs., October 1965.

WATSON, GEORGE E. et al. The families and genera of the petrels and their names. Ibis, vol. 107, pp. 401–405, 1965.

———. [Review], The birds of Kentucky, by R. M. Mengel. Atlantic Naturalist, vol. 20, pp. 244–245, 1965.

———. Pomarine jaeger near Lake Saranac. Kingbird, vol. 51, p. 25, 1965.

WEITZMAN, STANLEY H., and CHAN, LAI LEE. Identification and relationships of *Tanichthys albonubes* and *Aphyocypris pooni*, two cyprinoid fishes from South China and Hong Kong. Copeia, no. 2, pp. 285–296, 7 figs., 1966.

WETMORE, ALEXANDER (with other ornithologists). Water, prey, and game birds of North America. Pp. 464, 643 illus. Washington: National Geographic Society, 1965.

———. Foreword. *In* Johnson, A. W., The birds of Chile and adjacent regions of Argentina, Bolivia, and Peru, vol. 1, pp. 9–10, December 1965.

———. The Birds of the Republic of Panama. Part 1.—Tinamidae (tinamous) to Rynchopidae (skimmers). Smithsonian Misc. Coll., vol. 150, 483 pp., 73 figs., December 1965.

———. Aves. *In* Leaky, L. S. B., Olduvai Gorge 1951–61, vol. 1, pp. 71–72, 1965.

———. Additions to the list of birds of the Republic of Colombia. L'Oiseau et la Revue Française d'Ornithologie, vol. 35 (Berlioz Jubilee Number), pp. 156–162, April 1966.

INVERTEBRATE ZOOLOGY

BARNARD, J. LAURENS. Marine Amphipoda of atolls in Micronesia. Proc. U.S. Nat. Mus., no. 3516, vol. 117, pp. 459–552, 35 figs., December 1965.

———. Marine Amphipoda of the family Ampithoidae from southern California. Proc. U.S. Nat. Mus., no. 3522, vol. 118, pp. 1–46, 28 figs., December 1965.

BOWMAN, THOMAS E. *Cyathura specus*, a new cave isopod from Cuba (Anthuroidea: Anthuridae). Stud. Fauna Curaçao, vol. 22, no. 85, pp. 88–97, 1965.

———. *Xilitloniscus*, a new genus for the Mexican troglobitic isopod, *Cordioniscus laevis* Rioja (Oniscoidea: Trichoniscidae). Proc. Biol. Soc. Washington, vol. 78, pp. 209–215, 1965.

——— and LANCASTER, L. J. A bloom of the planktonic blue-green alga, *Trichodesmium erythraeum*, in the Tonga Islands. Limnology and Oceanography, vol. 10, no. 2, pp. 291–293, 1965.

———. *Haptolana trichostoma*, a new genus and species of troglobitic cirolanid isopod from Cuba. Internat. Journ. Speleology, vol. 2, no. 1, pp. 105–108, pls. 24–27, 1966.

——— and PETERSON, LANELLE W. Bibliography and list of new genera and species of amphipod crustaceans described by Clarence R. Shoemaker. Crustaceana, vol. 9, pt. 3, pp. 309–316, pl. 22, 1965.

CLARK, A. M. Japanese and other ophiuroids from the collections of the Munich Museum. Bull. Brit. Mus. (Nat. Hist.), vol. 13, no. 2, pp. 39–71, 1965.

——— and OWEN, H. G. *Eucidaris* Pomal, 1883, *Papula* Bayle, 1878, *Cidaris papillataconoidea* Parkinson, 1811, and *Cidaris savignyi* Audouin, 1826, proposed suppression; coupled with validation of *Eucidaris* Döderlein, 1887, *Stereocidaris* Pomel, 1883, and *Diadema savignyi* Michelin, 1845. Bull. Zool. Nomencl., vol. 22, no. 4, pp. 237–242, 1965.

CRESSEY, R. F. A new species of *Dentigryps* Wilson (Copepoda, Caligoida) from Madagascar. Proc. Biol. Soc. Washington, vol. 79, pp. 91–94, figs. 1–13, 1966.

———. *Bariaka alopiae* n. gen., n. sp. (Copepoda, Caligoida), a parasite on the gills of a thresher shark. Bull. Mar. Sci., vol. 16, pp. 324–329, 1966.

GONZÁLEZ, JUAN G., and BOWMAN, T. E. Planktonic copepods from Bahía Fosforescente, Puerto Rico, and adjacent waters. Proc. U.S. Nat. Mus., no. 3513, vol. 117, 21 figs., pp. 241–304, August 1965.

HOBBS, HORTON H., Jr. A new crayfish from Alabama with observations on the *Cristatus* section of the genus *Cambarus* (Decapoda, Astacidae). Proc. Biol. Soc. Washington, vol. 79, pp. 109–116, figs. 1–10, 1966.

———. *Astacus oreganus* Randall, 1840 (Crustacea, Decapoda): Proposed suppression under the Plenary Powers. Bull. Zool. Nomencl., vol. 22, pts. 5/6, pp. 351–354, 1966.

———. A new crayfish of the genus *Cambarus* from Tennessee with an emended definition of the genus (Decapoda, Astacidae). Proc. Biol. Soc. Washington, vol. 78, pp. 265–273, 12 figs., 1965.

——— and BEDINGER, M. S. Observations of a new troglobitic crayfish with notes on the distribution of troglobitic crayfishes in the Ozark region. Bull. Nat. Speleological Soc., vol. 27, no. 3, pp. 93–96, 1 fig., 1965.

MANNING, RAYMOND B. Stomatopoda from the collection of His Majesty, The Emperor of Japan. Crustaceana, vol. 9, pp. 249–262, pls. 11–12, figs. 1–2, 1965.

———. Stomatopod Crustacea from the Atlantic coast of northern South America collected by the *Calypso* in 1961. Ann. Inst. Oceanogr. Monaco, vol. 44, pp. 359–384, figs. 1–9, 1966.

MORRISON, JOSEPH P. E. New brackish water mollusks from Louisiana. Proc. Biol. Soc. Washington, vol. 78, pp. 217–224, figs. 1–9, 1965.

———. Notes on the genera of Hipponicidae. American Malacological Union, Annual Reports 1965, pp. 33–34, 1965.

———. On the families of Turridae. American Malacological Union, Annual Reports 1965, pp. 1–2, 1965.

PAWSON, DAVID L. The bathyal holothurians of the New Zealand region. Zool. Publ. Victoria Univ., Wellington, no. 39, pp. 1–33, 1965.

———. New records of echinoderms from the Snares Islands, to the south of New Zealand. Trans. Roy. Soc. New Zealand (Zool.), vol. 6, no. 25, pp. 253–260, 1965.

———. The distribution of echinoderms along the east coast of New Zealand. Trans. Roy. Soc. New Zealand (Zool.), vol. 6, no. 24, pp. 245–252, 1965

PETTIBONE, MARIAN H. Two new species of *Aricidea* (Polychaeta, Paraonidae) from Virginia and Florida, and a redescription of *Aricidea fragilis* Webster. Proc. Biol. Soc. Washington, vol. 78, pp. 127–140, 11 figs., 1965.

———. Revision of the Pilargidae (Annelida: Polychaeta), including descriptions of new species, and redescription of the pelagic *Podarmus ploa* Chamberlin (Polynoidae). Proc. U.S. Nat. Mus., no. 3525, vol. 118, pp. 155–208, 26 figs., March 1966.

RICE, WINNIE H., and KORNICKER, LOUIS S. Mollusks from the deeper waters of the northwestern Campeche Bank, Mexico. Publ. Inst. Mar. Sci., Univ. Texas, vol. 10, pp. 108–172, 16 pls., 1965.

ROBERTS, HENRY B. Fossil decapod crustaceans from the Marshall Islands. Geol. Survey Prof. Pap. 260–HH, pp. 1127–1131, pl. 303, 1964.

ROSEWATER, JOSEPH. Studying living Tridacnidae in the Marshall Islands. American Malacological Union, Annual Reports 1965, pp. 18–19, 1965.

RÜTZLER, KLAUS. Substratstabilität in marinen Benthos als ökologischer Faktor, dargestellt am Beispiel adriatischer Porifera. Int. Revue Ges. Hydrobiol., vol. 50, no. 2, pp. 281–292, 965.

———. Systematik und Ökologie der Poriferen aus Litoral-Schattengebeiten der Nordadria. Z. Morph. Okol. Tiere, vol. 55, pp. 1–82, 1965.

SCHMITT, WALDO L. Crustaceans. *In* Ann Arbor Science Library. 204 pp. Ann Arbor: Univ. of Michigan Press, 1965.

SQUIRES, DONALD F., and RALPH, PATRICIA M. A new scleractinian coral of the genus *Flabellum* from New Zealand, with a new record of *Stephanocyathus*. Proc. Biol. Soc. Washington, vol. 78, pp. 259–264, 1965.

———. Neoplasia in a coral? Science, vol. 148, pp. 503–505, 1965.

———. A new record for *Leptopenus*, a rare deep-water coral. Nature, 207, pp. 878–879, 1965.

ENTOMOLOGY

AUDY, J. R.; NADCHATRAM, M., LOOMIS, R. B.; and TRAUB, R. *Trombicula minor* Berlese (Acarina: Trombiculidae): Designation of neotype with larval and post-larval stages from Malayan bats, and new name, *Myotrombicula dilarami*, for *T. minor* Cooreman 1960 nec Berlese, 1905. Acarologia, vol. 7 (suppl.), pp. 1–33, figs. 1–11, 1965.

BLAKE, DORIS H. More new galerucine beetles with excised middle tibiae in the male (Coleoptera: Chrysomelidae). Proc. U.S. Nat. Mus., no. 3528, vol. 118, pp. 233–266, 35 figs., February 1966.

———. A review of the beetles of the genus *Neobrotica* and some closely related genera (Coleoptera: Chrysomelidae). Proc. U.S. Nat. Mus, no. 3529, vol. 118, pp. 267–372, 16 figs., April 1966.

CARRIKER, M. A., JR. A revision of the genus *Furnaricola* (Mallophaga) with descriptions of new species. Proc. U.S. Nat. Mus., vol. 118, no. 3532, pp. 405–432, 31 figs., 1966.

CLARKE, J. F. GATES. Microlepidoptera of the Juan Fernandez Islands. Proc. U.S. Nat. Mus., no. 3508, vol. 117, pp. 1–106, 111 figs., 1 pl., 1965.

DELFINADO, MERCEDES D. The culicine mosquitoes of the Philippines, Tribe Culicini (Diptera: Culicidae). Mem. Amer. Ent. Inst., no. 7, 252 pp., 275 fig., 1966.

DRAKE, CARL J., and HOBERLANDT, L. A revision of the genus *Potamometra* (Hemiptera: Gerridae). Acta Ent. Mus. Nat. Pragae, vol. 36, pp. 303–310.

——— and MALDONADO CAPRILES, J. A new lacebug from Haiti (Hemiptera: Tingidae). Journ. Kansas Ent. Soc., vol. 38, pp. 317–319, July 1965.

DUCKWORTH, W. D. Neotropical Microlepidoptera, VIII. A review of the genus *Falculina* with descriptions of new species (Lepidoptera: Stenomidae). Proc. U.S. Nat. Mus., no. 3531, vol. 118, pp. 391–404, 1 pl., 5 figs., February 1966.

EMERSON, K. C. Notes on some Mallophaga from Formosan mammals. Proc. Biol. Soc. Washington, vol. 77, pp. 195–198, 1964.

———. A new genus and species of Mallophaga. Ann. Mag. Nat. Hist., ser. 13, vol. 7, pp. 383–384, 1964.

———. Three new species of Mallophaga from Dassies (Hyracoidea). Ann. Mag. Nat. Hist., ser. 13, vol. 7, pp. 689–692. 1964.

———. A new species of Mallophaga from the Caracara. Florida Ent., vol. 49, pp. 49–51, 1966.

——— and STOJANOVICH, C. J. A new species of *Kelerimenopon* (Menoponidae, Mallophaga) from the Philippine Islands. Florida Ent., vol. 48, pp. 117–119, 1965.

FLINT, OLIVER S., JR. Taxonomy and life-histories of the caddisflies of the Lesser Antilles. Amer. Philos. Soc., Yearbook 1964, pp. 262–263, 1965.

———. New species of Trichoptera from the United States. Proc. Ent. Soc. Washington, vol. 67, pp. 168–176, 11 figs., 1965.

———. The genus *Neohermes* (Megaloptera: Corydalidae). Psyche, vol. 72, pp. 255–263, 19 figs., 1965.

———. Notes on certain Nearctic Trichoptera in the Museum of Comparative Zoology. Proc. U.S. Nat. Mus., no. 3530, vol. 118, pp. 373–390, 4 figs., February 1966.

———. Type disposition of some recently described Hemerobiidae (Neuroptera). Proc. Ent. Soc. Washington, vol. 68, p. 24, 1966.

HOOGSTRAAL, H., and TRAUB, R. The fleas (Siphonaptera) of Egypt: host-parasite relationships of cricetid rodents (Family Cricetidae, Subfamily Gerbillinae). Journ. Egyptian Public Health Assoc., vol. 40, pp. 141–175, 1965.

MUESEBECK, C. F. W. Two new braconid parasites of the spruce budworm (Hymenoptera). Ent. News, vol. 76, pp. 71–74, March 1965.

———. A new diapriid (Hymenoptera: Diapriidae) from termite nests from South Africa. Journ. Ent. Soc. South Africa, vol. 27, pp. 188–190.

RICE, R. D., and EMERSON, K. C. A new species of *Machaerilaemus* (Mallophaga: Menoponidae) from the red-plumed bird of paradise. Ent. News, vol. 76, pp. 275–277, 1965.

SNYDER, T. E. Our native termites. Ann. Rep. Smithsonian Inst. for 1964, pp. 497–506, 1 fig., 1965.

———. Termite stowaways intercepted 1962–1966. PCO News, vol. 26, no. 4, p. 73, April 1966.

SPANGLER, PAUL J. A new species of *Derovatellus* from Guatemala and a description of its larva (Coleoptera: Dytiscidae). Coleopt. Bull., vol. 20, no. 1, pp. 11–18.

STONE, A.; SCANLON, J. E.; BAILEY, D. L.; DELFINADO, M. D.; and BRAM, R. A. Preliminary keys to the mosquitoes of Vietnam. South East Asia Mosquito Project, 1st revised ed. (mimeogr. publ.), 92 pp., 5 pls., 1966.

TRAUB, R. Some opportunities and problems in medical entomology in the Asian-Pacific Region. Pacific Insects, vol. 7, pp. 21–28, 1965.

———. A new subgenus of *Ophthalmopsylla* from Gilgit, West Pakistan, and a new *Hopkinsipsylla* from Libya (Siphonaptera: Leptopsyllidae) Journ. Med. Ent., vol. 2, pp. 123–136, figs. 1–23, 1965.

——— and NADCHATRAM, M. A revision of the genus *Chatia* Brennan, with synonymic notes and descriptions of the new species from Pakistan (Acarina: Trombiculidae). Journ. Med. Ent., vol. 2, pp. 17–37, figs. 1–24, 1965.

BOTANY

CUATRECASAS, JOSÉ. Miscelánea sobre flora neotrópica II. Ciencia (Mexico), vol. 24, no. 1, 2, pp. 121–124, June 1965.

———. Una Bombacácea nueva de Venezuela. Bol. Soc. Venezolana Cienc. Nat., vol. 24, no. 109, pp. 153–155, September 1965.

———. Some new Compositae from Peru. Ann. Missouri Bot. Gard., vol. 52, no. 3, pp. 304–313, October 1965.

———. El género *Sorocea* (Moraceae) en la costa occidental de Colombia. Ciencia (Mexico), vol. 24, pp. 185–188, February 1966.

———. Establecimiento de la "Organización pro Flora Neotrópica." Ciencia (Mexico), vol. 24, pp. 267–270, February 1966.

DAWSON, E. YALE. An undescribed *Melocactus*? in the Galápagos Islands. Cactus Succulent Journ., vol. 37, no. 5, p. 126, 1965.

———. Further studies of *Opuntia* in the Galápagos Archipelago. Cactus Succulent Journ., vol. 37, no. 5, pp. 135–148, 1965.

———. Time of my life, pt. 1, 2. Cactus Succulent Journ., vol. 38, pp. 15–18, 58–60, 1966.

———. Marine algae in the vicinity of Humboldt State College, Humboldt Co., California. Pp. 77. Humboldt State College, 1965.

———. Intertidal algae. *In* An oceanographic survey of the southern California mainland shelf. State of California Water Quality Control Board, Publ. 27 and 27-Appendix, Chapt. 8, and Table IX, 1965.

———. Marine botany, an introduction. Pp. xii+371. New York: Holt, Rinehart & Winston, 1966.

ERNST, WALLACE R., et al. Documented chromosome numbers of plants. Madroño, vol. 18, no. 4, pp. 122–126, October 1965.

EYDE, RICHARD H. The Nyssaceae in the Southeastern United States. Journ. Arnold Arb., vol. 47, no. 2, pp. 117–125, April 1966.

HALE, MASON E., JR. *Parmelia* subgenus *Amphigymnia* of Japan (in Japanese). Misc. Bryol. Lichenol., vol. 3, pp. 161, 162, 1965.

———. Vertical distribution of cryptogams in a red maple swamp in Connecticut. Bryologist, vol. 68, no. 2, pp. 193–197, 1965.

———. Six new species of *Parmelia* from Southeast Asia. Journ. Jap. Bot., vol. 40, no. 7, pp. 199–205, 1965.

———. Studies in the *Parmelia borreri* group. Svensk Bot. Tidskr., vol. 59, no. 1, pp. 38–48, 1965.

KING, ROBERT M., and ROBINSON, HAROLD. Generic limitations in the *Hofmeisteria* complex (Compositae: Eupatorieae). Phytologia, vol. 12, no. 8, pp. 465–476, 1966.

McClure, Floyd A. The bamboos—A fresh perspective. Pp. xv + 347, Harvard Univ. Press, 1966.

Meyer, Frederick G., and Walker, Egbert H., eds., A flora of Japan (In English), by Jisaburo Ohwi. Pp. ix + 1067, 33 pls., 18 figs., Smithsonian Institution, September 1965.

Morton, Conrad V. A new generic name in the Saxifragaceae. Leafl. West. Bot. vol. 10, no. 11, p. 181, August 1965.

———. Una Gesneriaceae nueva de Venezuela. Bol. Soc. Venezolana Cienc. Nat., vol. 26, no. 109, pp. 156–158, September 1965.

———. Observations on cultivated ferns, VIII. *Stenochlaena*. Amer. Fern Journ. vol. 55, no. 4, pp. 164–166, January 1966.

———. Varieties of *Ballota nigra* in the eastern United States. Rhodora, vol. 68, no. 773, pp. 93, 94, March 1966.

——— and Stern, William L. The United States National Herbarium. Plant Sci. Bull., vol. 12, no. 2, pp. 1–4, June 1966.

Parker, B. C., and Dawson, E. Yale. Non-calcareous marine algae from California Miocene deposits. Nova Hedwigia, vol. 10, pp. 273–295, 1965.

Robinson, Harold E. A small collection of bryophytes from Kashmir. Bryologist, vol. 68, no. 3, pp. 313–320, 1965.

———. Notes on *Oreoweisia* and *Hypnella* from Latin America. Bryologist, vol. 68, no. 3, pp. 331–334, 1965.

———. Venezuelan bryophytes collected by Julian A. Steyermark. Acta Bot. Venezuelica, vol. 1, no. 1, pp. 73–83, 1965.

———. New or little known mosses from the eastern United States. Bryologist, vol. 69, no. 1, pp. 105–109, 1966.

———. The status of the moss genus *Rechingerella*. Bryologist, vol. 69, no. 1, pp. 112, 113, 1966.

Rudd, Velva E. The American species of *Ormosia* (Leguminosae). Contrib. U.S. Nat. Herb., vol. 32, pt. 5, pp. 279–384, 6 pls., 15 figs., September 1965.

———. Another Mexican *Desmanthus*? Leafl. West. Bot., vol. 10, no. 13, pp. 243, 244, February 1966.

———. *Acacia cochliacantha* or *Acacia cymbispina* in Mexico? Leafl. West. Bot., vol. 10, no. 14, pp. 257–262, May 1966.

Seidenschnur, Christiane E., and Shetler, Stanwyn G. The botanical activities of Paul Bartsch (1871–1960). Proc. Biol. Soc. Washington, vol. 78, pp. 275–292, December 1965.

Shetler, Stanwyn G., and Montgomery, Florence. Insectivorous plants. Smithsonian Institution Information Leaflet No. 447, pp. 1–23, 1965.

SMITH, LYMAN B. [Letter.] Bromeliana (Greater New York Chapt. Bromel. Soc.), vol. 2, no. 5, pp. 26–29, May 1965.
———. Herbarium notes, II. Phytologia, vol. 12, p. 249, July 1965.
———. Tillandsia's subgenus *Phytarrhiza*. Bromeliana (Greater New York Chapt. Bromel. Soc.), vol. 2, pp. 50–53, December 1965.
———. Itinerary of Edouard François André in his expedition to the northern Andes 1875–76. Phytologia, vol. 12, pp. 401–413, December 1965.
———. The great bromeliad hoax. Bromel. Soc. Bull., vol. 16, no. 1, pp. 4, 5, January–February 1966.
———. Notes on Bromeliaceae, XXIII. Phytologia, vol. 13, pp. 84–161, March 1966.
———, and DOWNS, ROBERT J. Xiridaceas. *In* Flora ilustrada Catarinense, pt. 1, fasc. XIRI, pp. 1–54, August 1965.
SODERSTROM, THOMAS R. Gramineae. *In* The botany of the Guayana Highland—Part VI. Mem. N.Y. Bot. Gard., vol. 12, no. 3, pp. 1–7, 1965.
———. Preparing a rain forest exhibit for Smithsonian's new Hall of Plant Life. Plant Sci. Bull., vol. 11, no. 2, pp. 1–3, 1965.
———. Phylogenetic position of *Piresia*, a grass of the tropical American rain forest (Abstract). Amer. Journ. Bot., vol. 52, no. 6, pt. 2, p. 651, 1965.
———, and DECKER, HENRY F. *Allolepis:* a new segregate of *Distichlis* (Gramineae). Madroño, vol. 18, no. 2, pp. 33–39, 1965.
STERN, WILLIAM L. The scientific name of "pink ivory." Internat. Wood Coll. Bull., vol. 19, no. 6, pp. 89, 90, June 1966.
STEYERMARK, JULIAN A.; ARISTEGUIETA, LEANDRO; and WURDACK, JOHN J. Una neuva especie de *Tapirira* para Venezuela. Bol. Soc. Venezolana Cienc. Nat., vol. 26, no. 109, pp. 159–162, September 1965.
WURDACK, JOHN J. Certamen Melastomataceis X. Phytologia, vol. 13, no. 2, pp. 65–80, March 1966.

PALEOBIOLOGY

ADEY, W. H. The genus *Clathromorphum* (Corallinaceae) in the Gulf of Maine. Hydrobiologia, vol. 26, nos. 3–4, pp. 539–573, 1965.
BENSON, R. H. Designation of ostracode lectotypes. Journ. Paleontology, vol. 40, no. 3, pp. 745–747, 1965.
——— and KAESLER, R. L. The Benson-Kaesler bolapipe dredge. Micropaleontology, vol. 11, no. 3, pp. 369–372, 1965.

BOARDMAN, R. S. *In* Doumani, G. A., et al., Lower Devonian fauna of the Horlick Formation, Ohio Range, Antarctica, Bryozoa. Antarctic Research Series, vol. 6, pp. 248–251, pl. 1, figs. 1–4, 2 tables, 1965.

BUZAS, M. A. The distribution and abundance of Foraminifera in Long Island Sound. Smithsonian Misc. Coll., vol. 149, no. 1, 89 pp., 4 pls., 22 figs. 1965.

———, The discrimination of morphological groups of *Elphidium* (Foraminifera) in Long Island Sound through canonical analysis and invariant characters. Journ. Paleontology, vol. 40, no. 3, pp. 585–594, 1 text-fig., 2 pls., 1966.

CIFELLI, R. Late Tertiary planktonic Foraminifera associated with a basaltic boulder from the Mid-Atlantic Ridge. Journ. Marine Research, vol. 23, no. 2, pp. 73–87, 1965.

CIFELLI, R.; BOWEN, V. T.; and SIEVER, R. Cemented foraminiferal oozes from the Mid-Atlantic Ridge. Nature, vol. 209, no. 5018, pp. 32–34, 1965.

COOPER, G. ARTHUR, and PHELAN, THOMAS. *Stringocephalus* in the Devonian of Indiana. Smithsonian Misc. Coll., vol. 151, no. 1, 20 pp., 5 pls., 11 figs., 1966.

DANE, C. H.; COBBAN, W. A.; and KAUFFMAN, E. G. Stratigraphy and regional relationships of a reference section of the Juana Lopez Member, Mancos Shale, in the San Juan Basin, New Mexico. U.S. Geol. Survey Bull. 1224H, Contr. to Strat., 5 pp., 3 figs., 1966.

DUNKLE, DAVID H., and RAHMAN, HABIB-UR. On marine fishes from the Eocene of West Pakistan. Geological Survey of Pakistan, Prepublication Issue no. 10, June 1966.

DUTRO, T. J. Brachiopods, *in* Kummel, Bernhard, and Raup, David eds., Handbook of paleontological techniques, pt. 1, General procedures and techniques applicable to major fossil groups, pp. 44–48, San Francisco: W. H. Freeman and Co., 1965.

———. [Review] Treatise of invertebrate paleontology. Science, vol. 152, no. 3721, pp. 494–495, 1966.

——— and PAYNE, T. G. Geologic map of Alaska, *in* Geologic map of North America, E. N. Goddard, chairman. U.S. Geol. Survey Special Map, 1965.

GAZIN, C. LEWIS. Animales prehistoricos localizados en Guatemala. Historia Natural y Pronatura, no. 2, pp. 4–6, 4 figs., 1965.

———. An endocranial cast of the Bridger middle Eocene primate, *Smilodectes gracilis*. Smithsonian Misc. Coll., vol. 149, no. 4, 14 pp., 2 pls., 1965.

———. Early Eocene mammalian faunas and their environment in the vicinity of the Rock Springs Uplift, Wyoming. Wyoming Geological Assoc. Guidebook, Symposium on Sedimentation of Late Cretaceous and Tertiary Outcrops, Rock Springs Uplift, 19th Ann. Field Conf., pp. 171–180, 1 fig., 1965.

HIBBARD, C. W.; RAY, C. E.; SAVAGE, D. E.; TAYLOR, D. W.; and GUILDAY, J. E. Quaternary mammals of North America. *In* H. E. Wright, Jr., and D. G. Frey (eds.), The Quaternary of the United States, pp. 509–525, 9 figs.), 4 tables. Princeton Univ. Press, 1965.

JOHNSON, J. H., and ADEY, W. H. Studies of *Lithophyllum* and related algal genera. Quart. Colorado School Mines, vol. 60, no. 2, pp. 1–105, 1965.

KAUFFMAN, E. G. Middle and late Turonian oysters of the *Lopha lugubris* group. Smithsonian Misc. Coll., vol. 148, no. 6, 92 pp., 8 pls., 18 figs., 5 tables, 1965.

———. Taxonomic, ecologic and evolutionary significance of interior shell morphology in the Inoceramidae (Mesozoic Bivalvia) [Abstract], Geol. Soc. America, Ann. Meeting, 1 p., 1965.

KAUFFMAN, E. G., and MCCULLOCH, D. S. Biota of a late glacial Rocky Mountain pond. Geol. Soc. America Bull., vol. 76, pp. 1203–1232, 5 figs., 2 pls., 1965.

KELLOGG, REMINGTON. Fossil marine mammals from the Miocene Calvert formation of Maryland and Virginia. U.S. Nat. Mus. Bull. 247, pts. 1 and 2, pp. 1–63, pls. 1–32, October 1965.

KIER, P. M. Evolutionary trends in Paleozoic echinoids. Journ. Paleontology, vol. 39, no. 3, pp. 436–465, pls. 55–60, 26 text-figs., 1965.

——— and GRANT, R. E. Echinoid distribution and habits, Key Largo Coral Reef Preserve, Florida. Smithsonian Misc. Coll., vol. 149, no. 6, 66 pp., 16 pls., 15 figs., 1965.

PIERCE, J. W. Sedimentology Program at the Museum of Natural History, Smithsonian Institution. *In* Interagency Conference on Continental Research, U.S. Army, Coastal Eng. Res. Center, Misc. Paper 1–66, pp. 9–11, 1966.

———. Sediment budget of a part of the North Carolina coast [Abstract]. Program of 1966 Annual Meeting, Southeastern Section, Geol. Soc. of America.

———, and GOOD, DONALD I. FORTRAN II Program for standard size analysis of unconsolidated sediments using an IBM 1620 computer. Kansas Geol. Surv., Spec. Distrib. Publ. 28, 19 pp., 1966.

RASETTI, FRANCO. Upper Cambrian trilobites of the Pleasant Hill Formation in central Pennsylvania. Journ. Paleontology, vol. 39, no. 5, pp. 1007–1014, pls. 119–120, 1965.

———. New Lower Cambrian trilobite faunule from the Taconic Sequence of New York. Smithsonian Misc. Coll., vol. 148, no. 9, 52 pp., 12 pls., 1966.

RAY, CLAYTON E. A glyptodont from South Carolina. Charleston Mus. Leaflet no. 27, pp. 1–12, pls. 1–4, 1965.

———. A new chipmunk, *Tamias aristus*, from the Pleistocene of Georgia. Journ. Paleontology, vol. 39, no. 5, pp. 1016–1022, 1 fig., 1965.

———. Variation in the number of marginal tooth positions in three species of iguanid lizards. Mus. Comp. Zool. Breviora, no. 236, 15 pp., 5 figs., 1965.

RAY, CLAYTON E. The identity of *Bison appalachicolus*. Notulae Naturae, Acad. Nat. Sci. Philadelphia., no. 384, 7 pp., 2 figs., May 1966.

RORHER, W. L., and GAZIN, C. LEWIS. Gray Bull and Lysite faunal zones of the Willwood Formation in the Tatman Mountain area, Bighorn Basin, Wyoming. *In* Geological Survey Research 1965, U.S. Geol. Survey Prof. Paper 525–D, pp. D133–D138, 1966.

ROSS, R. J., JR., and DUTRO, T. J. Silicified Ordovician brachiopods from east-central Alaska. Smithsonian Misc. Coll., vol. 149, no. 7, 22 pp., 3 pls., 1 fig., 1966.

TOWE, K. M. Carbon films for electron microscopy: A reliable method for stripping from glass surfaces. Rev. Sci. Instruments, vol. 36, no. 8, p. 1247, 1965.

——— and CIFELLI, R. Aspects of wall ultrastructure in some hyaline foraminifera [Abstract]. Bull. Amer. Assoc. Petroleum Geol., vol. 49, no. 3, p. 638, 1966.

UTGAARD, JOHN and BOARDMAN, R. S. *Heterotrypa* Nicholson, 1879, and *Peronopora* Nicholson, 1881 (Bryozoa, Trepostomata): Proposed designation of a type-species in conformity with generally accepted usage. Bull. Zool. Nomencl., vol. 22, pt. 2, pp. 112–118, 1965.

MINERAL SCIENCES

BUSECK, P. R.; MASON, B.; and WIIK, H. B. The Farmington meteorite. Geochim. Cosmochim. Acta, vol. 30, pp. 1–8, 1966.

CLARKE, R. S., JR.; WOSINSKI, J. F.; MARVIN, R. R.; and FRIEDMAN I. Potassium-argon ages of artificial tektite glass [Abstract]. Trans. Amer. Geophys. Union, vol. 47, p. 144, 1966.

DESAUTELS, PAUL E. Interaction between light and minerals. Natural History, vol. 74, No. 8, pp. 52–57, October 1965.

DONNAY, G.; MASON, B.; and INGAMELLS, C. O. Buergerite, a new species of tourmaline. Amer. Mineral., vol. 51, pp. 198–199, 1966.

FREDRIKSSON, K. Standards and correction procedures for microprobe analysis of minerals [Abstract]. IV[e] Congrès International sur l'Optique des Rayons X et la Microanalyse. Faculte des Sciences, Orsay, 1965.

——— and REID, A. A chondrule in the Chainpur meteorite. Science, vol. 149, pp. 856–860, 1965.

MASON, B. The geochemical behavior of some elements in meteorites. Probl. of Geochemistry, pp. 72–80, 1965.

———. The enstatite chondrites. Geochim. Cosmochim. Acta, vol. 30, pp. 22–39, 1966.

———. Geochemistry and meteorites. Geochim. Cosmochim. Acta, vol. 30, pp. 365–374, 1966.

———. Memorial to Mark Chance Bandy. Bull. Geol. Soc. Amer., vol. 77, pp. 13–16, 1966.

MELSON, W. G. Phase equilibria in calc-silicate hornfels, Lewis and Clark County, Montana. Amer. Mineral., vol. 51, nos. 3 and 4, pp. 402–421, 1966.

———, BOWEN, V. T.; VAN ANDEL, TJ. H.; and SIEVER, R. Greenstones from the central Valley of the Mid-Atlantic Ridge. Nature, vol. 209, pp. 604–605, 1966.

——— and SWITZER, G., Plagioclase-spinel-graphite xenoliths in metallic iron-bearing basalts, Disko Island, Greenland. Amer. Mineral., vol. 51, nos. 5 and 6, 14 pp. 1966.

OLSEN, E., and FREDRIKSSON, K. Phosphates in iron and pallasite meteorites. Geochim. Cosmochim. Acta, vol. 30, pp. 459–470, 1966.

WIIK, H. B., and MASON, B. Analyses of eight iron meteorites. Geochim. Cosmochim. Acta, vol. 29, pp. 1003–1005, 1965.

National Zoological Park

THEODORE H. REED, *Director*

FOR THE NATIONAL ZOOLOGICAL PARK, the year ending June 30, 1966, was in many ways remarkable. The construction program moved ahead methodically, a scientific research department was established, additional emphasis was placed on conservation, and the breeding of exotic species added notably to the value of the animal collection.

The collection continued to grow in zoological breadth and diversity. Gifts, births, purchases, and exchanges have enhanced public interest in and the scientific usefulness of the Zoo. The following summary of the animals on hand on June 30 shows the greatest number of species and of individual animals since the retirement of Dr. William M. Mann in 1956.

STATUS OF THE COLLECTION

June 30, 1966

Class	*Orders*	*Families*	*Species or subspecies*	*Individuals*
Mammals	13	50	257	771
Birds	23	80	413	1,306
Reptiles	4	27	209	750
Amphibians	2	14	33	107
Fishes	5	11	29	198
Arthropods	2	3	4	61
Mollusks	1	1	1	30
TOTALS	50	186	946	3,223

Births

For the first time in the Zoo's long history, a baby orangutan was born. Previously, two gorillas, numerous chimpanzees, and gibbons had been raised here, so it was gratifying to have the fourth species of great ape reproduce. The Zoo had long had a trio of orangutans—Butch, Susie, and Jennie—but perhaps because they had all been brought up together from childhood there may have been a sibling relationship—in any event they never bred. The Toronto Zoo had a magnificent specimen named Archie, 10 years old and a proven sire, which they offered to exchange for a young male gorilla. Accordingly Leonard, the second gorilla born here, was dispatched to Toronto, and the National Zoo acquired Archie, a dynamic personality, big, with great cheek callosities and masses of long red hair. On April 2 Jennie gave birth to a fine healthy male, who has been named Atjeh for the province of northern Sumatra where wild orangs occur. Jennie

---

NOTE: Certain tabulated, statistical, and other information previously given in the report of the National Zoological Park in *Smithsonian Year* now appears as appendices to the Separate of this Report (available on request from the Director of the National Zoological Park). This information includes:

Visitor statistics and other operational information.

Report of the veterinary, augmented by case histories and autopsy reports.

Complete lists of: (a) animals in the collection on June 30, 1966; (b) all births and hatchings during the year; (c) changes in the collection by gift, purchase, or exchange.

---

has proved to be a good parent, and visitors enjoy watching mother and baby, although during its first months about all they could see as she cradled the baby in her arms, was its small coconut-like head with its sparse red hair. Susie is also believed to be pregnant. Butch, by the way, was loaned to the Boston Zoo, where he promptly mated with their female.

The Zoo in previous years had good success in breeding Nubian giraffes, and offspring had been sent to other zoos; but the original breeding stock, brought to the Zoo in 1937 by the Smithsonian Institution—National Geographic Society Expedition, had died, and none had been born since January 1957. Consequently, a trio of young giraffes was ordered from Africa, and in 1962 two Masai giraffes, Myrt and Marg, arrived, the male having died at sea. Not until the following year was the Zoo able to obtain a male, named Michael-John after the young son of the collector, Tony Parkinson. Then began the long wait for the animals to attain maturity. On May 27 Cecelia, the first offspring of the new herd, was born.

One of the season's unusual Zoo babies was a soulful-eyed California sea lion rejected by its mother, and in consequence hand-reared by Mrs. Jan Davis, medical technologist. For the first two days the baby was fed by stomach tube; on the third day Mrs. Davis persuaded it to accept a bottle. The formula used was—

1 cup Esbilac,
2 cups of water,
4 chopped smelt (minus the heads).

The mixture was run through a blender and then sieved to remove rough bits of skin or fin. The infant weighed 14 pounds at birth; at 2 weeks it had gained 4 pounds, 2 ounces, and the formula had been strengthened to—

1 cup Esbilac,
1½ cups of water,
8 chopped smelt (no heads),
1 teaspoon cod liver oil.

The mixture was still blended and sieved, and 4 drops of viDaylin T vitamin were added to the bottle. The little sea lion drank 18 ounces of it every two hours during the day but was not fed at night. Four sea lions have been raised in the National Zoo in the past, but this was the first time one had been bottle-raised.

Baby sea lions must be taught to swim. They are born on land and the mother takes her offspring to a shallow tidal pool to introduce it to the water. The Zoo's baby, known as Loo-Seal, was given her first swimming lesson when she was four weeks old in the indoor hippopotamus pool scrubbed and filled with clean water for the lesson. When Dr. Gray and Mrs. Davis first took the young animal into the water, it promptly sank to the bottom, but in a surprisingly short fifteen or twenty minutes it got the idea, and swam swiftly if sometimes awkwardly back and forth between its foster parents with obvious enjoyment. The lessons were continued until Loo-Seal was completely at home in the water.

The African lions Caesar and Princess produced their 24th cub in their eighth litter. The parents are now growing old; they have been here since 1953 and their age is estimated to be 15 years. The Zoo plans to keep the new little lion and eventually to use him for breeding, hence he has been named Augustus, a fitting name for a successor to Caesar.

The Zoo has long enjoyed a good record for breeding pygmy hippopotamuses. The male, Totota, has sired 11 offspring since his arrival in 1960, the most recent being born to a female sent here from another zoo to be bred. The International Union for the Conservation of Nature puts the pygmy hippo on the endangered species list, and every effort

is being made to continue the reproduction of the species in captivity.

Nile hippopotamuses, a bighorn sheep, and brindled gnus were also born during the year. In the bird department, a second-generation pair of kookaburras reared their young, and black-necked swans were hatched. A Brazilian tapir, the first born here in many years, arrived in October in an outside enclosure. Looking something like an animated watermelon in her black and white stripes, she was soon to be seen waddling happily in the erstwhile beaver pond.

Mohini, the white tiger, had her second litter—one stillborn cub, one healthy, both of the normal orange color, but a tragic outbreak of panleukopenia (feline distemper) in the lion house in August caused the death of two of Mohini's first three cubs, including the white one, before it could be brought under control.

Through a grant from the National Institutes of Health, the Zoo obtained additional closed-circuit television equipment and a TV tape recorder, and was able to record the births of Mohini's cubs, the giraffe, and the Nile hippopotamus. The tapes will be valuable in future studies of animal behavior.

Throughout the year efforts were made to obtain animals to pair with single ones in the collection. Mates were obtained for 25 mammals and birds, five of which are on the endangered species list.

Exchanges

In October 1965 zoologist Marion P. McCrane personally escorted a male pygmy hippopotamus and four Virginia white-tailed deer to the National Zoological Gardens in Pretoria, South Africa. While in South Africa she had an opportunity to visit zoos, museums, aquariums, game reserves and national parks. She returned with animals given in exchange by the Pretoria Zoo: a pair of aardwolves, the first at the Zoo in 35 years; a male serval to mate with two females already in the collection (seven kittens have been born since his arrival); a caracal; a pair of black-footed cats, the first ever exhibited here; suricates; flightless rails, and two rare species of parrot—Meyer's and the Cape parrot, never exhibited here before.

Gifts

An unusually welcome gift came from Mrs. Lyndon B. Johnson, who on January 12 received the Distinguished Service Award of the National Wildlife Federation. The award was accompanied by a check for $1000, which she graciously gave to the National Zoological Park for the beautification of the Connecticut Avenue vehicular entrance.

A DAY IN THE LIFE OF A BABY SEA LION

At her first peek at the big hippo pool, Loo-Seal gets encouragement from veterinarian Clinton W. Gray.

she's an eager pupil and takes to water like a—sea lion.

Oops!

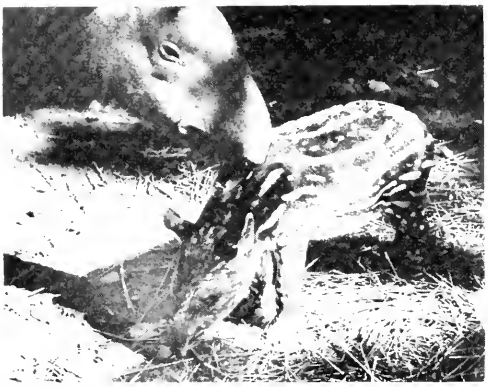
Some buoying up, more encouragement . . .

and she's soloing on her own . . .

which rates an affectionate "Well done!" from Mrs. Davis. (Photos in left column by Frank Hoy, Washington Post; right column by Randolph Routt, Washington Evening Star.)

Top left: Black-footed cat (*Felis nigripes*) of South Africa, one of the smallest and rarest felines. The pads of its feet are jet black. Left center: Aardwolf (*Proteles cristatus*), one of a pair from the National Zoological Gardens of South Africa, in Pretoria. The bushy tail and back crest of this member of the hyena family caused the Boers to call it the "maned jackal." Lower left: Cecelia, female Masai giraffe, is the first giraffe born at the Zoo since 1957. Above: One of three serval kittens hand-reared by Mrs. Janet Davis, medical technologist in the animal hospital, sits on top of the new closed-circuit TV tape-recording equipment.

New animals from Madagascar. Top: Ring-tailed mongooses (*Galidia elegans*), or vontsiras, the first of these rare viverrines ever exhibited here. Above left: A pair of rare fanalokas (*Fossa fossa*), the Zoo's first, are found only on the island. They were acquired along with other prized Madagascar fauna by resident scientist John Eisenberg. Above right: Gloves protect hands from the sharp prickly spines of this large Madagascar hedgehog (*Setifer setosus*). Below: A lesser Oriental civet (*Viverricula indica*), introduced on the island many years ago.



Top left: Caroline, first Brasilian tapir (*Tapirus terrestris*) born at the Zoo in many years. It was named for Miss Caroline Jarvis of the Zoological Society of London, editor of the International Zoo Yearbook (photo by Tom Kelley, *Washington Post*). Top right: One of the smaller Madagascar chameleons (*Chamaeleo lateralis*). Right: First orangutan born in the National Zoo and mother Jennie. Named Atjeh by Smithsonian Secretary S. Dillon Ripley for a province in Sumatra where orangutans occur. The Zoo has now successfully bred all four kinds of great apes—gibbons, orangutans, chimpanzees, and gorillas.

Below: The Zoo's nucleus herd of sitka deer in one of eight shady paddocks in the Deer Area, near the Connecticut Avenue pedestrian entrance. Completed in November 1965, the area is gradually being stocked.

Mrs. Johnson visited the Zoo and consulted with the director, the engineer, and the head gardener. The planting at this entrance has now been completed.

The largest gift of the year was a collection of tropical birds from Woodward & Lothrop, a Washington department store. The birds, collected in Central and South America and West Africa by Kerry Muller, manager of the Zoo's bird division, and George Payne, display manager for the store, were used for a month-long "fashion on the wing" display. Crowds came to see the brightly lighted store windows, where stately flamingos, roseate spoonbills, iridescent sunbirds, and sugar birds appeared in natural-habitat settings. At the end of the month the whole collection, including many rare species and numbering 436 birds, was presented to the National Zoo.

Another spectacular collection, consisting of 65 birds of 42 species, was given to the Zoo by the artist Edward Marshall Boehm, noted for his ceramic figures of birds. All were valuable, but outstanding were the dusky lory, Vaal River white eye, Australian fairy blue wren, pavonine trogon, and Coleto starling.

A magnificent hyacinthine macaw named "Gainsborough" was given the Zoo by Princess Belosselsky of New York. This species of macaw had not been exhibited here for many years.

The gifts of birds mentioned above were especially appreciated in view of the recently remodeled bird house and the great outdoor flight cage opened to the public on July 18, 1965. This soaring, imaginative, walk-through aviary has been extremely popular with visitors, who now can stroll past splashing waterfalls and landscaped shrubbery while they watch the birds close at hand, with no barriers between people and the flash of wings.

The U.S. Naval Medical Research Unit no. 3 in Cairo, Egypt, through the efforts of Dr. Harry Hoogstraal, a long-time friend of the Zoo, collected and shipped a number of interesting reptiles and other animals.

Research

Recognizing the importance of the original Congressional mandate establishing the National Zoological Park "for the advancement of science," the Zoo throughout its history has made many contributions to scientific knowledge. The emphasis on science was strengthened by the formal organization last year of a division of research and by the appointment on September 1, 1965, of Dr. John F. Eisenberg as resident scientist. The staff of the research division also includes Mrs. Wyotta Holden as secretary and Eugene Maliniak as assistant. The latter has been for many years in charge of the small mammal house

and has a keen interest in small mammals. Temporary research facilities have been constructed in the basement of the lion house.

Eisenberg also serves as research associate professor at University of Maryland department of zoology, which is headed by Dr. George Anastos, and there he offers graduate courses and supervises a graduate research program.

During the past year Eisenberg presented research papers at the International Ethological Congress in Zurich, at the University College at Nairobi, and at the 1966 meeting of the American Society of Mammalogists. He submitted for publication two research papers: "The Behavior of *Ateles geoffroyi* and Related Species" and "Notes on the Ecology, Behavior, and Reproduction of Some Tenrecoid Insectivores."

From January through April 1966, Eisenberg participated as coinvestigator with Edwin Gould of Johns Hopkins University in an ecological and behavioral study of the tenrecoid insectivores of Madagascar. From his field camp there he was able to send to the Zoo a number of fine specimens, including a fossa (*Cryptoprocta ferox*), the second of the only two specimens ever exhibited in the United States, both at the National Zoo. The new acquisition is thought to be the only one now on exhibit in any zoo in the world. Other valuable additions to the collection are a pair of fanalokas (*Fossa fossa*) and three vontsiras, or Madagascar ring-tailed mongooses (*Galidia elegans*), which have never been seen in the Zoo before. All of these are members of the family Viverridae. In addition, 25 living specimens of tenrec of 7 different species were sent back to the Zoo. Most of them will be kept in the research division for further studies. This field work has resulted in the first basic ecological data for several genera of tenrecs, including the greater hedgehog tenrec (*Setifer setosus*), the lowland streaked tenrec (*Hemicentetes semispinosus*), and the highland streaked tenrec (*H. nigriceps*). In addition, range extensions for *Fossa fossa* and *H. nigriceps* were established.

For the murine opossum (*Marmosa* sp.) and the hedgehog tenrec (*Echinops telfairi*) the gestation period, on the basis of three pregnancies, was determined by Maliniak and Eisenberg to be less than 17 days for the opossum and 62 to 68 days for the tenrec. The tiny murine opossum, unlike the common opossum, has no pouch, and the numerous young, as many as 18 in a litter, can be seen hanging to the mother like a bunch of grapes.

Current research projects at the National Zoological Park are:

1. Studies of thermoregulation and hibernation in the tenrecs of the genera *Microgale*, *Hemicentetes*, *Setifer*, *Echinops*, and *Centetes* (with E. Maliniak).

2. Social behavior of microtine rodents under varying population densities (with G. McKay).

3. Studies of social behavior and communications in the marmoset species *Saguinus oedipus* and *S. geoffroyi* (= *spixii*) (with Miss N. Muckenhirn).

4. Studies on the social behavior and on the ontogeny of behavior among selected species of Caviomorph rodents (with N. Smythe).

5. Basic studies on the behavior of mammals during parturition (in conjunction with Dr. Clinton W. Gray).

Information and Education

The information and education section, continuing its sign and label making program, completed 437 animal identification labels, 167 supporting signs (safety, building and construction signs, etc.), and 232 other visual information projects. Natural history and Park information were disseminated by telephone and correspondence. Guided tours were conducted for groups of handicapped children, for classes from schools and colleges, personnel from other zoos, and for special guests and dignitaries.

In addition to these activities, the section handled public relations (press, radio, television, etc.), prepared articles and literature for publication and distribution, and provided liaison between the Zoo and volunteer groups interested in aiding it.

The information and education section and the veterinary section collaborated with the National Educational Television Association in the production of a 30-minute educational TV program on zoo veterinary medicine, to be aired in late summer or early fall, 1966.

Friends of the National Zoo

The Friends of the National Zoo continued their interest and helpfulness. Their education committee, with the assistance and cooperation of the Zoo's section on information and education, prepared an information brochure on the Zoo and an educational aid packet for distribution in the District school system and to all interested groups. This was something the Zoo had long needed and has met with a welcome response from teachers in District of Columbia elementary public schools.

The Friends were invited to a preview of the great flight cage on the evening of July 17, and held their annual meeting and election of officers in the Zoo cafeteria on April 28.

Construction and Improvements

In fiscal year 1966 the Smithsonian Institution Appropriation Act contained an item of $1,539,000 for capital improvements at the National Zoological Park, including a hospital-research building and service buildings (mechanical shop, automotive garage, property supply building, and greenhouse).

A landscape architect was engaged last year at the recommendation of the Fine Arts Commission to restudy the entire master plan, and design and construction of the hospital-research-service area have been delayed until preliminary phases of the restudy are completed. The designs for these buildings, completed by architect Alan Jacobs, have been approved by the Fine Arts Commission and the National Capital Planning Commission, and construction is expected to begin in late fall 1966.

On the recommendation of the Fine Arts Commission, the area south and east from the location of the proposed giraffe house (the present artificial "sheep mound") to Rock Creek is to be designed as a unified plan, including landscaping and exterior architecture. Upon approval of preliminary (feasibility) plans, the detailed plans and construction designs of the multiclimate house for this area will proceed.

On June 13 the President of the United States, using his authority under the Reorganization Act, sent to Congress Reorganization Plan No. 4 of 1966, in accordance with the Reorganization Act of 1949. This plan will transfer the responsibility for construction within the Zoo from the District of Columbia to the Smithsonian Institution.

In preparation for this transfer the General Services Administration has, at the request of the District of Columbia, already taken over the administration of the present design contract and will in the future supervise construction in the Zoo.

Construction continues within the Zoo. The great flight cage was completed and opened to the public on July 18. Almost a third of the exhibition area has been under construction. Parking lot F, near the waterfowl pond, was completed and was accepted on September 16, 1965. It accommodates 260 automobiles and 24 buses. The new electrical transformer station was completed, and installation of the electrical switch gear is underway. The new gas-fired boiler at the bird house was completed and placed in service.

The trunk sewers and retention basin, authorized under the Phase II program, were started on January 4, 1966, and will undoubtedly be completed on schedule. The present exhibition of sea lions and canines, the beaver pool, and the silver gull cage have been withdrawn from public exhibition during the sewer construction.

The deer area, consisting of 6 exhibition paddocks and 2 reserve paddocks, served by 5 houses, was completed and accepted in November. There was some work to be completed by the Zoo staff and because of inclement weather animals were not moved in until early spring. Dedication will take place at the same time as the hoofed-stock areas. This area, with its large trees, shady hillsides, and wandering paths gives a most pleasant effect of a private deer park. Because of the hilly terrain, moats could not be used, but overlooks are placed along the path where visitors may look out and down over the deer. In cases where fencing was necessary, a special, inconspicuous wire mesh was used. Construction continued on the hardy and delicate hoofed-stock areas.

The Department of the Interior, National Capital Parks, Rock Creek Parkway project (which includes the Zoo by-pass, the tunnel under Administration Hill, the Harvard Street overpass into the Zoo, and the North Parking lot) are nearing completion and are scheduled to be completed early in fall 1966.

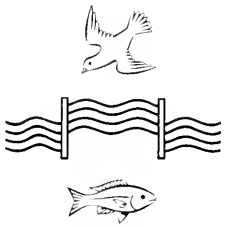
Beautification of the Zoo grounds, under the direction of head gardener John Monday, continued with the planting of 20 trees, 2300 evergreens, 50 shrubs, 3000 bulbs, and 3500 annuals and perennials. The inside of the new flight cage and the new parking lot "F" were landscaped with evergreens. Bulbs, annuals and perennials were used in flower beds throughout the Park, giving them color for most months of the year. Many bare areas in the Park were seeded, and 400 yards of sod put in where seed would have been impractical.

The work of the department also included a constant watch for dead wood that might be dangerous to visitors, employees or animals; felling dead trees and trimming others; cutting perches for birds and animals and supplying browsers with foliage.

230-457—66——14

Smithsonian Tropical Research Institute

MARTIN H. MOYNIHAN, *Director*



THE NEW NAME "Smithsonian Tropical Research Institute," replacing the previous "Canal Zone Biological Area," indicates how the activities and responsibilities of the bureau are increasing and becoming broader in scope. This development, begun some years ago, in 1966 was marked by the inauguration of several new major programs. The Institute is now fully engaged in both research and in education and training, as well as in certain aspects of conservation.

Facilities

The opening of two marine biology laboratories, one on Naos Island (Fort Amador) on the Pacific coast and the other on Galeta Island on the Atlantic coast, certainly was the outstanding event of the past year. The Naos Island facilities include the "bunker laboratory" and another large building (provisionally referred to as "building T–332"). The bunker laboratory is completely operational, with a running salt-water system, series of small aquaria, and equipment for behavioral and ecological studies of small to medium size marine organisms. Work is still in progress on building T–332, in which is a series of large tanks, 29′ x 23′ x 8′ deep, that will be provided with running sea water and will be used for studies of large and/or pelagic organisms. The Galeta Island building, also being remodelled, will eventually provide much the same range of facilities as the bunker laboratory. These new

marine facilities are available for use by visiting scientists and students in the same way as the Barro Colorado laboratory.

The existing living accommodations and laboratory were improved during the year, and some additional living quarters are being constructed. The Tropical Research Institute also acquired title to Orchid Island and two small islets off Buena Vista Point, near the shore of Barro Colorado. It is planned to preserve the native fauna and flora of these islands; but they will also be used for certain experimental programs such as the introduction of certain exotic species of mammals from other parts of the tropics.

Research and Publication

Most of the subjects investigated by scientists of the Tropical Research Institute staff (permanent resident scientists and graduate student interns) fall into the fields of evolution, social behavior, communication, species diversity, and zoogeography. Unless specifically noted otherwise, this research was supported from federal funds appropriated to the Smithsonian Institution.

A. Stanley Rand's studies of the ecology and behavior of iguanid lizards are providing information on the various ways in which species can partition environmental resources. Among the special topics he investigated were nest site competition in *Iguana iguana*, selective forces affecting egg type and clutch size in tropical reptiles in general, patterns of distribution of West Indian anoles on small islands, and the social organization and spatial distribution of *Anolis lineatopus* in Panama. Rand also expanded his investigation of vocal communication in the frog *Engystomops pustulosus*. The repertory of the species has been cataloged, and considerable progress has been made in identifying the information encoded in the system. In a paper presented at the Symposium on the Biota of the Amazon, held in Belém, Brazil,* Rand presented a double hypothesis which may help to explain in part the extreme species diversity in the tropics. He suggested that the formation of search images by predators, in the prey recognition process, produces selection pressure in favor of diversity of appearance in prey species, and that this pressure is maximal in complex environments with many species of both predators and prey.

Neal G. Smith studied the evolution of adaptations to brood parasitism by certain species of cuckoos, cowbirds and flycatchers, and the counter-adaptations of their hosts. These adaptations may include

---

*His travel was partly supported by the Association for Tropical Biology.

elaborate egg mimicry, and behavioral, morphological, and physiological polymorphism, and must be due to a delicate balance of conflicting selection pressures. Progress has been made in identifying some of the selective forces involved. He also is making an experimental analysis of the factors governing the diversity of bird species in tropical grasslands.

Many species of cuckoos are divided into distinct infra-specific "egg clans" called "gentes." The females of each subgroup lay eggs which differ in appearance (size, shape, color) from those of other subgroups of the same species. In the cuckoos that Smith is studying, females of a particular gens place their distinctive eggs in the nests of hosts which lay eggs of similar size, color, and pattern. During the past year, Smith was able to elucidate one of the major proximate factors governing egg color discontinuity. The color differences are the result of the length of time that the egg remains in the uterus. This, in turn, is controlled by a hormone similar to oxytosin. By appropriate administration of this hormone and other compounds, Smith was able to induce marked changes in the color of the eggs laid by free-living cuckoos. This technique has proved useful in determining the perceptual limitations which influence a host's ability to discriminate between its own eggs and those of other species.

Ira Rubinoff continued studies of the development of reproductive isolating mechanisms between allopatric species of *Bathygobius* from the Atlantic and Pacific coasts of Panama. He began an experimental program, partly supported by a grant from the National Science Foundation to Harvard University, that includes attempts at interspecific forced matings as well as controlled artificial hybridization of species which have been geographically separated for 6 to 8 million years. He presented a paper on geminate species of marine fishes at the meetings of the American Society of Ichthyologists and Herpetologists.

In order to trace the movements of species from ocean to ocean and/or from marine waters into Gatún Lake, Rubinoff, assisted by various members of the staff, collected fishes stranded in the Gatún Locks of the Panama Canal when the locks were drained for overhaul. There have been remarkably few studies of this subject in previous years, and Rubinoff intends to continue sampling the fishes in the locks whenever opportunities arise.

Director Martin Moynihan continued his study, largely supported by a grant from the National Science Foundation, of geographic variation in social behavior among Andean birds. Observations over the last five years have revealed that different populations of the same species of birds have very different social reactions in different parts

of the Andes. These variations, certainly not random, are strictly correlated with geographic parameters of the regions inhabited. Different species have adapted (or reacted) to the same parameters in different ways. The study of these phenomena is beginning to yield a considerable amount of new information about the basic advantages and disadvantages of different types of social systems. It should increase our understanding of both the distribution of species and the natural regulation of population size.

Moynihan also continued his comparative study of communication (acoustic, visual, olfactory, and tactile) in the monkeys, tamarins, and marmosets of tropical America. These closely related species, a relatively small group, are remarkable in occupying a great variety of ecological niches and in using very different types of "language." The functional significance of these different types is being elucidated by detailed analyses of the structures of the patterns used in the languages and their correlation with different environments and ways of life. The results contribute to an understanding of the philosophical and logical aspects of communication in general, and the evolution of communication systems in all primates, including man.

Robert L. Dressler, on leave for most of the past year, served as executive director of the central office of the Association for Tropical Biology. In spite of his heavy administrative duties (including organization of the Symposium on the Biota of the Amazon), he continued research, supported by a grant from the National Science Foundation, on pollination relationships in the Orchidaceae, especially the relations between orchids of the subtribe Stanhopeinae and bees of the tribe Euglossini. Male bees of this tribe, attracted by odor, visit the orchids in order to gather some substance from the surface of the flowers. Little is known, however, about the nature of the substance gathered, or its role in the biology of the bees (although there is some evidence that the male bees die if deprived of it for approximately 12 days). That the bees are the exclusive pollinators of the orchids has been definitely established. They also are highly specific in their visits; most species of orchids are visited by only one or a few species of bees. Thus, the adaptations which the orchids have evolved to attract the "correct" kind, or kinds, of bees supply the principal isolating mechanism between sympatric congeneric species. This type of breeding system has the advantage of favoring out-crossing, even when individual plants are widely scattered.

Michael H. Robinson analysed the antipredator adaptations of some 15 species of stick-and-leaf mimicking insects. Among the adaptations studied were special protective resemblances (homotypy), startle displays, the production of repellent secretions, and generalized escape

behavior. The efficacy of these devices was tested by using captive tamarins (*Saguinus geoffroyi*) as experimental predators. The curious "rocking movements" made by many stick-and-leaf mimicking insects have been considered to be a challenge to selection theory, since they may render an otherwise concealed insect highly conspicuous to a human observer. Robinson's experiments suggest that these movements are really a behavioral extension of the morphological mimicry, and that predators hunting in a natural environment do not respond to them because they resemble the passive wind-induced movements of non-edible objects, such as twigs and leaves. In the course of his experiments, Robinson also collected information on the behavior of the tamarins with respect to prey-recognition, searching patterns, and methods of prey-capture and eating.

Nicholas D. Smythe began a study of the ecology and behavior of the large caviomorph rodents inhabiting tropical forests. These animals are particularly interesting because they are similar in some aspects of morphology and ecology to such small ungulates as the Old World chevrotains and the small forest antelopes of Africa. (They also bear a remarkable superficial resemblance to some primitive and extinct forms, such as *Eohippus*.) Different species of these caviomorphs have rather different types of social systems, and Smythe hopes to be able to explain the functional significance of these differences by determining their correlations with particular features of the ecology of the species concerned. He has been paying special attention to the agouti *Dasyprocta punctata* and the paca *Agouti paca*, both of which are common on Barro Colorado Island and in many other parts of the Canal Zone and the Republic of Panama. He observed their behavior in the wild (recording with automatic cameras many intra- and inter-specific encounters), and began experimental investigation of some reactions in the laboratory. He also made a special study of the fruits eaten by these species, the effects of different distributions of fruiting trees and fruiting times upon the movements of the rodents, and the possible "reciprocal" effects of the activities of the rodents on the distribution of the trees.

Eugene Morton, was primarily concerned with the environmental factors affecting the evolution of acoustic communication in birds. He recorded the calls of individual species characteristic of mature forest, dense "edge" and second-growth forest, grasslands, and the environs of rapid-flowing streams, analyzed the physical characteristics of these sounds, and then determined their function as signals. He also recorded ambient background sounds for use in signal-to-noise ratio calculations that will enable him to identify the frequencies most conveniently available for communication purposes. In his study of the general sound propagation characteristics of the four environments

cited above, he is using pure tones and random noise bands at ⅓-octave intervals up to 15 kc. to determine sound attenuation per unit distance from the sound source. This will be compared with attenuation of sound under "standard" conditions of air density, temperature, etc. (One rather surprising result has already emerged: certain ranges of frequencies have been found to attenuate less in nature than under ideal laboratory conditions, apparently due to environmental resonance.) During this last phase of the project, Morton will seek to determine the amplitude of natural sounds at their sources.

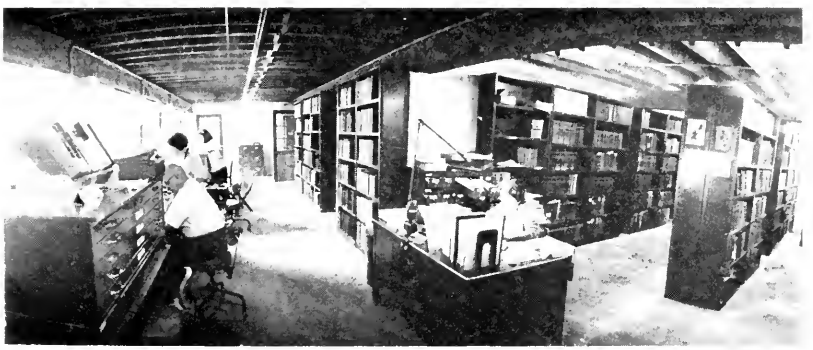
When the results of all this work are available, it should be possible to distinguish between many of the aspects of bird sounds which are purely or primarily adaptations to the "conducting" properties of the environment (devices to ensure that the signal reaches potential receivers) and those designed to produce correct responses by receivers (that encode all or most of the relevant information in the signal).

John Oppenheimer recently began a study of the white-faced monkey *Cebus capucinus* on Barro Colorado. Monkeys of the genus *Cebus* are particularly interesting because they are convergent toward the best known monkeys of the Old World (genus *Macaca*) in many aspects of behavior, structure, and ecology; they are highly gregarious; some of their social reactions appear to be unusually complex under the conditions of captivity (although not necessarily in the wild); and because they have been found to be remarkably "intelligent" in solving certain types of problems and in tool-using. Oppenheimer is paying special attention to such subjects as the structure of groups, intra- and inter-specific reactions, diet, and predator evasion tactics.

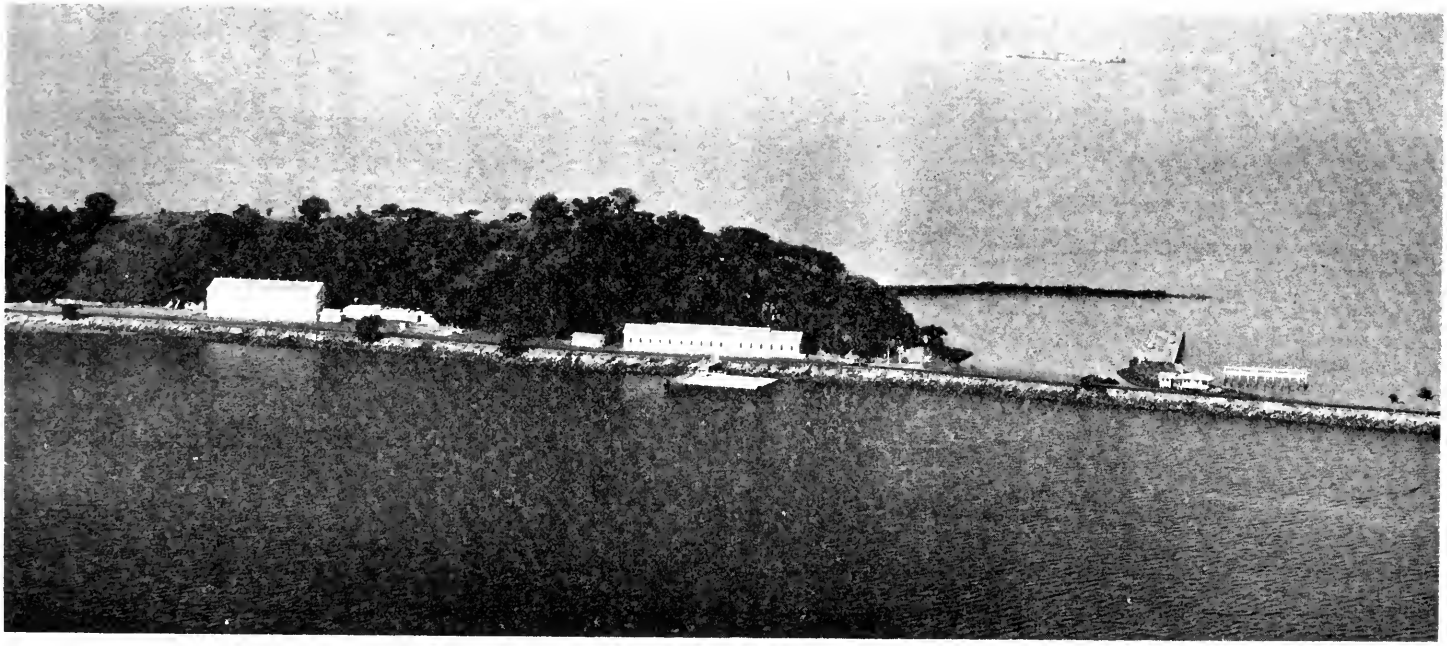
Begun late last year was a study by Martin G. Naumann of the bionomics of three closely related species of wasps of the genus *Protopolybia*. Although social wasps are a conspicuous and particularly impressive part of the fauna of the Neotropical region, relatively little is known about them. Many earlier observations of them were brief and casual, and our knowledge of their seasonal activities and nesting cycles is most incomplete.

Naumann seeks to measure seasonal fluctuations in nesting activity and population size, with special attention to the effects of brood production and caste composition upon the development of the social organization of nests. Initial surveys were made on Barro Colorado and neighboring areas of the mainland, and within one nest of *Protopolybia pumila* oviposition, larval development, and queen-worker interactions were studied by the use of transparent insertions in the nest covering.

The number of visiting scientists and students using facilities of the Smithsonian Tropical Research Institute increased last year to over 134.



Top: Laboratory-library building at Barro Colorado Island with main animal house, right, and animal cage, left. Center: A laboratory room. Below: Part of the library.



Pacific-side marine facilities on Naos Island. Long, white building in center is T–332; pump for salt-water system is on pier in front of it and entrance to bunker laboratory is partly visible to right.

Atlantic-side marine laboratory at Galeta Island, with laboratory buildings at end of road, center.

Top: Grassy habitat on western bank of Canal Zone near Pedro Miguel locks. Center: Second-growth forest near Gamboa. Below: Hillside NNE. of laboratory clearing. Flowering and fruiting times of all trees on this slope are being recorded.

Mention of a few of their projects illustrates the range of activities which the Institute has been able to facilitate, encourage, or support.

Theodore Bullock and Alan Grinnell, of the University of California at Los Angeles, during an entire summer on Barro Colorado, set up a temporary but rather sophisticated neurophysiological laboratory to study the peculiar electric signals emitted by knife-fishes of the family Gymnotidae, which live in rather murky habitats where visibility tends to be poor. The experiments indicate that at least some of the electric signals are used in social communication.

Eric Davidson of Rockefeller University collected anurans for use in his studies of gene activity in oögenesis. Examination of such species as *Bufo typhonius*, *Phyllomedusa calladryas*, *Engystomops pustulosus*, and *Leptodactylus pentadactylus*, found to provide particularly useful and convenient material, is yielding new information about relative rates of RNA synthesis in oöcyte nucleoli and lampbrush chromosomes, and has suggested new experiments on possible DNA synthesis in the nucleoli (which would be partial genomic replication, and a rather novel phenomenon).

T. C. Schneirla of the American Museum of Natural History and Ralph Buchsbaum of the University of Pittsburgh were involved in a dual field project. Schneirla continued his studies (begun in the 1930's) of army ants on Barro Colorado Island. With Buchsbaum and their associates, he also made a film for the educational division of the Encyclopaedia Britannica.

Other scientists also returned to continue or resume long-term investigations begun in earlier years. Charles F. Bennett, Jr., and E. O. Willis, of the American Museum of Natural History, may be cited as examples. Bennett collected various kinds of microclimatological data on Barro Colorado Island. This work is part of a major study of the evolution of neotropical forests (including the effects of different human societies upon both the forests and the animals inhabiting them) which is providing new information and insights for both biologists and workers in other disciplines. Willis continued his observations of forest birds, especially the species which follow army ants. The complex of relations among these species, between the birds and the ants, and between both birds and ants and other species more or less frequently associated with ant columns, provides unusually favorable opportunities for quantitative as well as qualitative analyses of ecology and behavior.

The broad subject which attracted the largest single group of visitors with similar interests was, not unexpectedly, species diversity. Among the scientists concentrating on this problem were Robert H. MacArthur of Princeton, Peter Klopfer of Duke, Martin Cody of the University of

Pennsylvania, and Joseph Connell of the University of California at Berkeley. MacArthur and Cody censused bird populations in a variety of habitats in order to test the predictive validity of hypotheses derived from earlier studies in the middle latitudes. Klopfer studied several aspects of bird behavior in the hope of detecting widespread, general differences between tropical and temperate species which might help to explain variations in diversity. Connell studied diversity among forest trees and the invertebrates of the coral reef near the Galeta Island marine laboratory.

A comprehensive over-all plan for the future research activities of the Tropical Research Institute, now being discussed with scientists both inside and outside the Smithsonian, envisages a gradual expansion of research, largely along lines already established, but with some changes of emphasis. The problem of the relationship between species diversity and evolutionary success is to be attacked by means of a relatively large number of coordinated research projects. Special efforts to encourage investigations of groups of organisms previously ignored will result next year in studies of land crabs and cephalopods. And the program of collecting basic information on the physical environment is to be expanded by monitoring a greater variety of parameters.

Staff Publications

Publications by the Smithsonian Tropical Research Institute staff are only a small part of the literature based wholly or partly upon the results of research at the Institute facilities. *Smithsonian Information Leaflet* 281 (rev. August 1965), "Bibliography of Papers pertaining to the Natural History of Barro Colorado Island, Canal Zone," lists most of the earlier publications based on such work, and a bibliography of the more recent work is in preparation. Both are available on request.

MOYNIHAN, M. Display patterns of tropical American "nine-primaried" songbirds. IV. The yellow-rumped tanager. Smithsonian Misc. Coll., vol. 149, no. 5, 34 pp., 1966.

RUBINOFF, I. Mixing oceans and species. Natural History vol. 74, pp. 69–72, 1965.

———. *Gymnothorax galetae*, a new moray eel from the Atlantic coast of Panama. Breviora no. 242, pp. 1–4, 1966.

———. Distributional and ecological relationships of Panamanian shore fishes. Yearbook Amer. Phil. Soc. (1965), pp. 346–349, 1966.

——— and MEAD, G. W. *Avocettinops yanoi*, a new nemichthid eel from the southern Indian Ocean. Breviora, no. 243, pp. 1-7. 1966.

SMITH, N. G. Adaptations to cliff-nesting in some arctic gulls. Ibis, vol. 108, pp. 68–83, 1966.

———. Evolution of some arctic gulls (*Larus*): an experimental study of isolating mechanisms. Amer. Ornith. Union, Monogr. Ser. no. 4, pp. 1–99, 1966.

Staff Changes

Dr. Ira Rubinoff joined the Tropical Research Institute staff in July 1965. He is continuing his long-term research on Panamanian inshore marine fishes (see below), and has taken charge of the marine laboratories.

A number of scientists interested in various aspects of the tropics have been made honorary research associates of the Tropical Research Institute, with the expectation that they will act as a panel to provide expert advice and assistance in developing new research projects and programs. The group includes Professor Ernst Mayr, Director of the Museum of Comparative Zoology, Harvard University; Dr. Martin Young, Director of the Gorgas Memorial Laboratory; Dr. Robert H. MacArthur, of the Department of Biology, Princeton University; Dr. Giles W. Mead, Curator of Fishes, Museum of Comparative Zoology, Harvard University; Dr. Charles F. Bennett, Jr. of the Department of Geography, University of California at Los Angeles; Dr. W. John Smith of the Department of Biology, University of Pennsylvania; and Mr. C. C. Soper, former Director of the Eastman Kodak Tropical Laboratory. It is planned to enlarge this group to include distinguished Latin American scientists.

Education and Training

The cooperative fellowship program established by the Smithsonian Tropical Research Institute and the Scientific and Educational Division of the Organization of American States became operational last year. The first Fellows appointed were Mr. Maximo Galvez of Peru and Mr. Estanislau da Silveira of Brazil. Stationed on Barro Colorado Island, they are learning modern techniques, of field biology under the guidance of the resident members of the Institute staff.

Arrangements were made with the Organization for Tropical Studies* to provide working space, some services, and other forms of assistance

*A consortium of the University of Costa Rica and the following North American Universities: California, Florida, Georgia, Harvard, Indiana, Kansas, Louisiana State, Miami, Michigan, Southern California, Texas A & M, and Washington.

(including some teaching) for an introductory course in tropical biology. Increasingly close cooperation with the University of Panama is being planned. Dr. Rubinoff has been appointed consultant in marine biology in the University of Panama - cooperative Central American training program.

The senior members of the Institute's scientific staff are assisting, and to some extent directing the work of, the graduate student interns. They also provide occasional, informal guidance to visiting students from other institutions.

Conservation

Effort to prevent poaching and disturbance of the forest on Barro Colorado Island should be further helped next year when the staff of wardens will be augmented.

The few species of animals which disappeared from Barro Colorado before it was set aside as a reserve are being re-introduced whenever possible. A program for the protection of the coral reef and other marine organisms near Galeta Island has been instituted with the cooperation of the U.S. Navy.

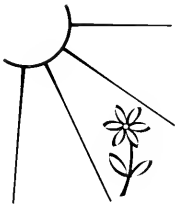
Members of the bureau staff also are providing advice and technical assistance, when requested, to Latin American governments and public authorities developing plans for biological reserves and national parks.

Acknowledgments

The Smithsonian Tropical Research Institute can operate only with the excellent cooperation of the Canal Zone Government and the Panama Canal Company, the U.S. Army and Navy, and the government authorities of the Republic of Panama. Thanks are due especially to Executive Secretary of the Canal Zone Paul M. Runnestrand and his staff; the customs and immigration officials of the Canal Zone; the dredging division and police division of the Panama Canal Company; Major General James D. Alger, Commander, U.S. Army Forces Southern Command; the late Rear Admiral Louis A. Bryan, Commander, U.S. Naval Forces Southern Command; Lt. Col. William Barron, Assistant Chief of Staff, G–4; Lt. Commander K. L. Robinson, Commanding Officer Naval Security Group; Mr. Thomas P. McGann, supervisor engineering technician, Navy Public Works Department; Mr. Martin J. Hayes, Army Assistant Post Engineer; the U.S. Army Maintenance Division; and the Eastman Kodak Company.

Radiation Biology Laboratory

W. H. KLEIN, *Director*



ALL BIOLOGICAL SYSTEMS, from the unicellular through the spectrum of multicellular organisms to entire ecosystems, or for that matter the biosphere itself, can be thought of as open-ended thermodynamic systems through which energy flows. The primary source of all energy for these diverse biological systems is, of course, solar radiation.

During the past year the Radiation Biology Laboratory has continued to direct its research efforts toward understanding the mechanisms by which radiant energy is absorbed, converted to potential chemical energy, and then utilized by cells for growth and differentiation. Within this general framework the current research of the laboratory is in four general areas:

1. Regulatory biology—physiology of photomorphogenic responses,
2. Regulatory biology—biochemical mechanisms,
3. Measurement of solar radiation, and
4. Carbon dating—measurements and research techniques.

Physiology of Photomorphogenic Responses

In the general area of photomorphogenesis, chloroplast differentiation is being studied with particular reference to protein synthesis. Chloroplasts of etiolated leaves increase in protein content when the leaves are placed in the light. There is good reason to believe that this in-

230-457—66——15

crease in chloroplast protein is catalyzed by the chloroplast itself. A routine preparative procedure for chloroplasts has been developed for isolating bean-leaf plastids which are undergoing light-dependent development and thus are carrying out synthesis of protein. The plastid-containing homogenate is essentially cell-free and incorporates radioactive amino acids into cold trichloroacetic acid-insoluble material. This incorporation, which may partly represent incorporation into protein, undoubtedly is partially due to formation of amino-acyl RNA. However, the 1000 x g pellet fraction accounts for only a lesser part of the incorporating activity of the homogenate fractions, although it has the highest specific activity. The incorporation by this fraction is highly dependent on the presence of an ATP generating system.

Radioactive amino acid (leucine) is incorporated into the 1000 x g pellet fraction even when TCA-precipitable material is extracted with hot TCA. Some of the radioactivity precipitated by cold TCA is removed by this treatment, indicating formation of both protein and amino-acyl RNA. The incorporation of radioactivity into precipitates extracted with hot TCA usually stops after 30 to 60 minutes. Incorporation is not carried out in heated chloroplasts. Rates of 5 to 50 $m\mu$ mole leucine/mg protein/hour have been obtained, calculated from the specific activity of the leucine supplied.

The 1000 x g fraction contains numerous chloroplasts. In addition, starch grains and particles about 1 μ in length, the latter probably mitochondria, are also present, both being more numerous than chloroplasts. Wall fragments and whole cells are present as minor contaminants; nuclei have not been seen.

Bacteria account for only a small portion of the observed incorporation activity. Experiments with Triton x 100 indicate that most of the activity is in the supernatant after centrifugation at 6000 x g. If the label had been incorporated into bacterial protein, it would have been recovered in the pellet.

Similarly, in experiments in which the reaction mixture is centrifuged in a density gradient, little incorporated activity is found in the region where nuclei would be expected. Ribosomes are probably not responsible for the observed incorporation, since the specific activity of the chloroplast-containing fraction with regard to incorporating activity is higher than that of the ribosome fraction, and incorporation by the chloroplast-containing fraction is insensitive to RNAase. The distribution of incorporated radioactivity follows the distribution of chlorophyll. Further, when chloroplasts are fixed after incorporation and are autoradiographed, the chloroplasts produce a higher grain count than chloroplasts fixed before incorporation. Thus, the preliminary

conclusion is reached that the incorporation into protein of radioactive leucine by the chloroplast-containing fraction is associated with the chloroplasts. The extent of chloroplast involvement in the incorporation of amino acid is being determined.

Biochemical Mechanisms

Work has continued on the detection of early biochemical changes that may be correlated with photomorphogenic stimulation. One of the observations made during the survey of tracer distribution in various metabolite fractions obtained from light-treated corn-leaf tissue, was an indication of a light-stimulated utilization of phosphate. Experiments were performed in which corn leaf sections were first irradiated, then immediately transferred to a solution of glucose and phosphate (P^{32}) substrate, and the specific activity of organic phosphates in extracts were determined at various times. A consistently higher specific activity was found at all points on the time course in light-treated samples. However, technical difficulties have prevented a conclusive demonstration of an early phytochrome-associated increase in phosphate turnover rates. Experiments are continuing to elucidate the nature of this response.

Phytochrome, a protein common to many plants, is known to be the pigment involved in photomorphogenesis. Although phytochrome has been partially purified from *Avena* by other laboratories, it was not completely purified from any source, and consequently, very little was known about the physical and chemical characteristics of the molecule. A successful method for the isolation of pure phytochrome has been developed in our laboratory and, in collaboration with Edward Steers, Jr., and J. R. Suriano of the National Institutes of Health, data have been obtained on pure phytochrome.

The pigment is extracted from 4-day-old, etiolated annual rye shoots, and purified 200-fold by ammonium sulfate fractionation and chromatography on calcium phosphate and DEAE-cellulose. The final product sedimented in a Spinco Model E ultracentrifuge as a single boundary with an $S^{\circ}_{20,w}$ of approximately 9.5. Treatment with sodium dodecylsulfate resulted in the formation of monomers with a tentative S value of 1.8 and a molecular weight of approximately 36,000. No free sulfhydryl or disulfide groups were found by amino-acid analyses, indicating that the monomers comprising the native aggregate are held together through noncovalent bonds. There are about 100 trypsin-sensitive bonds (lysine+arginine) per 100,000 molecular weight units, or about 36 per subunit. Phytochrome also has

an excess of dicarboxylic amino acids over basic amino acids. It is not known how many of these carboxyl groups are amidated, but it is likely that phytochrome has a net negative charge at pH 7.

Phytochrome is completely excluded by Sephadex G–100 (exclusion limit: 100,000) and it is not excluded by G–200 (exclusion limit: 200,000). Sephadex G–150 almost completely excludes phytochrome. This would indicate that phytochrome has a molecular weight near 150,000 if it does not interact with the dextran and if it is a perfect hydrodynamic sphere.

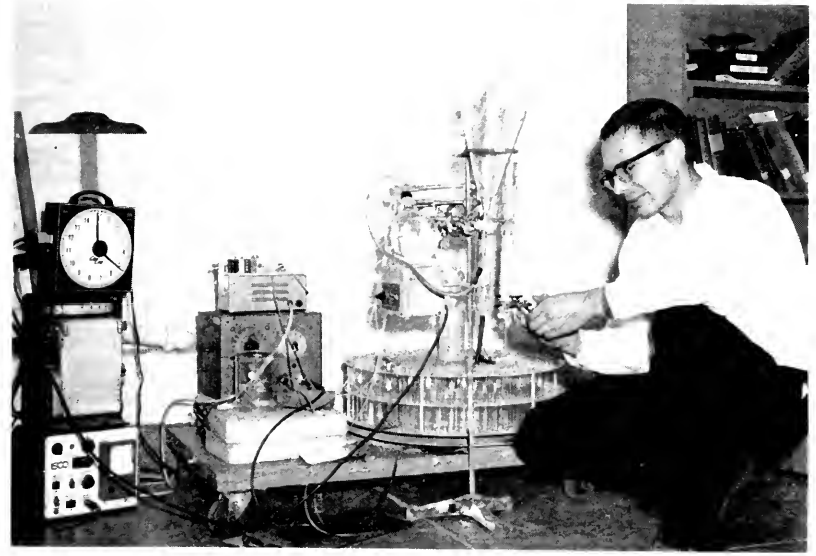
The purified phytochrome, after saturation irradiation at 730 mμ, had an $E^{1\%}_{1cm}$ of 6.9 at 277 mμ, 0.87 at 376 mμ, and 2.2 at 662 mμ. This form, excited at 290 mμ, fluoresced at 340 mμ and at 672 mμ. Excitation at 370 mμ produced fluorescence at 672 mμ. After saturation irradiation at 660 mμ, phytochrome had an $E^{1\%}_{1cm}$ of 6.9 at 277 mμ, 0.72 at 386 mμ, and 1.15 at 730 mμ.

A study of growth and phototropism of moss protonema has been initiated in our laboratory. The interest in a protonemal system lies in the fact that the stimulus and response take place in a single uninucleate cell. Potentially, it may be a simpler system than the multicellular or coenocytic cells commonly used in studying photogrowth responses.

Preliminary experiments have been initiated to determine action spectra for photogrowth and phototropism. Protonemata of the clone of *Physcomitrium pyriforme* do not grow in darkness when supplied adequate carbohydrate substrates. All visually detectable growth ceases within a few minutes after removal from the light and resumes within a few minutes after reexposure. Growth of the protonema is apical, and switching from diffuse equilateral to unilateral light resulted in a sharp elbow-like bend as the filament continued its growth toward the light source. This behavior implies that phototropism of the protonema involves a shifting of the whole apical growing zone to a new lateral region rather than causing a differential growth between the two sides, as is commonly observed in fungi.

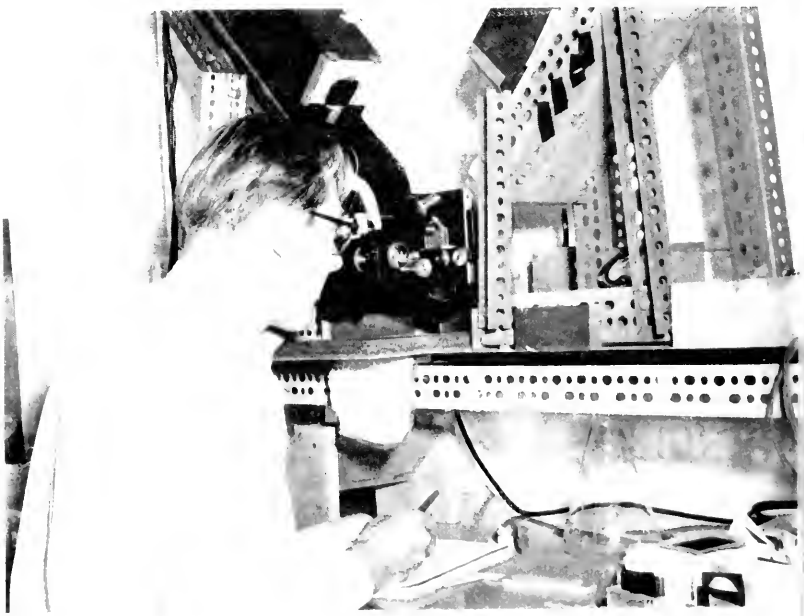
Both growth and tropism in this moss are supported by red light in a broad spectral region from 610 to 730 mμ. Detailed action spectra for both responses are being determined. *Physcomitrium* differs in its phototropic response in that there appears to be little or no activity in the blue region of the spectrum. The action spectra for growth and tropism are similar.

Spectrophotometric measurements of the light-sensitive sporangiophores of *Phycomyces* have continued and the absorption maxima for light and dark adapted sporangiophores have been found to be surprisingly constant (near 0.14 O.D. at 475 mμ) during and following



Radiation Biology Laboratory: David L. Correll collecting fractions of nucleic acids from marine viruses. Below: Franco Parenti, Visiting Research Associate from the University of Milan, performing a spectrophotometric analysis of protein from bean (*Phaseolus vulgaris*) chloroplasts by the Folin-Ciocalteau method.

Radiation Biology Laboratory: Austin Long with electronic counter, carbon-dating laboratory. Below: Bernard J. Nebel determining orientation of growth of *Physcomitrium* sp. as influenced by exposure to two unilateral light sources.



various light stimuli. To date, no absorption shifts (± 0.001 O.D.) following saturating pulse or step-up light stimuli have been observed, even though these same stimuli produced well-defined growth responses in the sporangiophores being measured.

The temperature characteristics for the phototropic response to continuous unilateral stimuli and growth responses to pulse stimuli have been determined. The temperature optimum for both responses occurs at 20 ± 1°C while the maximum growth rate occurs between 15 and 20°C. Well-defined growth responses occur over the temperature range of 5° to 25°C with no marked temperature dependence. However, the responses as well as growth disappear rapidly at temperatures of 30°C or higher.

Ribonucleic acids isolated from a variety of organisms have been shown to contain 2′-0-methylribonucleotides. The functional role of such 0-methyl derivatives is not known. An attempt has been made to study the biosynthesis of the 2′-0-methyl group of the RNA contained in a ribonucleoprotein particle produced by *Saprospira grandis*. This organism is a saprophytic marine flexi-bacterium which produces large amounts of a rod-shaped, virus-like particle currently called the rhapidosome. The RNA of rhapidosomes is at least 85% 2′-0-methylated. This fact, coupled with the large amount of rhapidosomes produced and their ease of isolation, makes it an ideal system for the study of 2′-0-methyl-RNA.

Utilizing radioactive substrate precursors, which the saprophyte *Saprospira* would be expected to incorporate, cells grown on ^{14}C-methyl-methionine for many generations released rhapidosome particles which were highly radioactive. However, the radioactivity was almost entirely in the protein portion. Similarly, using ^{14}C-methyl-betaine and ^{14}C-methyl-choline, no incorporation into 2′-0-methyl group was found.

In vivo incorporation of $^{14}CO_2$, ^{14}C-Formate and ^{14}C-formaldehyde was tested. These compounds are potential precursors of one carbon-N^5-derivatives of tetrahydrofolic acid at various oxidation states. No incorporation into the 2′-0-methyl group was found with formate or formaldehyde, but tentative evidence of CO_2 incorporation was found. Thus, it is indicated that CO_2 can penetrate the cell and is utilized, perhaps via formate or formaldehyde which are normally excluded by the host cell, in the synthesis of rhapidosome RNA.

Solar Radiation

Measurements of total sun and sky radiation have continued, using an automatic system sampling once every three minutes for 100 mμ

band widths from 0.29 to 2.5 μ. Values of each spectral band have been obtained, accurate to $\pm 5\%$. However, it has been consistently observed that the calibration factors for the present Hoover detectors deviate markedly for early morning and late afternoon readings. A comparison Eppley radiometer was installed this year and comparison runs were made at all times of day and under variable sky cover conditions. Reduction of these data indicates that an independent electrical check system must be installed in each of the detectors. Therefore, pyranometers which can be directly calibrated against an electrical signal are being installed for each band-pass filter system. It is anticipated that the accuracy of the measuring systems can be increased to $\pm 1\%$ by this modification.

Normal incidence readings for clear-sky days were reduced to the top of the atmosphere and a calculation of the solar constant made. Within the band pass of the quartz hemisphere the number of langley/min was found to be 2.03 ± 0.02. If the radius vector correction (a normalized value for the distance from the sun to the earth) was applied, the value becomes 2.07 ± 0.02.

On a daily total energy basis, the present automatic data reduction system indicates that the red/far-red ratio remains fairly constant, even with extremely hazy sky conditions.

Carbon Dating

The carbon-dating section of the laboratory has designed and placed in service a new ^{14}C detector which will double the analytical processing capability of the laboratory. Also under construction is a new methane preparation system that will operate at higher pressures and allow faster and more efficient preparation of methane required for counting purposes. During the past year more than 80 samples were dated.

Field studies carried on in Arizona, including investigations of the Willcox playa in southeastern Arizona, show ancient Lake Cochise to have had a much greater extent than previously recognized. The carbon-dating section also participated in a tree-ring project with the University of Arizona. Analyses of bristlecone pine specimens have been made and the dendrochronology has been extended to earlier than 4300 B.C.

During the past year extensive renovations of the Radiation Biology Laboratory facilities were made. Several new laboratory areas were added, including new dark-room facilities, cold room, chemical laboratories, and staff offices. The main laboratory offices were consolidated near the center of the lab, the older sections were repainted,

and electrical services were modernized. The shops were moved to larger, modernized rooms. At the same time new lighting systems for precision control and higher intensity capacity were installed in two of the greenhouse environmental-control rooms. With these new systems it is anticipated that it will be possible to vary the light intensity continuously in a fashion analogous to natural daylight fluctuations, while maintaining the spectral quality of the radiation at any predetermined value. It is expected that these control-room facilities will be in operation by the middle of next year.

Staff Publications

CORRELL, DAVID L. Ribonucleic acid-polyphosphate from algae. III. Hydrolysis Studies. Plant and Cell Physiol., vol. 6, pp. 661–669, 1965.

———. Pelagic phosphorus metabolism in Antarctic waters. Limnol. Oceanog., vol. 10, pp. 364–370, 1965.

———. Imidonitrogen in *Chlorella* "polyphosphate." Science, vol. 151, pp. 819–821, 1966.

DAMON, PAUL E.; LONG; AUSTIN; and GREY, DONALD C. Fluctuation of atmospheric C^{14} during the last six millennia. Journ. Geophys. Res., vol. 71, pp. 1055–1063, 1966.

LONG, AUSTIN. Smithsonian Institution radiocarbon measurements II. Radiocarbon, vol. 7, pp. 245–256, 1965.

——— and MIELKE, JAMES E. Smithsonian Institution radiocarbon measurements III. Radiocarbon, vol. 8, pp. 413–422, 1966.

———. Techniques of methane production for radiocarbon dating. *In* Proceedings of the Sixth International Radiocarbon and Tritium Dating Conference, pp. 666–777, 1966.

MITRAKOS, KONSTANTINOS; KLEIN, W. H., and PRICE L. Soluble sugar changes in etiolated corn leaf tissue as influenced by red-light treatment. Planta, vol. 66, pp. 207–215, 1965.

PRICE, LEONARD; MITRAKOS, K.; and KLEIN, W. H. Some kinetical aspects of light-induced carbohydrate utilization in etiolated leaf tissue. Physiol. Plant., vol. 18, pp. 540–549, 1965.

SHROPSHIRE, W., JR., and GETTENS, REBECCA H. Light-induced concentration changes of adenosine-triphosphate in Phycomyces sporangiophores. Plant Physiol., vol. 41, pp. 203–207, 1966.

Other Activities

In August, at the American Institute of Biological Sciences meetings, plant physiologist A. M. Steiner presented a paper, "The Influence of

Red Light on the Distribution of C–14 in Etiolated Corn Leaf Sections." Biochemist M. M. Margulies, at the symposium on "Croissance et Viellissement des Chloroplasts" in Gorsem, St. Trond, Belgium, presented a communication, "Effects of Chloramphenicol on Light-dependent Formation of Structure and Proteins of Chloroplasts of *Phaseolus vulgaris*." Assistant Director W. Shropshire in October presented a lecture on "Sensory Systems of Phycomyces" to the Biological Division of Purdue University, and in December gave two lectures and laboratory demonstrations on "Biophysical Methods Applicable to Stimulus-Response Systems" at the University of Maryland.

In the proceedings of the annual meetings of the Federation of American Society for Experimental Biology (25:3086, 1966) was published an abstract: "Phytochrome: Isolation and Partial Characterization," by David L. Correll, Edward Steers, Jr., J. L. Edwards, J. R. Suriano, and W. Shropshire, Jr.

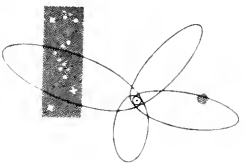
In May 1966 biochemists F. Parenti and M. M. Margulies presented a paper, "Amino Acid Incorporation by a Chloroplast Containing Fraction from Developing Bean Leaves," to the Washington Section of the American Society of Plant Physiologists at Goucher College, Maryland.

Staff Changes

Scientists who joined the staff during the year are cytogeneticist Te-Hsiu Ma and plant biochemist Robert L. Weintraub. Biochemist Francesco Parenti, visiting from the University of Milano, Italy, joined the laboratory in October 1965 to work on protein synthesis in chloroplasts. A. M. Steiner returned to the Botanical Institute, University of Freiburg, Germany, in November; Konstantinos Mitrakos returned to Greece as Director of the Botanical Institute of the University of Athens in January 1966; and cytogeneticist Robert W. Rogers resigned in May 1966.

Smithsonian Astrophysical Observatory

FRED L. WHIPPLE, *Director*



FOR THE ASTROPHYSICAL OBSERVATORY, 1966 was an anniversary year. Participating in the Bicentennial of James Smithson's birth, the Observatory was represented by the Director, who was one of the invited lecturers. His paper, "Knowledge and Understanding of the Physical Universe as Determinants of Man's Progress," discussed the philosophical and sociological factors in science today, presenting evidence to support Smithson's thesis "it is in his knowledge that man has found his greatness and his happiness." The Observatory also commemorated anniversaries—its own 75th and its 10th in Cambridge—by holding two international symposiums, the Symposium on Meteor Orbits and Dust,*[1] and the Aeronomy Symposium on Upper Atmosphere Density and Composition (under the auspices of the International Association of Geomagnetism and Aeronomy).[2]

A milestone was passed by the Observatory with the announcement of the Smithsonian Standard Earth.[3] This accurate measure of the earth's size and gravitation is the first to incorporate transoceanic distances determined with precision on the order of 10 meters.

A major contribution in the field of positional astronomy is the *Smithsonian Astrophysical Observatory Star Catalog*.[3] Compiled and updated from the best available sources, the data contained in the *Catalog* give positions and motions for a quarter million stars. The 2600 pages of data were composed in 1½ seconds each by computer, thereby avoiding errors and the monstrous task of hand typesetting and proofreading.

*Unless otherwise noted, research is supported from Federal funds appropriated to the Smithsonian Institution. The Observatory, by paying scientists' salaries, shares in the support of all research. Support from outside sources is detailed in notes 1–35 on page 212.

Meteors and Comets

Astronomically, it was the year of the Great Comet, Ikeya-Seki. A spectacular early morning object, the comet rivaled Halley's and was the fourth longest comet ever recorded. Discovered on September 18, 1965, by two Japanese observers, K. Ikeya and T. Seki, the new object, of 8th magnitude, was moving slowly through the constellation Hydra.

Its discovery was immediately confirmed on Baker-Nunn photographs made by the Smithsonian network of Astrophysical Observing Stations, and announced to the world by the Central Bureau for Astronomical Telegrams at SAO.[4] A preliminary orbit computed from a series of early observations enabled the Director to identify the new comet as a member of the "sun-grazing" family that has been producing spectacular comets from time to time since the 17th century. Owen J. Gingerich, director of the Central Bureau, and Brian G. Marsden quickly adapted an existing program to compute orbits and ephemerides.

With daily predictions computed in Cambridge, the Baker-Nunn cameras continued to photograph the comet as it came closer to the sun. Brightening steadily, it was visible to the unaided eye during the afternoon of October 20 and again the following day. About a week later, the comet had developed a tail some 30° long and was a brilliant sight in the morning sky.

Soon after it passed the sun, Comet Ikeya-Seki was observed to have broken into several pieces. Shortly before, the Director and Robert P. Stefanik had published a new concept of the icy-conglomerate comet nucleus to explain this splitting of some comets near perihelion. They suggested that early, short-lived radioactivity within such comets causes the most volatile materials, such as methane, to move from the central area to an outer shell, where they refreeze. This would make new comets rather brittle shells, subject to heat shock and possible breakage when they first enter the inner parts of the solar system and are heated by solar radiation.

By the end of January, when Comet Ikeya-Seki had grown too faint to photograph, the Observatory had secured 998 observations. They are now being reduced and analyzed. Richard B. Southworth is measuring photographs of Comet Ikeya-Seki and others in two spectral regions.[3, 5]

Observations of Ikeya-Seki were part of a broader program of participation in the International Year of the Quiet Sun. For that program, the Observatory is conducting a study of comet brightnesses in search of information on the relation between solar radiation and cometary phenomena. Although direct correlations of cometary

brightnesses with solar activity are not generally established, the Director and Diarmaid H. Douglas-Hamilton have found that observed appearances of the nucleus or tail of Comet Encke correlate positively with the level of solar activity. This suggests a triggering effect. They have also been investigating the slow decay of periodic comet brightnesses, particularly that of Comet Encke over the last 180 years. This comet appears to be dying slowly and may conceivably disappear by the end of the century.

The Director assisted in the organization and was chairman of the Symposium on Nature and Origin of Comets held in Liège, Belgium, in July.

At the Symposium on Meteor Orbits and Dust,[1] the meteorite content of the space surrounding the earth was discussed in detail. The conference was sponsored jointly by SAO and NASA; Gerald S. Hawkins served as chairman. The Observatory presented findings from its meteor research program.[6] Based on both radar and optical observations, the program is coordinated by Hawkins, with Southworth and Richard E. McCrosky as chief investigators. With I. I. Shapiro of Massachusetts Institute of Technology, Giuseppe Colombo and Don A. Lautman presented a study of the forces affecting the motion of small dust particles in interplanetary space. They analyzed factors that might concentrate dust around the earth, such as gravitational focusing, ejection of dust from the moon by meteor impact, and capture of dust particles in the earth's gravitational field. They found no mechanism that should produce a large concentration of dust near the earth.

The Meteor Radar at Havana, Illinois, was completely refurbished during the year.[7] A new, phase-coherent, 8-station radar network has been assembled. More than 200 hours of observations have been made with the new system, and some of the data have already been reduced.[8] Franco F. Verniani completed a theoretical study of the feasibility of measuring atmospheric density and temperature at heights between 80 and 100 km through the amplitude decay of radar echoes from meteors. Mario D. Grossi, who was responsible for the coherent system, is using it for measuring winds continuously in the upper atmosphere between 80- and 100-km altitude.[9]

At Wallops Island, two artificial meteors carried aloft by rockets were fired into the atmosphere and, for the first time, one was successfully observed by both optical and radar systems. Data from this test are being analyzed by McCrosky and Southworth.

Under the supervision of McCrosky, the Prairie Network has continued to operate with increased efficiency during the past year.[10] Over 300 meteors were photographed simultaneously by two or more of the

16 camera stations, a requisite for the determination of the atmospheric trajectory and mass of a meteoroid. Approximately a third of the meteors were of sufficient duration to allow computation of an accurate heliocentric orbit for the body.

Meteoroids are known to originate from both comets and asteroids. A primary purpose of the Network is the observation of extremely bright objects that were thought to originate primarily from the asteroidal source. These meteoroids, consisting of material of relatively well-known composition and structure, could supply the needed calibration to improve our understanding of the corresponding characteristics of the cometary matter entering the atmosphere as meteors.

Orbital information obtained from Prairie Network meteors suggests that perhaps a quarter of the brightest objects are of asteroidal origin. However, analysis of the trajectory of these bodies suggests with equal force that their structure, in many cases, is remarkably like that of the fragile, low-density material generally associated with cometary objects. The solution of this apparent dilemma is an immediate goal of the project.

Meteorites and Cosmic Dust

The physical, chemical, and mineralogical characteristics of meteorites are under intensive investigation at the Observatory. Being of extraterrestrial origin, meteorites yield valuable data on historical conditions and processes elsewhere in the solar system.

Introducing a new idea to this field, the Director suggested that chondrules, the tiny, sometimes glassy spheroids in stony meteorites, may have been created by lightning in the primitive solar nebula either before or as the asteroidal bodies that produce meteorites were formed. To test this suggestion Winfield W. Salisbury is assembling a laboratory system for approximating primordial conditions of pressure, temperature, and electrical discharge in small quantities of meteoritic dust.[11] John A. Wood is collaborating in manufacturing artificial "primitive" dust. In regions where dust-particle density is sufficient to produce frequent collisions, enough electrostatic charge separation may take place to produce a nearly continuous lightning discharge. (This effect is observed in terrestrial dust storms and volcanic dust clouds.) These discharges may agglomerate dust particles into particles of meteoric size, and account for the temperature and flocculation necessary to produce the chondrules observed.

In collaboration with Edward L. Fireman, the Director continued research on the problem of immediate supply and destruction factors for meteorites. It appears that some are chipped off the Apollo-type asteroids whose orbits cross that of the earth, and that their etching

rates are appreciable; both effects are caused by collisions with interplanetary materials. The Apollo asteroids are constantly being eliminated by gravitational and collisional interaction with the earth, and are probably supplied from Mars-crossing orbits, as Öpik suggested.

In an attempt to determine relative erosion rates of different meteorite types, Matthias F. Comerford exposed a number of terrestrial and meteorite specimens to a simulated space environment in the shock tube at NASA's Lewis Research Center. Results show that dense, brittle materials suffer a linear weight loss of about 1 mg per joule of impact energy, while the losses of tougher, metallic materials are barely measurable. The greater weight loss suffered by brittle materials was predicted, but the difference in rate may be more than expected.

Absence of some constituents such as aluminum-26 from the particles recovered from the Greenland icecap led Fireman, Robert H. McCorkell,[12] and James C. DeFelice to suspect that some of the original meteoritic material trapped in glacial ice might go into solution when the ice is melted to collect the residual dust. To recover this dissolved material, Fireman and McCorkell have been using an ion-exchange column; other material in colloidal suspension was recovered by natural sponges coated with iron hydroxide. In all, some million gallons of water were pumped through the system.

Fireman and James C. D'Amico continued to measure isotope ratios in various meteorites, dust, and sea sediments. From such ratios in the 70-ton Hoba West meteorite, McCorkell has established that the meteorite fell between 80,000 and 200,000 years ago.

In a search for specific differences between spherules of terrestrial origin and cosmic particles, Frances W. Wright and Fred A. Franklin are determining densities of individual spherules of possible extraterrestrial origin, using samples between 8 and 50 microns in radius. They have also measured densities of individual volcanic spherules and test samples of known composition. The results indicate that samples collected in Greenland and at the South Pole have densities at least 25% greater than those of similar specimens of volcanic origin.

Frances W. Wright and Paul W. Hodge continued chemical analyses, with the electron-probe microanalyzer, of microscopic spherules of possible extraterrestrial origin. As a check on these studies, they analyzed 12 spherules from recent volcanic eruptions. They also studied abundance anomalies of artificial meteoritic spherules produced by melting both iron and stony-iron meteorites. The iron/nickel ratio is highly variable for iron meteorite particles, and spherules from stony-iron meteorites vary greatly in composition.

David Tilles calculated the expected abundance of solar-flare rare-gas ions implanted in fine-grained dust in space. He found that the

calculated argon abundance agrees, within an order of magnitude, with the minimum amounts of excess argon-36 and argon-38 released at high temperatures from fine-grained concentrates from the Pacific Ocean and Greenland. Presumably, these ocean sediments are rich in extraterrestrial dust. He also investigated the planetary atmospheric source mechanism of solar-wind embedment in cometary interplanetary dust.

Ursula B. Marvin is studying spherules of probable cosmic origin that are found in beach sands. These are black magnetic spherules of the type found in polar ice, Pacific clays, and other environments relatively free of industrial contamination. The spherules consist of magnetite, wüstite, and hematite, and range in size from 40 to 600 microns. Mrs. Marvin is mapping the distribution of these spherules in both Pleistocene and Recent beaches.

By studying the distribution of nickel in the metal alloys taenite and kamacite found in meteorites, Wood has been able to determine the rate at which the bodies initially cooled. He has applied this technique to 10 octahedrites (iron meteorites) and a similar number of chondrites (stony meteorites). Most of these meteorites cooled from 600°C to 400°C at rates ranging from 1°C to 10°C per million years. Such slow cooling through this range indicates that they were buried under layers of insulating rocky material, tens of kilometers thick, inside their parent planets.

With the Air Force Cambridge Research Laboratories, Comerford is investigating the effects of high pressure on the annealing rates of metallic meteorites. Many of the microstructural changes observed in metallic systems do not necessarily involve changes in chemical composition; some involve only changes in lattice defects.

In her study of the diamonds of the Canyon Diablo meteorite, with Clifford Frondel of Harvard University, Mrs. Marvin observed two types of diamond.[13] One, occurring in irregular masses of black fine-grain diamond, has been interpreted as metastable products of impact shock. The other type possesses the outward form of isometric single crystals, but the internal structure of polycrystalline aggregates. X-ray patterns of these diamonds display a pairing or tripling of the strongest reflections, an effect suggestive of radiation damage. This type may prove critical in the controversy over the origin of meteoritic diamonds.

Planetary Studies

Culminating 10 years of active research, the Observatory presented the Smithsonian Standard Earth [3] at the COSPAR Space Science

Symposium in Vienna, Austria, in May 1966. The delegation of SAO scientists was headed by the Director.

The refined station coordinates were obtained by a combination of dynamical and geometrical methods.[14] Based on original work by the late Imre Izsak, the dynamical method has been extensively reworked and improved by Edward M. Gaposchkin. George Veis is chiefly responsible for the geometrical method. The complex combination of the two was performed in large part by Walter J. Köhnlein.

For the 12 stations in the SAO network, the agreement between the two independent methods supports the conclusion that the station coordinates are indeed accurate to some 15 meters. Values for all the tesseral harmonic coefficients with indexes through 8, have also been obtained. Coefficients for still higher terms have been determined for those that have an effect of more than 5 meters on the orbit of any of the 13 satellites used. The Standard Earth also incorporates coefficients for the zonal harmonics derived by Yoshihide Kozai and reported in *Smithsonian Year 1965.* Charles A. Lundquist was responsible for the coordination and comparison of the calculations leading to the Standard Earth.

Until now, the determination of the earth's gravitational field has had insufficient resolution to be tested significantly against surface gravity observations. However, William E. Strange has shown that the resolution is now fine enough that reasonable correlations are beginning to emerge.[15]

Chi-Yuen Wang has been concerned with interpretation of geopotential data derived from satellite observations in terms of the interior structure of the earth.[3] The interpretation involves correlations with other geophysical data such as velocity of seismological waves. Consequently, he has been measuring the velocity of compressional waves in some possible mantle rocks such as dunite, eclogite, and peridotite.

With the adoption of the Standard Earth, the reduction of satellite data is now approaching an accuracy comparable to that of the observations made by the Baker-Nunn cameras, so the Observatory is exploring new techniques for satellite observation. The prime effort is being devoted to refinement of a laser tracking system.[3] An engineering model is now being tested under the direction of Carlton G. Lehr, Leonard A. Maestre, and Peter H. Anderson at the New Mexico Astrophysical Observing Station. Early evidence suggests that tracking accuracy may be improved by an order of magnitude. Lundquist and Henry D. Friedman have initiated a review of new scientific horizons attainable from more accurate satellite tracking by lasers or other means.

230-457—66——16

Luigi G. Jacchia, in collaboration with Jack W. Slowey, Max Roemer, and Franco F. Verniani, continued his investigations of upper-atmosphere structure and variations through the analysis of the drag on artificial satellites.[3] Recently these studies were significantly advanced by two balloon satellites (Explorer 19 and Explorer 24) specifically launched for Smithsonian's drag-analysis project. Observations of the two Explorer balloons have yielded particularly interesting results. It appears that, at the perigee height of the two satellites (500–700 km), the diurnal bulge is elongated in the north-south direction and is centered on the equator rather than migrating with the subsolar point as previously supposed. The resulting temperature distribution in the exosphere is reminiscent of the electron-density distribution in the F2 layer. Since the latter also exhibits a semiannual variation in phase with that observed in the neutral-gas temperature, one is led to suspect that ions, whose motion is partly governed by the earth's magnetic field, play a much more important role in controlling upper atmospheric temperatures than had hitherto been assumed.

In cooperation with the Argentinian Space Research Council, Mario D. Grossi has designed equipment for investigating the formation of field-aligned shells of thermal electrons in the magnetosphere. A high-powered HF transmitter has been borrowed from the U.S. Army and installed at the Astrophysical Observing Station in Jupiter, Florida. Receiving equipment is being set up at Usuhaia, Tierra del Fuego, roughly at the conjugate point of Jupiter. Radio waves transmitted from Jupiter and guided in the magnetosphere along the $L=1.8$ shell will be sought by a receiver at Usuhaia. Analysis of the received signals will provide data on the electron content and gradients in the magnetospheric shells, the time dependence of basic shell characteristics, and correlations between the latter and phenomena related to solar activity.

Nathaniel P. Carleton, with Charles H. Dugan, has been investigating excitation and de-excitation of metastable oxygen atoms (especially the ^1D level) in an electric discharge, and the processes by which fast photoelectrons convey their energy to the ionosphere.[16] He finds that ^1D oxygen atoms react very rapidly with nitrogen molecules, so that most of them will be destroyed before radiating, if they are created in the atmosphere below about 150-km altitude. Anthony R. Lee has been preparing a laboratory study of inelastic electron-ion collisions, in which he will observe light radiated from the region of intersection of crossed electron and ion beams. Costas Papaliolios is making a careful measurement of the lifetime of the lowest excited state of the CO molecule by observing the absorption spectrum of the molecule at high resolution. In his photoelectron work, Carleton hopes to

explain the intensity and variability of the radiation from ^1D atoms in the upper atmosphere observed at the Blue Hill Observatory.

Jacchia's static diffusion models of the upper atmosphere with empirical temperature profiles and their associated variation models have been adopted by the U.S. Committee on Extension of Standard Atmosphere and will be incorporated in the forthcoming U.S. Supplemental Atmospheres.

Basing his work on these atmospheric models, Ladislav Sehnal [12] has developed a technique for computing short-periodic perturbations of artificial-satellite orbits, caused by atmospheric drag. The disturbing function is constructed by computer; the effects of the diurnal bulge are included.

In a theoretical study, Manfred P. Friedman has developed a set of equations to describe the structure of the upper atmosphere between 120 and 1000 km, the altitude range containing nearly all artificial satellites.[3] These equations have been solved on a digital computer and predict concentrations of five major atmospheric constituents (O_2, N_2, O, He, H) and the temperature distribution all around the earth.

A particularly exciting advance in the study of the solar system is the availability of closeup photographs of the surface of the moon obtained by the Ranger series of NASA. Donald H. Menzel has reviewed the various theories relating to the surface characteristics of the moon.[17] He suggested that radioactivity kept the moon liquid during the early part of its life and that a porous crust with pockets of gas floated on the surface. Meteoritic impacts and volcanism caused the old craters, and successive lava flows created the maria and ghost craters.

Using theoretical techniques, Professor Prabhu L. Bhatnagar of Bangalore, India, has studied the surface structure of the moon.

An invited paper, "The Meteoritic Environment of the Moon," was presented by the Director at a lunar symposium sponsored by the Royal Society of London and will appear in their publication. It concerns meteoritic impact rates and crater formation on the moon and shows that the larger craters fit expectations for large-body impact, whereas the small impact craters are less numerous than expected.

Looking to the future, Winfield W. Salisbury has proposed using the subsurface materials in the lunar lithosphere as a propagation medium for communications on the moon. Its small diameter and lack of an ionosphere will make usual methods of radio communication between stations on the moon's surface impossible or impractical. The low thermal conductivity and water content of lunar-surface materials suggest that they may be an appropriate transmission medium.

Studying the rotational motions of the moon and planets, Giuseppe Colombo has developed a simple model that provides further understanding of their mechanics.[3] With it he has shown that the moon's rotational variations minimize the dissipation of energy by internal friction in the earth-moon system.

A particularly striking discovery has been made by Colombo. He pointed out that Mercury's rotation period, as determined from radar observations, is exactly two-thirds of its orbital period, indicating a "locking-in" process. With Shapiro he made a detailed analysis of the gravitational and tidal forces acting on the planet and found that such a locking in of Mercury's rotation should be expected.

Ralph F. Baierlein [12] has been calculating the general relativistic corrections to the lunar motion. Extending Brumberg's results by including the influence of the eccentricity of the earth's orbit, his results may be used with laser ranging measurements of the earth-moon distance to test the theory of general relativity.

Allan F. Cook and Fred A. Franklin have accounted for the observed, but perplexing, fact that the thickness of Saturn's rings is much greater than the diameter of the particles of which they are composed. By assuming that electrostatic forces are responsible for keeping the particles in the rings well separated, they have shown that the particle radii must be less than about one millimeter. This size is consistent with all present observations and implies that the total extent of the rings is about one meter.

Jean Meffroy introduced Von Zeipel's method in general planetary theory. He eliminated the short-periodic terms of a first-order theory, and he is currently investigating the elimination of the long-periodic terms.[3]

With E. Lippincott of the University of Maryland and R. E. Eck and M. O. Dayhoff of the National Biomedical Research Foundation, Carl Sagan has made an IBM–7094 analysis of the expected thermodynamic-equilibrium composition of the atmospheres of Earth, Mars, Venus, and Jupiter.[13] They find that except for trace compounds produced by biological activity, lightning, radiation, and volcanism, the terrestrial atmosphere is close to thermodynamic equilibrium. The atmosphere of Venus is inconsistent with the possibility of hydrocarbons either on the surface or in the clouds. For Mars, Venus, and Jupiter there are no molecular species of large predicted equilibrium abundance and spectroscopically accessible absorption features that have not already been identified. However, at high temperatures, such as would be produced by lightning discharges, simple hydrocarbons and cyanides, polycyclic aromatics, and a variety of nitrogen compounds would be expected on Jupiter. Some of these compounds are brightly colored

and may contribute to the variable colorations observed on Jupiter.

Sagan [19] and James B. Pollack have devised a comprehensive model of the surface environment of Mars. They show that the reasons for elevations being colder on Earth do not apply to Mars and that the seasonal growth and recession of the Martian polar caps point to the dark areas being highlands.

In conjunction with R. M. Goldstein of the Jet Propulsion Laboratory they have analyzed the radar Doppler spectra of Mars, obtained at JPL's Goldstone tracking facility during the 1963 and 1965 oppositions. They find, both from the total power as a function of longitude and from the details of the Doppler spectra, that Martian dark areas are indeed at higher elevations than the bright areas. Regions undergoing marked secular changes have shallow slopes, suggesting that the secular changes are due to drifting dust. Such elevation differences permit the construction of an inorganic model of Martian seasonal phenomena, in which smaller, more highly reflecting particles are blown off the highlands during spring, and then redistributed back on the highlands by the greater winds of late fall and winter.

Sagan's laboratory for prebiological organic chemistry has been concentrating on nucleotide-amino acid interactions in simulated primitive terrestrial environments and near-ultraviolet production of amino acids from the simulated primitive atmosphere, using cosmically abundant untraviolet-photon acceptors.[18]

William M. Irvine continued his theoretical study of light scattering and radiative transfer in planetary atmospheres.[20] The effect of multiple scattering on absorption features was investigated with the aid of a probability distribution of photon optical paths in the medium. The usual theory of radiative transfer breaks down when the scattering particles are large enough and their density is great enough so that they shadow one another. This "shadowing effect" was studied in detail and the appropriate correction to the equation of transfer derived.

Flight Experiments

On May 29, a 250-foot polyethylene balloon carried SAO's gamma-ray spark chamber, designed and built by Giovanni G. Fazio and Henry F. Helmken, into the dawn sky.[21] From the National Balloon Launch Facility in Palestine, Texas, the balloon took about 2 hours to climb to its ceiling of 125,000 feet, where it floated for 7 hours. The instrument telemetered television pictures of gamma-ray events in the spark chamber while the balloon rose in the atmosphere. As it hung at maximum altitude, the spark chamber scanned the Crab Nebula, Sun, Milky Way, and several radio sources. Reduction of the data,

now going on, will reveal whether the equipment detected gamma radiation from any of these possible sources.

Frances W. Wright and Paul W. Hodge are continuing their program of collecting meteoritic dust particles of microscopic size. Two clam-shell-type collectors have been built for balloon flights to 110,000 feet.

Robert J. Davis has established an accurate standard of spectrophotometric sensitivity between 1,000 and 3,000 angstroms. Referred to a National Bureau of Standards total radiance standard by means of a thermal detector, Davis' standard is for use in Project Celescope.[22] Designed for ultraviolet observations from an orbiting astronomical observatory, the Celescope package is now undergoing final cali brations and its sensitivity is being measured. Toward this end, Davis has confirmed the index of refraction of lithium fluoride and is working on the measurement of the index of refraction of magnesium fluoride, these substances being used in the optical parts of the instrument.

Fazio, Joseph F. Dolan, and Matthias F. Comerford have completed a laboratory investigation showing that the Borrmann effect (anomalous transmission of polarized X-rays through single crystals) can be used to measure X-ray polarization. Experimental results and calculations indicate that satisfactory statistics can be obtained with exposure times on the order of a day for very weak celestial sources of X-rays and as little as a few seconds for a solar flare.

Theoretical Astrophysics

Progress in theoretical astrophysics proceeded along three major fronts: stellar atmospheres, relativity and cosmology, and high-energy physics.

The stellar-atmospheres group under the general guidance of Charles A. Whitney continued its investigations of the theory of model atmospheres, the analysis of stellar spectra, and the theory of spectral-line formation in astrophysical plasmas.[23]

Whitney pursued his study of the interplay between gas-dynamic and radiative-energy exchange in a pulsating stellar atmosphere, and developed a simple formalism for studying the theory of temperature inversions in the superficial layers of stellar atmospheres.[24]

George B. Rybicki developed a theory of radiative transfer that is applicable to the material in a turbulent state and applied this theory to the observed fluctuations in the solar atmosphere.

Several members of the group continued their collaborative study of the effects of departures from local thermodynamic equilibrium on the structure of stellar atmospheres. They find that the results

for hot main-sequence stars are quite sensitive to the values of the collision cross sections for atomic hydrogen, and they conclude that such departures may have a significant influence on atmospheric structure. This work is now being extended to the solar atmosphere.

Two studies of the influence of absorption lines on the structure of stellar atmospheres, under the direction of Stephen E. Strom and Owen J. Gingerich, have achieved significant progress in refining the calculation of temperature distributions. Examination of the solar spectrum has empirically verified these calculations.

Gingerich, with David W. Latham and Jeffrey L. Linsky, is now pioneering the computation of model atmospheres for very cool stars, in the temperature range 1500°K to 4500°K.[25] The construction of these models presents several interesting difficulties, and continued sophistication of the analytical and numerical procedures is required to cope with the enormous variations of opacity with wavelength and with the preponderance of Rayleigh scattering. Willard R. Chappell investigated the fundamental theory of the interaction of radiation with plasmas, with the purpose of obtaining kinetic equations to describe the approach of such systems to equilibrium.

Several members of the group, principally Strom and Gingerich, have continued their extensive empirical studies of stellar spectra with the aim of determining atmospheric parameters and chemical abundances. The precision and scope of this work make it unique. The initial studies have concentrated on several normal main-sequence stars, some stars whose very low metal abundance indicates their great age, members of several galactic star clusters, and the eclipsing star Beta Aurigae. The data for these studies have been obtained by visits to several western observatories.

Leo Goldberg has carried out a number of theoretical investigations concerning astrophysical implications of auto-ionization, the intensities of hydrogen recombination lines, and the interpretation of the solar spectrum.[26] The theoretical intensity of the autoionizing calcium triplet near 6350 Å was calculated as a function of spectral class and luminosity, and was found to agree with observation for stars having the same calcium/hydrogen abundance. Theoretical intensities of hydrogen recombination lines, emitted at radio frequencies by H II regions, have been found to be sensitive to small departures from equilibrium in the populations of highly excited levels. These departures act to enhance stimulated emission and therefore reduce the apparent discrepancy between electron temperatures derived from radio and optical observations, respectively.

Theoretical calculations by Gingerich and Robert W. Noyes indicated the importance of infrared measures of the extreme solar limb and have led to the latter's preparation for an eclipse expedition.

Gingerich, in collaboration with John Rich of the Harvard Observatory, reports the discovery of the absorption edge due to the first excited state of silicon in the solar ultraviolet. Their studies of limb darkening in this ultraviolet region have led to important conclusions concerning the structure of the lower solar chromosphere, which have been confirmed in collaborative studies by Noyes on the infrared.

Predicting the formation of spectrum lines under rather general conditions of density and temperature is a problem of amazing complexity, and the investigations rely heavily on numerical experiments to be examined with analytical theories. Investigations of the transfer of line radiation by multilevel atoms, principally carried out by Eugene H. Avrett and Wolfgang Kalkofen in collaboration with Rybicki, have broken important new ground in the interpretation of stellar spectra. An example of the exciting results to be expected from this program is the fact that Linsky and Avrett have, for the first time, performed sufficiently accurate computations of the profiles of the chromospheric calcium emission lines to permit their use in a direct study of chromospheric structure. Many other problems, hitherto unassailable, will be attacked with these methods.

In the area of relativity and cosmology, Giovanni G. Fazio and James P. Wright with Floyd W. Stecker have investigated X-ray and gamma-ray production by the interaction of cosmic ray electrons with the 3.5°K universal blackbody radiation field. They concluded that, if the universal radiation field actually exists, the intergalactic cosmic-ray electron intensity must be lower than that observed at the earth. Henri E. Mitler and Stecker have initiated a program to investigate the formation of helium and deuterium at the beginning of a universal big-bang. It is hoped that the helium-3 and helium-4 abundances and the universal blackbody radiation as now observed will emerge as byproducts of these calculations.

Mitler has extended his work on the neutron flux in meteoroids to be expected from galactic cosmic rays and from solar flares; this work should give useful information concerning the amount of neutron activity to be expected in meteoroids in space.

With the hope of understanding the discrete X-ray sources that have recently been discovered by rocket flights, Sachiko Tsuruta has continued her studies of neutron stars, relativistic assemblies of matter with densities up to 10^{15} grams per cubic centimeter. She and James Wright have examined the vibrational periods for such stars, finding them to be less than 1/1000 of a second! Wright has shown that relativistic effects place a lower limit on the possible pulsation period of such stars.

Myron Lecar continued his theoretical studies of stellar motions in an idealized galaxy. He has obtained an exact solution for a class of stellar orbits in a time-varying gravitational field that has permitted him to demonstrate that a slowly collapsing galaxy could provide the observed high eccentricities of the older stars. He pursued an extensive computational investigation of the motion of the stars perpendicular to the plane of the galaxy and demonstrated the validity of neglecting close encounters in studying the long-time behavior of this model. This important work promises to provide new techniques for studying the evolution of the Galaxy.

Lecar also initiated, in collaboration with the Yale Observatory, a series of numerical experiments on the dynamical structure of globular star clusters.

William M. Irvine studied the early conditions in an expanding universe, and the fluctuations of density that may arise at such a stage, in order to examine the early stages in the formation of galaxies and other astronomical systems.

Work in high-energy physics has progressed with Mitler's calculation of the total number of elementary particles of various species evaporated from excited nuclei, and he developed a new approximation for the partition function of hydrogen. Joseph F. Dolan and Giovanni G. Fazio have completed an extensive study of the polarization to be expected from various types of sources of celestial X-rays, and they conclude that measurements of linear polarization would be an important means of diagnosing the mechanism of X-ray production. Stecker investigated cosmic-ray particle acceleration by low-frequency plasma waves and radio waves and has evaluated the energy spectra to be expected from various models of cosmic-ray sources.

Donald H. Menzel is continuing several programs in theoretical astrophysics that he started at Harvard College Observatory.[27] He is investigating complex sunspots and associated instabilities, magnetic stars such as the sun that are pumping hydrogen into the external magnetic regions, and the origin of planetary systems.[28]

Many SAO activities depend upon facile use of computers, which in turn depend on special mathematics dealing with computer logic. Theoretical study by Henry D. Friedman of a mathematical concept called linear graphs is an example of this science.[3]

Radio Astronomy

The Observatory is making a strong entry into the field of radio astronomy. An 85-foot "dish" antenna with a precision surface has been acquired and will be installed on a mount owned by Harvard

College Observatory. The resulting jointly owned radio telescope will be used by staff scientists of both institutions under the direction of A. Edward Lilley.

To study the design for a large fully steerable radio antenna, the Cambridge Radio Observatory Committee (CAMROC) has been established by S. Dillon Ripley, President J. A. Stratton of Massachusetts Institute of Technology, and President Nathan M. Pusey of Harvard University. The Committee is investigating all aspects of construction and operation of a facility with a paraboloidal antenna having a nominal 400-foot diameter.

Representing SAO on the committee are Fred L. Whipple, Charles A. Lundquist, and A. Edward Lilley; Mario D. Grossi, Carlton G. Lehr, Thomas E. Hoffman, and Carlton W. Tillinghast are scientific and administrative associates.

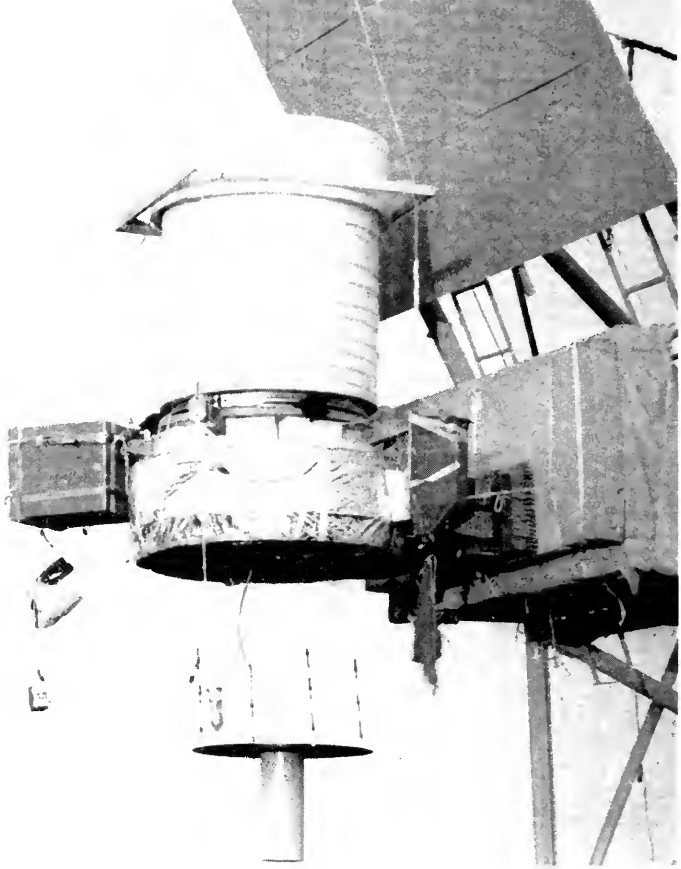
The objectives of CAMROC are threefold—scientific, educational, and technological. The number of significant astrophysical problems now susceptible to investigation by radio and radar astronomy has expanded rapidly, but the number of available instruments suitable for these studies has not increased apace. CAMROC is considering an instrument with great versatility to accommodate diverse scientific programs. There is an acute need for more professionals in both radio and radar astronomy. A facility of the sort being studied, if located in or near an academic community, would provide an opportunity for research and graduate training that does not exist today. Such a facility would also be applicable to programs other than purely astronomical studies. It would pave the way for design of larger facilities and could be used as an emergency backup in national and international space programs.

Lilley and Donald H. Menzel are studying the theory of hydrogen emission at radio wavelengths.[29] New and simple expressions have been developed for the intensities of the hydrogen lines of high-series members. Various theories of line broadening were reviewed and improved results were obtained. Further analysis will apply to the continuous background produced by bound-free and free-free emissions.

Optical Astronomy

Even with the great strides taken in space and radio astronomy, the fundamental tool of the astronomer is still the ground-based optical telescope. Data provided by telescopic observations are critical to virtually all branches of astronomy. Even the theoretician must have observations against which to test his theories. Because there are too few telescopes and too little observing time available to satisfy

Smithsonian Astrophysical Observatory's new multipurpose Southwest Observatory will be located to the east of the 8572-foot peak of Mt. Hopkins (center). It will house at least three major instruments, including a Baker-Nunn satellite-tracking camera, the world's largest gamma-ray collector, and a good-size conventional telescope particularly suited to spectroscopy. The new facility will join the nearby Kitt Peak National Observatory and the University of Arizona's Lunar-Solar Laboratory in making Tucson one of the leading astronomical areas of the world.



Smithsonian-built gamma-ray detector is a spark chamber connected to a closed-circuit television system, by which a spark pattern can be registered and telemetered back to earth. Launched from Flight Station of the National Center for Atmospheric Research at Palestine, Texas, May 28, 1966, it was carried 120,000 feet aloft in an 8½-hour flight. Data analysis is underway.

the needs of modern astronomy, the Astrophysical Observatory is establishing a new observing station.

After an extensive search, the Observatory selected what is regarded as the finest site available in North America. Mount Hopkins, in the Coronado National Forest of southern Arizona, appears to offer excellent observing conditions and is close to Tucson, a rapidly developing astronomical center. The National Forest provides a natural buffer precluding encroachment of urban areas with their sky-spoiling lights and smoke. Near by are Kitt Peak National Observatory and the observing facilities of the University of Arizona.

Immediate plans call for installation of a large light collector to observe Čerenkov radiation generated by gamma rays hitting the upper atmosphere, a medium-sized astronomical telescope for spectrometry, and a Baker-Nunn camera and laser tracking equipment for observing artificial satellites. Charles A. Tougas has been named Field Manager and will be in charge of site development.

During the past year, Giovanni G. Fazio and Henry F. Helmken have been searching at night for Čerenkov light from very high-energy gamma rays with the solar furnace at the U.S. Army Quartermaster Corps in Natick, Massachusetts. High-speed counting equipment has improved the electronic stability of the system, but the major limitation still remains the high background light in the night sky from Boston and surrounding communities. This problem will be overcome with establishment of the new light collector on Mount Hopkins.

Today, supported by modern high-speed computers, the Observatory's theoretical astrophysicists have pushed the frontiers of theory to the limit, and badly need confirming observations. For this purpose, David W. Latham and Stephen E. Strom twice visited Mount Wilson Observatory to use the Coudé spectrograph of the 100-inch telescope. They exposed 20 plates on Alpha Lyra, covering wavelengths between 3200 and 6500 angstroms with dispersions between 1 and 3 Å/mm. The plates will be used to improve their analysis of this fundamental standard star. Strom and Latham also obtained photoelectric $H\gamma$ profiles with a resolution of one angstrom for abundance analyses of nine stars—Alpha Canis Majoris, Gamma Geminorum, Alpha Canis Minoris, 63 Tauri, 64 Tauri, 68 Tauri, 8 Comae, HD73666, and Iota Herculis. Combined with photoelectric scans, these measurements will be analyzed for accurate values of the surface gravity and effective temperature for these stars.

A central effort in this empirical program is Latham's development of a photoelectric spectrophotometer for measuring stellar-energy distributions in the range 3000 to 8000 angstroms. This equipment is

now being tested on the 61-inch telescope of the Harvard College Observatory. Latham also continued his fundamental work on the factors that limit the accuracy of high-dispersion photographic spectrophotometry.

In the continuing flare-star observing program [3] reported last year, Leonard H. Solomon has reduced 115 hours worth of data to light curves.[30] With Sir Bernard Lovell, University of Manchester, England, he deduced a mean light-radio curve for UV-Ceti outbursts. He was unable to find any periodicity for UV-Ceti flares.

An image slicer allowing spectrograms to be obtained simultaneously for two heights in the solar chromosphere has been used by Robert W. Noyes at the Sacramento Peak Observatory. The data contain information on the dynamics of chromospheric spicules. With J. M. Beckers of Sacramento Peak Observatory, Noyes has started infrared observations of the sun between 10 and 30 microns; and with the Lunar and Planetary Laboratory of the University of Arizona, he has made observations of the center-to-limit variations of the solar continuum flux at wavelengths out to 25 microns. These show that the current descriptions of the vertical temperature structure of the solar atmosphere place the temperature minimum too deep.

With David Morrison, Carl Sagan, and James B. Pollack, Thomas E. Hoffman has designed a camera capable of very fine focusing. It will be used for infrared planetary photography on hypersensitized plates at wavelengths up to 1 micron. The completed camera is now being tested.[18]

Fred A. Franklin has observed the earth-lit portion of the moon in two colors to obtain the albedo and phase function of the earth.[31] This study, undertaken to resolve the discrepancy between visual observations and satellite measurements, indicates that the average Bond albedo of the earth is about 0.36 in yellow light and some 20% higher in the blue.

Paul W. Hodge and Frances W. Wright have completed work on their Atlas of the Large Magellanic Cloud. A preliminary edition was printed in June for distribution to some 25 observatories carrying on major programs in Magellanic Cloud research. A formal edition will be published later.

Thornton L. Page [12] has been preparing to make spectroscopic observations of southern galaxies at the National Astronomical Observatory, Cordoba, Argentina. He will be determining red shifts and internal motions of objects in de Vaucouleur's catalog, quasi-stellar objects, and peculiar galaxies. Extensive modernization of the 61-inch telescope has been necessary before the observations could be undertaken.

A new type of satellite-tracking camera built by the Observatory for geodetic measurements is now in operation near Athens, Greece, under a cooperative agreement with the National Technical University of Athens.[3] A modified K–50, the camera is the first of three to join the Smithsonian's network of Astrophysical Observing Stations. The others will be located at Curaçao, in the Netherlands Antilles, and in Shiraz, Iran. The lens system, originally designed for aerial photography by James G. Baker of Harvard College Observatory, has been mounted by Observatory engineers on a pedestal suitable for satellite tracking.

The network of Astrophysical Observing Stations was improved by the installation of new precision time standards.[3] Nine stations now have the new EECO clocks in operation, thereby increasing potential observing accuracy from 1 millisecond to 0.1 millisecond.

In addition to their routine satellite-tracking assignments, the stations were able to secure several particularly significant series of photographs.[3] Early this year, the South Africa station photographed part of the Gemini 5 rocket as it reentered the atmosphere and disintegrated. Later, the same station observed the injection and inflation of the PAGEOS geodetic balloon satellite. In December, the Argentina station caught Gemini 6 and Gemini 7 as they made their historic rendezvous in space.

Historical Astronomy

Charles A. Whitney prepared an article tracing the development of the astronomical concept of the universe through Herschel's discovery of nebulosity, to Hubble's proof that spiral nebulae are extragalactic systems, to the recent identification of quasars. The article delineates the substantial revolution in astronomical thought following each of these identifications of a specific and a new kind of astronomical object. He also initiated a study of Laplace's nebular hypothesis, its relation to the theoretical work of Kant and the observational work of Herschel, and the evolution of Laplace's expression of this hypothesis through the six editions of his work published from 1795 to 1835. Whitney collected material to prepare a *variorum* edition of Laplace's *Systems of the World.*

Owen J. Gingerich recomputed the planetary section of Kepler's *Rudolphine Tables;* a remarkably high internal accuracy, as well as excellent predicting ability for planetary positions, had been displayed. He translated several chapters of the *Rudolphine Tables* and has begun a full-scale translation of Kepler's *Astronomia Nova.* This project is assisted by a Latin transduction computer program, the dictionary of

which currently contains 2800 Latin roots actually used in Kepler's writing. Gingerich is continuing investigations of Kepler's lunar tables and a study of 13th-century *Alphonsine Tables*.[32]

Hawkins obtained stereoscopic aerial surveys of Stonehenge in southern England and of Callanish in Scotland.[33] From these surveys accurate plans have been drawn that are superior to those previously available. These plans have been used to confirm the sun and moon alignments found between the stones and post holes at these monuments.[34]

Central Bureaus

The Central Bureau for Satellite Geodesy, under the guidance of executive director Jan Rolff, has strengthened international cooperation in satellite geodesy.[35] The Bureau was instrumental in arranging cooperation between SAO's satellite-tracking program and foreign stations, particularly in eastern and western Europe.

The Central Bureau for Astronomical Telegrams,[4] under the direction of Gingerich, distributed 47 Circulars carrying information about supernovae, comets, asteroids, and unusual stars. The most extensive activity resulted from the spectacular sun-grazing comet Ikeya-Seki, for which 11 Circulars were issued in a period of 6 weeks. In addition to the postcard Circulars distributed to about 625 subscribers in 50 countries, the Bureau sent over a dozen "telegram books" to various of its 120 subscribers in 40 countries. Most of the foreign subscribers are serviced by the AGIWARN system of the International Ursigram and World Days Service. Richard B. Southworth and Brian G. Marsden served as associate directors of the Bureau.

Staff Changes

One of the Observatory's distinguished scientists, Leo Goldberg, resigned upon his appointment as the new director of the Harvard College Observatory. His predecessor in that position, Donald H. Menzel, joined the SAO staff.

The scientific staff of the Astrophysical Observatory was increased during the year by physicists Willard R. Chappell and Costas Papaliolios; astrophysicist Myron Lecar; geologist John A. Wood; astronomers Guiseppe Forti and Brian G. Marsden; celestial mechanicians Salah E. Hamid and Jean Meffroy. Richard W. McCarthy joined the staff as personnel manager, and Henry D. Friedman as manager of the data processing department, which now includes a new computer division under the supervision of Lauri E. Kujanpaa.

Consultants to the Observatory during the year were Giuseppe Colombo, Giorgio Fiocco, Yusuke Hagihara, David G. Hummer,

William M. Kaula, Colin S. L. Keay, Czeslaw P. Kentzer, Yoshihide Kozai, A. Edward Lilley, Irving Michelson, Eduardo O. Patino, A. E. Ringwood, Juan Roderer, Winfield W. Salisbury, Mario R. Schaffner, William E. Strange, Bhuwan M. Tripathy, Francis X. Tuoti, V. Vanysek, and George Veis.

In 1965, the Observatory initiated in cooperation with the National Academy of Sciences/National Research Council its postdoctoral fellowship program for research associates. The first four appointees were Thornton L. Page, director of the Wesleyan University Observatory, Robert H. McCorkell of M.I.T.; Ralph F. Baierlein of Jefferson Laboratory, Harvard University; and Ladislav Sehnal of the Astronomical Institute of Czechoslovakia. Richard Haefner and Franco Verniani resigned.

Staff Papers

Presented or Published

July 1965 through June 1966

ANDERSON, P. H., LEHR, C. G., MAESTRE, L. A., HALSEY, H. W., and SNYDER, G. L. The two-way transmission of a ruby-laser beam between earth and a retro-reflecting satellite. Proc. IEEE, vol. 54, p. 426, 1966.

AVRETT, E. H. Source function equality in multiplets. Astrophys. Journ., vol. 144, pp. 59–75, 1966.

——— and HUMMER, D. G. Non-coherent scattering II: Line formation with a frequency independent source function. Monthly Notices, Roy. Astron. Soc., vol. 130, pp. 295–331, 1965.

BECKERS, J. M., NOYES, R. W., and PASACHOFF, J. M. New observations of solar chromospheric spicules [abstract]. Astron. Journ., vol. 71, p. 155, 1966.

BRIGGS, R. E. *See* Jacchia, Verniani, and Briggs.

CHAPPELL, W. R. *See also* Glass and Chappell.

——— and BRITTIN, W. E. Quantum kinetic equations for a multicomponent system of charged particles and photons. Phys. Rev., vol. 146, pp. 75–91, 1966.

———, BRITTIN, W. E., and GLASS, S. J. The interaction of radiation with charged particles I. Nuovo Cimento, vol. 38, pp. 1186–1191, 1965.

——— and SWENSON, R. J. Guessing kinetic equations. Phys. Fluids, vol. 8, pp. 1195–1197, 1965.

COLOMBO, G. *See also* Shapiro, Lautman, and Colombo.

COLOMBO, G. Rotation period of the planet Mercury. Nature, vol. 208, p. 575, 1965.

———. Recent developments in the theory of rotation of Mercury and Venus. Presented at NATO Advanced Study Institute, Newcastle-upon-Tyne, April 1965.

COMERFORD, M. F., and THOMAS, D. A. Substructure and mechanical properties of a drawn and annealed iron-silicon alloy. Trans. Met. Soc. AIME, vol. 233, pp. 1236–1243, 1965.

COOK, A. F., and FRANKLIN, F. A. Rediscussion of Maxwell's Adams prize essay on the stability of Saturn's rings, II. Astron. Journ., vol. 71, pp. 10–19, 1966.

DAVIS, R. J. The Celescope optical system for the orbiting astronomical observatory. Presented at the Conference on Optics in Space, University of Southampton, Southampton, September 1965.

———. The use of the Uvicon-Celescope television system for ultraviolet astronomical photometry. Presented at the Symposium on Photo-electronic Image Devices as Aids to Scientific Observation, Imperial College of Science and Technology, University of London, London, September 1965.

———. Factors affecting the transmittance of lithium fluoride and barium fluoride in the vacuum ultraviolet. Journ. Opt. Soc. Amer., vol. 56, pp. 837–839, 1966.

DODD, R., VAN SCHMUS, R., and MARVIN, U. Merrihueite, a new alkali-ferromagnesium silicate from the Mezo-Madaras chondrite. Science, vol. 149, pp. 972–974, 1965.

DOLAN, J. F. Stellar molecular abundances: I. Polyatomic molecules. Astrophys. Journ., vol. 142, pp. 1629–1632, 1965.

———. An experimental method of determining the polarization of celestial x-rays [abstract]. Astron. Journ., vol. 71, p. 160, 1966.

FAZIO, G. G. *See also* Helmken and Fazio.

———, STECKER, F. W., and WRIGHT, J. P. Cosmic blackbody radiation, high-energy electrons, and the origin of isotropic x-ray and gamma radiation. Astrophys. Journ., vol. 144, pp. 611–614, 1966.

FIREMAN, E. L. Evidence for extraterrestrial particles in polar ice. Presented at the Symposium on Meteor Orbits and Dust, Cambridge, Massachusetts, August 1966.

———. Neutron exposure ages of meteorites. Zeitschr. für Naturf., vol. 21A, pp. 1138–1146, 1966.

FLEISCHER, R. L., NAESER, C. W., PRICE, P. B., WALKER, R. M., and MARVIN, U Fossil particle tracks and uranium distributions in minerals of the Vaca Muerta mesosiderite. Science, vol. 148, pp. 629–632, 1965.

FRANKLIN, F. A. *See* Cook and Franklin.

GAPOSCHKIN, E. M. A new determination of tesseral harmonics of the geopotential and station coordinates from Baker-Nunn observations. Presented at the AGU meeting, Washington, D.C., March 1966.

———. A dynamical solution for the tesseral harmonics of the geopotential, and station coordinates using Baker-Nunn data. Presented at VIIth COSPAR International Space Science Symposium, Vienna, May 1966.

GINGERICH, O. Lunar visibilities in ancient Babylon. Isis, vol. 56, p. 69, 1965.

———. Eleven-digit regular sexagesimals and their reciprocals. Trans. Amer. Phil. Soc., vol. 55, pt. 8, 1965.

———. The great comet of 1965. Atlantic Monthly, vol. 217, pp. 57–62, 1966.

———. Limb darkening for a grid of model stellar atmospheres. Astrophys. Journ., vol. 144, pp. 1213–1215, 1966.

——— and RICH, J. C. Metallic continuous absorption coefficients in the solar ultraviolet [abstract]. Astron. Journ., vol. 71, p. 161, 1966.

GLASS, S. J., and CHAPPELL, W. R. The interaction of radiation with charged particles II. Nuovo Cimento, vol. 38B, pp. 79–88, 1966.

GOLDBERG, L., NEWSON, G., PARKINSON, W. H., and REEVES, E. M. A study of broad absorption features in the solar spectrum. Presented at the AAS meeting, Ann Arbor, Michigan, August 1965. [Abstracted in Astron. Journ., vol. 70, p. 676, 1965.]

GROSSI, M. D. Preliminary results from a VHF meteor radar system for the measurement of 3-dimension wind velocities in the lower ionosphere. Presented at the 2nd Conference on Direct Aeronomic Measurements in the Lower Ionosphere, Univ. of Illinois, Urbana, September 1965.

———. Guided propagation in the ionosphere and its potential use for global communications. Electronic Progress, vol. 9, no. 2, pp. 1–12, 1965.

——— and BARKER, J. I. Guided propagation modes in the lower ionosphere and satellite-to-satellite HF-VHF communication experiments. Presented at 2nd Symposium on Radio-Astronomical and Satellite Studies of the Atmosphere, Boston, October 1965.

——— and SMITH, B. M. Computer simulation of HF and VHF waveguidance phenomena in the lower ionosphere. Presented at fall URSI meeting, Hanover, New Hampshire, October 1965.

HAWKINS, G. S. *See also* Wolfe, Battan, Fleming, Hawkins, and Skornik.

———. Callanish, a Scottish Stonehenge. Science, vol. 147, pp. 127–130, 1965.

———. Sun, moon, men and stones. Amer. Scientist, vol. 53, pp. 391–408, 1965.

———. Stonehenge physics. Physics Today, vol. 19, pp. 38–42, 1966.

———. Stonehenge. *In* Book of knowledge annual yearbook, p. 333. New York: Grolier, 1966.

——— and MOORE, J. F. The life of a star. New York: Holt, Rinehart, and Winston, 1965. 32 pp.

——— and WHITE, J. B. Stonehenge decoded. New York: Doubleday and Co., 1965. 194 pp.

HELMKEN, H. F., and FAZIO, G. G. Vidicon spark chamber detector for gamma-ray astronomy. IEEE Trans. on Nuclear Science, vol. NS-13, pp. 486–492, February 1966.

HODGE, P. W. *See also* Wright and Hodge.

———. The location of star formation in galaxies. Science, vol. 150, pp. 374–375, 1965.

———. The mass of the galaxy. Publ. Astron. Soc. Pacific, vol. 78, pp. 72–74, 1966.

———. Newly-discovered clusters of the Large Magellanic Cloud [abstract]. Astron. Journ., vol. 71, pp. 164–165, 1966.

———. Surface photometry of the Sculptor Dwarf Galaxy. Astron. Journ., vol. 71, pp. 204–205, 1966.

——— and BROWNLEE, D. E. Photographic isophotometry of galaxies. Publ. Astron. Soc. Pacific, vol. 78, pp. 125–131, 1966.

——— and HITCHCOCK, J. L. Three-dimensional shape of irregular galaxies. Publ. Astron. Soc. Pacific, vol. 78, pp. 79–80, 1966.

——— and WRIGHT, F. W. New variable stars in the Large Magellanic Cloud. Astron. Journ., vol. 71, pp. 131–132, 1966.

———. On the chemical compositions of the interiors of possibly cosmic particles and the problem of the origin of naturally occurring iron-rich spherules. Presented at the Symposium on Meteor Orbits and Dust, Cambridge, Massachusetts, August 1965.

IRVINE, W. M. Multiple scattering by large particles. Astrophys. Journ., vol. 142, pp. 1563–1575, 1965.

———. The distribution of photon optical paths in a scattering atmosphere [abstract]. Astron. Journ., vol. 70, p. 679, 1965.

———. Multiple scattering by large particles [abstract]. IUGG Monogr. no. 28, p. 11, 1965.

———. Infrared optical characteristics of ice spheres. Presented at the Symposium on Meteor Orbits and Dust, Cambridge, Massachusetts, August 1965.

———. Diffuse reflection and transmission by clouds and haze layers [abstract]. Trans. Amer. Geophys. Union, vol. 47, p. 13, 1966.

JACCHIA, L. G. Atmospheric structure and its variations at heights above 200 km. *In* CIRA 1965, COSPAR International Reference Atmosphere, pp. 293–313, Amsterdam: North-Holland Publ. Co., 1965.

———. Remarks on a paper by L. Broglio. Nuovo Cimento, vol. 40B, pp. 314 and 317, 1965.

———. Solar plasma velocity, exospheric temperature, and geomagnetic activity. Journ. Geophys. Res., vol. 70, pp. 4385–4386, 1965.

———. [Review] Space physics with artificial satellites, by Ya. L. Al'pert, A. V. Gurevich, and L. P. Pitaevskii. Science, vol. 150, pp. 875–876, 1965.

———. Density variations in the heterosphere. Ann. de Geophys., vol. 22, pp. 75–85, 1966.

———. VERNIANI, F., and BRIGGS, R. E. Selected results from precision-reduced Super-Schmidt meteors. Presented at the Symposium on Meteor Orbits and Dust, Cambridge, Massachusetts, August 1965.

KALKOFEN, W. *See* Strom and Kalkofen.

KÖHNLEIN, W. Corrections to station coordinates and to nonzonal harmonics from Baker-Nunn observations. Presented at VIIth COSPAR International Space Science Symposium, Vienna, May 1966.

LAUTMAN, D. A. *See* Shapiro, Lautman, and Colombo.

LECAR, M. Validity of the Vlasov equation for a one-dimensional self-gravitating gas. Presented at the 14th International Astrophysical Symposium, Liège, June 1966.

LEHR, C. G. *See* Anderson, Lehr, Maestre, Halsey, and Snyder.

LILLER, M. H., WELTHER, B. L., and LILLER, W. Angular expansion of planetary nebulae. Astrophys. Journ., vol. 144, pp. 280–290, 1966.

LOESER, R. *See* Avrett and Loeser.

LOVELL, B., and SOLOMON, L. H. Correlation of radio emission with the optical flares on UV Ceti. Obs., vol. 86, pp. 16–18, 1966.

LUNDQUIST, C. A. Satellite geodesy at the Smithsonian Astrophysical Observatory. Presented at the American Society for Surveying and Mapping and the American Society of Photogrammetry Convention, Washington, D.C., March 1966.

LUNDQUIST, C. A. Standard earth parameters for use in orbit determination. Presented to the Seminar on Guidance Theory and Trajectory Analysis, NASA Electronics Research Center, Cambridge, Massachusetts, June 1966.

MAESTRE, L. A. *See* Anderson, Lehr, Maestre, Halsey, and Snyder.

MARSDEN, B. G. Revision of the astronomical constants. Handbook British Astron. Assoc., vol. 66, pp. 64–65, 1965.

———. The great comet of 1965. Sky and Telescope, vol. 30, pp. 332–337, 1965.

——— and CAMERON, A. G. W., eds. International Conference on the Earth-Moon System. New York: Plenum Press, 1966.

MARVIN, U. *See also* Dodd, Van Schmus, and Marvin; and Fleischer, Naeser, Price, Walker, and Marvin.

———, FLEISCHER, R. L., PRICE, P. B., and WALKER, R. M. Studies of iron and stony-iron meteorites by nuclear particle track analysis. Presented at the XXth International Congress of Pure and Applied Chemistry, Moscow, July 1965.

——— and MARVIN, T. C. A re-examination of the crater near Crestone, Colorado. Meteoritics, vol. 3, no. 1, pp. 1–10, May 1966.

MERRIHUE, C. M. Meteoritic trace element determinations by mass spectrometry of neutron-irradiated samples. Presented at the XXth International Congress of Pure and Applied Chemistry, Moscow, July 1965.

———. The origin of anomalous Xe^{129} in meteorites. Zeitschr. für Naturf., vol. 20A, pp. 961–962, 1965.

———. Xenon and krypton in the Bruderheim meteorite. Journ. Geophys. Res., vol. 71, pp. 263–313, 1966.

NOYES, R. W. *See* Beckers, Noyes, and Pasachoff.

NOZAWA, Y. A digital television system for satellite-borne ultraviolet photometer. Presented at the Symposium on Photo-electronic Image Devices as Aids to Scientific Observation, Imperial College of Science and Technology, University of London, London, September 1965.

OHRING, G., SAGAN, C., *et al.* Meteorological experiments for manned earth orbiting missions. Geophysics Corporation of America Tech. Rep. No. 66-10-N, 1966.

POLLACK, J. B. *See also* Sagan and Pollack.

——— and SAGAN, C. The infrared limb-darkening of Venus. Journ. Geophys. Res., vol. 70, pp. 4403–4426, 1965.

SAGAN, C. *See also* Ohring and Sagan; Pollack and Sagan; Shklovskii and Sagan; Swan and Sagan; and Walker and Sagan.

———. Primordial ultraviolet synthesis of nucleoside phosphates. *In* The Origins of Prebiological Systems, ed. by S. W. Fox, pp. 207–219. New York: Academic Press, 1965.

———. High-resolution planetary photography and the detection of life. *In* Proceedings of the Caltech-JPL Lunar and Planetary Conference, ed. by H. Brown, G. J. Stanley, D. O. Muhleman, and G. Münch, pp. 279–287. California Institute of Technology and JPL Publ., 1966.

———. Review of Mars, by R. S. Richardson. Amer. Scientist, vol. 53, pp. 478A–480A, 1966.

———. On radiative transfer in the atmosphere of Jupiter. Trans. Int. Astron. Union, vol. 12B, p. 215, 1966.

———. Mariner IV observations and the possibility of iron oxides on the Martian surface. Icarus, vol. 5, pp. 102–103, 1966.

———. The photometric properties of Mercury. Astrophys. Journ., vol. 144, pp. 1218–1220, 1966.

———. Planetary environments and biology. Astronaut. and Aeronaut., vol. 4, no. 7, pp. 12–22, 1966.

———. [Extensive contributions (chaps. 3, 9, 11, 12, 13, 15, 16, and 28 authored singly or with others) to Biology and the exploration of Mars, ed. by C. Pittendrigh, W. Vishniac, and P. Pearman.] Nat. Acad. Sci. Nat. Res. Council Publ. 1296, Washington, D.C., 516 pp. 1966.

——— Hanst, P. L., and Young, A. T. Further remarks on Martian NO_2. Planetary and Space Science, vol. 13, pp. 1003–1004, 1965.

———, Kilston, S. D., and Drummond, R. R. A search for life on earth at kilometer resolution. Icarus, vol. 5, pp. 79–98, 1966.

——— and Leonard, J. Planets. Time-Life Science Book, 1966.

——— and Pollack, J. B. An analysis of microwave observations of Venus. Journ. Res. NBS, vol. 69D, pp. 1583–1584, 1965.

——— and Pollack, J. B. Properties of the clouds of Venus. *In* Proceedings of the Caltech-JPL Lunar and Planetary Conference, ed. by H. Brown, G. J. Stanley, D. O. Muhleman, and G. Münch, pp. 155–163. California Institute of Technology and JPL Publ., 1966.

———. Radio and radar evidence on the structure and composition of the Martian surface [abstract]. *In* Proceedings of the Caltech-JPL Lunar and Planetary Conference, ed. by H. Brown, G. J. Stanley, D. O. Muhleman, and G. Münch, pp. 255–256. California Institute of Technology and JPL Publ., 1966.

———. On the nature of the clouds and the origin of the surface temperature of Venus [abstract]. Astron. Journ. vol. 71, p. 178, 1966.

SAGAN, C. and WALKER, R. G. The infrared detectability of Dyson civilizations. Astrophys. Journ., vol. 144, pp. 1216–1218, 1966.

SALISBURY, W. W. Generation of infrared and visible light by free electrons. Presented at Boulder Millimeter Wave and Far Infrared Conference, Estes Park, Colorado, August 1965.

———. Visible light from free electrons in vacuum. Presented at Technical Symposium, General Motors Defence Research Laboratories, Santa Barbara, California, October 1965.

SHAPIRO, I. I., LAUTMAN, D. A., and COLOMBO, G. Dynamics of orbiting dust particles. Presented at the Symposium on Meteor Orbits and Dust, Cambridge, Massachusetts, August 1965.

SHKLOVSKII, I. S., and SAGAN, C. Intelligent life in the universe. San Francisco: Holdenday, Inc., 1966.

SOLOMON, L. H. *See* Lovell and Solomon.

STECKER, F. W. *See* Fazio, Stecker, and Wright.

STROM, S. E., and KALKOFEN, W. The effect of departures from LTE on stellar continuum fluxes in the spectral-type range B5–A0. Astron. Journ. vol. 144, pp. 76–87, 1966.

SWAN, P. R., and SAGAN, C. Martian landing sites for the Voyager mission. Journ. Spacecraft and Rockets, vol. 2, pp. 18–24, 1965.

TILLES, D. Searches for noble gas evidence of cosmic dust. Presented at the XXth International Congress of Pure and Applied Chemistry, Moscow, July 1965.

———. Some studies of separated fractions of low accumulation-rate dust. Presented at the Symposium on Meteor Orbits and Dust, Cambridge, Massachusetts, August 1965.

———. Atmospheric noble gases for extraterrestrial dust [Reply to comments of R. A. Schmidt]. Science, vol. 151, p. 1015, 1966.

TSURUTA, S. Lack of homology in the oscillations of neutron stars. Nature, vol. 207, pp. 470–472, 1965.

——— and CAMERON, A. G. W. Cooling of neutron stars. Nature, vol. 207, pp. 364–366, 1965.

——— and CAMERON, A. G. W. Composition of matter in nuclear statistical equilibrium at high densities. Canadian Journ. Phys., vol. 43, pp. 2056–2077, 1965.

VERNIANI, F. *See also* Jacchia, Verniani, and Briggs.

———. Comments on Ceplecha's paper "Classification of meteor orbits." Presented at the Symposium on Meteor Orbits and Dust, Cambridge, Massachusetts, August 1965.

WALKER, R. G., and SAGAN, C. The ionospheric model of the Venus microwave emission: An obituary. Icarus, vol. 5, pp. 105–123, 1966.

WANG, C.–Y. Some geophysical implications from gravity and heat flow data. Journ. Geophys. Res., vol. 70, pp. 5629–5634, 1965.

———. On the calcite transitions to 20 kilobars [abstract]. Trans. Amer. Geophys. Union, vol. 47, p. 178, 1966.

———. Earth's zonal deformations. Journ. Geophys. Res., vol. 71, pp. 1713–1720, 1966.

WELTHER, B. L. *See* Liller, Welther, and Liller.

WHIPPLE, F. L. Knowledge and understanding of the physical universe as determinants of man's progress. Presented at the Bicentennial Celebration, Smithsonian Institution, Washington, D.C., September 1965.

———. Comets. *In* Advances in the Astronautical Sciences, vol. 19, ed. by G. W. Morganthaler and R. C. Morra, Amer. Astronaut. Soc., Washington, D.C., pp. 119–134, 1965.

———. Chondrules: Suggestion concerning the origin. Science, vol. 153, pp. 54–56, 1966.

———. On the satellite geodesy program at the Smithsonian Astrophysical Observatory. Presented at the VIIth COSPAR International Space Science Symposium, Vienna, May 1966.

WHITE, J. B. *See* Hawkins and White.

WHITNEY, C. A. Physical basis for the interpretation of the continuous spectra of pulsating variable stars. Presented at the 5th Symposium of Cosmical Gas Dynamics, September 1965.

WOLFE, W. C., BATTAN, L. J., FLEMING, R. H., HAWKINS, G. S., and SKORNIK, H. Earth science and space science. Boston: D. C. Heath Publ. Co., 1966.

WOOD, J. A. Meteorites and asteroids. *In* Advances in the astronautical sciences, vol. 19, ed. by G. W. Morganthaler and R. C. Morra, pp. 99–118. Washington, D.C.: Amer. Astronaut. Soc., 1965.

———. Metal grains in chondritic meteorites. Nature, vol. 208, pp. 1085–1086, 1965.

WRIGHT, F. W. *See also* Hodge and Wright.

——— and HODGE, P. W. Studies of particles for extraterrestrial origin. 4. Microscopic spherules from recent volcanic eruptions. Journ. Geophys. Res., vol. 70, pp. 3889–3898, 1965.

WRIGHT, J. P. *See also* Fazio, Stecker, and Wright.

———. Pulsation periods of general relativistic objects. Nature, vol. 208, p. 65, 1965.

Special Reports

SPECIAL REPORTS of the Astrophysical Observatory distribute catalogs of satellite observations, orbital data, and preliminary results of data

prior to journal publication. Numbers 181 through 215, issued during the year, contain the following material:

181 (August 9, 1965). Brightness changes in periodic comets, by F. Whipple and D. Douglas-Hamilton.

182 (August 11, 1965). On the physics and splitting of cometary nuclei, by F. Whipple and R. Stefanik.

183 (September 14, 1965). Catalog of precisely reduced simultaneous observations (No. S–1): Satellite 1960 Iota 2 (Echo 1 rocket body) for Nov. 17 and Dec. 28, 1964; Satellite 1961 Delta 1 (Explorer 9) for June 5–Aug. 6, Oct. 1 and Dec. 6, 1961, and Feb. 9–Mar. 1, 1962; Satellite 1961 Alpha Delta 1 (Midas 4) for May 30–July 14, 1962, June 11–28, July 1–Aug. 6, Oct. 26–29, and Nov. 2–28, 1963, and Feb. 9–Dec. 5, 1964; Satellite 1962 Alpha Epsilon 1 (Telstar 1) for Oct. 30–31, 1962, and Aug. 14–24, 1963; Satellite 1962 Beta Mu 1 (Anna 1B) for Nov. 17–21 and Dec. 19–21, 1962, Feb. 28, Apr. 22, Sept. 14, Nov. 22, and Dec. 9–21, 1963; Satellite 1963 30A for Dec. 6–25, 1964; Satellite 1963 30D (Balloon) for Jan. 12–Feb. 8, Apr. 4–June 13, and Sept. 13–Dec. 30, 1964; Satellite 1963 53A (Explorer 19) for Nov. 15–25, 1964; and Satellite 1964 38A (Elektron 3) for Dec. 6 and 8, 1964, prepared by R. Wells.

184 (September 20, 1965). Density variations in the heterosphere, by L. Jacchia.

185 (September 3, 1965). Catalog of precisely reduced observations (No. P–14): Satellites 1959 Alpha 1 (Vanguard 2), 1959 Eta 1 (Vanguard 3), 1960 Iota 2 (Echo 1 rocket body), 1961 Delta 1 (Explorer 9), 1961 Omicron 1 (Transit 4A), 1961 Omicron 2 (Injun Solar Radiation 3), 1961 Alpha Delta 1 (Midas 4), 1962 Alpha Epsilon 1 (Telstar 1) for Jan. 1–Mar. 31, 1963; Satellite 1962 Beta Upsilon 1 (Relay 1) for Dec. 16, 1962–Mar. 31, 1963.

186 (September 6, 1965). Determination of the absolute space directions between Baker-Nunn camera stations, by L. Aardoom, A. Girnius, and G. Veis.

187 (October 11, 1965). Transmission coefficient of the Baker-Nunn optical system, by F. Young and K. Hebb.

188 (October 13, 1965). The rotation of the planet Mercury, by G. Colombo and I. Shapiro (Revised November 15, 1965, and published as No. 188R).

189 (October 20, 1965). Determination of station coordinates from optical observations of artificial satellites, by W. Köhnlein.

190 (October 21, 1965). Some recent accurate laser satellite-range measurements, by P. Anderson, C. Lehr, and L. Maestre.

191 (October 22, 1965). Observation of the GT–5 rocket-body reentry—preliminary analysis, by L. Solomon.

192 (November 8, 1965). Aanlysis of artificial meteoritic spherules, by F. Wright and P. Hodge.

193 (November 12, 1965). Atmospheric densities and temperatures from the drag analysis of the San Marco satellite, by L. Jacchia and F. Verniani.

194 (November 15, 1965). On the accuracy of the gravitational potential as derived from camera observations of artificial satellites, by W. Köhnlein.

195 (December 10, 1965). Statistical evidence of the masses and evolution of galaxies, by T. Page.

196 (December 14, 1965). Radiation spikes in H II regions, by T. Page.

197 (January 24, 1966). Fluctuations and correlations in the expanding universe, by P. Eltgroth.

198 (January 28, 1966). Geometric structure of the earth's gravitational field as derived from artificial satellites, by W. Köhnlein.

199 (February 3, 1966). Atmospheric densities and temperatures from precisely reduced observations of the Explorer IX satellite, by M. Roemer.

201 (February 18, 1966). Kernel representations in the solution of line-transfer problems, by E. Avrett and R. Loeser.

202 (February 21, 1966). Observations of Gemini 6–Gemini 7 rendezvous, by J. Latimer.

203 (March 4, 1966). Cassini's second and third laws, by G. Colombo.

204 (March 11, 1966). Particle evaporation from excited nuclei, by H. Mitler.

205 (March 25, 1966). Photographic measurements of the energy distribution in the beam of a ruby laser, by C. Lehr, L. Maestre, and P. Anderson.

206 (March 28, 1966). A suggestion as to the origin of chondrules, by F. Whipple.

207 (April 1, 1966). The shape and location of the diurnal bulge in the upper atmosphere, by L. Jacchia and J. Slowey.

208 (April 4, 1966). Satellite orbital data: Satellites 1958 Alpha (Explorer 1), 1959 Alpha 1 (Vanguard 2), 1959 Eta 1 (Vanguard 3), 1960 Iota 1 (Echo 1), 1960 Xi 1 (Explorer 8), 1961 Delta 1 (Explorer 9), 1962 Alpha Epsilon 1 (Telstar 1), 1962 Beta Mu 1 (Anna 1B), 1962 Beta Tau 2 (Injun 3), 1962 Beta Upsilon 1 (Relay 1), 1963 13A (Telstar 2), 1963 26A (Geophysical Research), and 1963 30D for Jan. 1–Mar. 31, 1964; Satellite 1963 53A (Explorer 19) for Dec. 19, 1963–Mar. 31, 1964; Satellite 1964 4A (Echo 2) for Jan. 29–Mar. 31, 1964; and Satellite 1964 5A

(Saturn 5) for Jan. 30–Mar. 31, 1964, prepared under the supervision of B. Miller.

209 (April 5, 1966). Satellite orbital data: Satellites 1958 Alpha 1 (Explorer 1), 1959 Alpha 1 (Vanguard 2), 1959 Eta (Vanguard 3), 1960 Iota 1 (Echo 1), 1960 Xi 1 (Explorer 8), 1962 Alpha Epsilon 1 (Telstar 1), 1962 Beta Mu 1 (Anna 1B), 1962 Beta Tau 2 (Injun 3), 1962 Beta Upsilon 1 (Relay 1), 1963 13A (Telstar 2), 1963 26A (Geophysics Research), 1963 30D, 1963 53A (Explorer 19), 1964 4A (Echo 2), and 1964 5A (Saturn 5) for Apr. 1–July 1, 1964, prepared under the supervision of B. Miller.

210 (May 12, 1966). A study of flare stars, by L. Solomon.

211 (May 13, 1966). Measurements of satellite range with a ruby laser, by C. Lehr, L. Maestre, and P. Anderson.

212 (May 20, 1966). The polarization of celestial x-rays, by J. Dolan.

213 (May 27, 1966). Some new algorithms for stellar structure, by P. Usher.

214 (June 10, 1966). The decay of Satellite 1965 79A, by W. Hirst.

215 (June 20, 1966). Satellite tracking with a laser, by C. Lehr.

NOTES

[For explanation of notes, see footnote, page 181.]

[1] Supported in part by grant NGR 09–015–021 from the National Aeronautics and Space Administration (NASA).

[2] Supported in addition by the grant AF 65–531 from the U.S. Air Force (USAF) and by the Smithsonian Institution Hodgkins Fund.

[3] Supported by NASA grant NsG 87.

[4] Supported in part by the International Astronomical Union.

[5] Supported by grant GP–2999 from the National Science Foundation (NSF).

[6] Supported by NASA grant NsG 536 and NASA contract NSR-09–015–033.

[7] Supported in part by NASA contract NASr–158 and by National Bureau of Standards agreement CST–7332, both with Harvard University.

[8] Supported in part by NASA contract NAS 9–4873.

[9] Supported by USAF contract AF 19(628)–3248.

[10] Supported by NASA grant NsG 291–62.

[11] Supported in part by NASA grant NsG 460 to Harvard University.

[12] Supported by the National Academy of Sciences.

[13] Supported in part by NASA grant NsG 282–63 to Dr. Frondel of Harvard.

[14] Supported by NASA grants NGR 09–015–025 and NsG 87.

[15] Supported in part by the University of Hawaii, Institute of Geophysics.

[16] Supported by USAF contract AF 19(628)–4203 from the Office of Acrospace Research.

[17] Supported in part by NASA grant NsG 64–60 to Harvard University.

[18] Supported by NASA grant NsG 09–015–023.

[19] Supported in part by a grant from the Alfred P. Sloane Foundation.

[20] Supported in part by NASA grant NsG 89–60 to Harvard University.

[21] Supported in part by NASA contract NSR 09–015–022.

[22] Supported by NASA contract NAS 5–1535.

[23] Supported in part by NSF grant GP–4318.

[24] Supported in part by USAF contract AF 19(628)–3877 with Harvard University.

[25] Supported in part by the National Science Foundation.

[26] Supported in part by NASA grant NsG 438 to Harvard University.

[27] Supported in part by USAF contract AF 19(628)–3322 with Harvard University.

[28] Supported in part by the Advance Research Laboratory of Douglas Aircraft Company.

[29] Supported by NSF grants GP–3866 and GP–5791 to Harvard.

[30] With the cooperation of Jodrell Bank Experimental Station, and CSIRO of Australia; Cornell University.

[31] Supported by NASA grant NGR 09–015–025.

[32] Supported in part by Harvard University.

[33] Supported by a grant from the National Geographic Society.

[34] Supported in part by Boston University Department of Astronomy.

[35] Supported in part by the International Association of Geodesy.

Science Information Exchange

MONROE E. FREEMAN, *Director*

THE SCIENCE INFORMATION EXCHANGE performs a unique service for the national research community by providing a reasonably comprehensive source of pre-publication information about research that is planned or actually in progress. Under the leadership of the Smithsonian Institution since 1953, this program has attracted the participation and cooperation of research organizations throughout the country. The number of participating agencies has risen steadily, and now includes most of the Federal research programs, as well as those of a substantial number of private foundations, universities, industries, and state and city governments. Interest in the registration of foreign research is growing, and new sources of information are steadily added as SIE progresses towards its goal of a comprehensive, and eventually complete, collection of currently active research information.

As the registration of the Federal research programs has come closer to completion in 1966, more attention is being directed towards the non-Government sources. Growth of the inventory is expected to continue steadily, but at a slower rate in future years.

Many potential users throughout the scientific community are as yet unaware of the advantages of the role SIE plays in the free flow of scientific information exchange in the pre-publication phase, so that an equally important objective has been to encourage the use of SIE by all members of the scientific community. A continuing effort has

been to make these services better known, and readily available to all research scientists. Over 100 articles and news notes about SIE services have appeared in scientific journals and other news media during the year, many written or prepared by staff members. SIE staff members have responded to invitations to speak at professional meetings, informal conferences, symposia, and the annual meetings of such organizations as the Pharmaceutical Manufacturers Association, The Special Libraries Association, the American Chemical Society, and others.

Some 20,000 descriptive brochures were distributed to potential users, information display booths were set up at a number of professional society meetings, and almost a thousand visitors came to the Exchange during the year, many from overseas, to learn more about the Exchange, and how its services could be adopted to their needs.

Although the primary mission of SIE is to serve research scientists, SIE has undertaken a number of investigations on the effectiveness and efficiency of information systems. Studies have dealt with such problems as the level of professional training and experience required for effective information handling, new techniques for selective subject indexing, the organization of information for research management, a study on relevance and recall as the basic factors of effectiveness, and detailed cost and productivity analyses as a prerequisite for standards of efficiency and effectiveness. Six reports were presented at the Congress of the International Federation of Documentation; others have been published in various professional journals. A thesaurus of 4,000 commonly used terms in the field of water resources research was prepared for the Office of Water Resources Research. This will be printed and distributed by the Department of Interior. Other projects of increasing interest and activity at SIE are the modernization of computer files to inverted files and the conversion of selected linear tape files to random-access disc storage. Another project intended to increase efficiency and economy is the development of a unique last-term system with generic relationships automatically handled by computer programming. A project is being drawn up to establish a remote interrogation real time system for handling scientific subject matter on a cost-benefit basis comparable with established methods. The extensive experience of SIE in information handling, as well as its broad scope of subject interest, offers unusual opportunities for research. The research program is considered second only to the primary mission of service.

For most of the year, SIE was intensively studied by a survey team of the Battelle Memorial Institute. The survey of users and potential users clearly indicated general satisfaction with the information services,

but pointed out the need for comprehensive coverage and the need to make its services better known throughout the nation.

While the collection of research records has steadily climbed to over 100,000 records annually, the demand for services has increased even more rapidly (approximately 25 percent over 1965). About 50,000 reports of all kinds were requested. These vary from simple requests for a single document to the preparation of catalogs that include thousands of records covering broad subject fields. SIE is the national research cataloging center for water resources investigations and has initiated, upon request from several federal sources, the collection and organization of information about current studies related to urban problems. Dr. Scott Keyes, University of Illinois, will spend six months at SIE assisting in the organization of this program.

It is noteworthy that increasing interest in SIE has come from many foreign countries. Besides the many visitors from overseas, there have been increasing numbers of foreign research records voluntarily offered for registration. Information services are provided to overseas inquiries to the extent that they do not interfere with SIE's responsibilities to the Federal research agencies and the American research community.

Publications

The following papers by staff members of the Science Information Exchange were published:

DAVIS, W. F., JR. The Science Information Exchange: Communication, storage and retrieval of scientific information. *Poultry Science* (30 September 1965), vol. 44, no. 5.

FITZPATRICK, WILLIAM H. and FREEMAN, MONROE E. The Science Information Exchange: The evolution of a unique information storage retrieval system. *Libri* (fall 1965), vol. 15, no. 2.

FOSTER, W. R. and HERSEY, D. F. Indexer requirements for the recognition of scientific content and context. 1965 Congress, International Federation for Documentation (FID) Abstracts, October 10–15, 1965.

FREEMAN, MONROE E. Determining cost of information systems. 1965 Congress International Federation for Documentation (FID) Abstracts, October 10–15, 1965.

———. A national inventory of research in progress. *The Chemical Bulletin*, October 1965.

FREEMAN, MONROE E. The use of current scientific research information for administrative purposes. 1965 Congress International Federation for Documentation (FID) Abstracts, October 10–15, 1965.

———. Water resources research and information retrieval. Proceedings of the 10th Annual Conference, November 22–23, 1965, Texas A&M University.

———. The role of Science Information Exchange in the management of current research. *The Chemist* (December 1965), vol. 42, no. 12.

———. The role of Science Information Exchange in the management of current research—conclusions. *The Chemist* (February 1966), vol. 43, no. 2.

———, KOHN, EDWARD H.; FOSTER, W. R.: HERSEY, DAVID F.; and ROTH, HELGA. Information problems related to urban research. Conference Proceedings, 11 October 1965, sponsored by The Advisory Commission on International Relations, the Department of Housing and Urban Development, Science Information Exchange.

KREYSA, F. J. and FOSTER, W. R. A retrieval profile for current research information. 1965 Congress International Federation for Documentation (FID) Abstracts, October 10–15, 1965.

LONG, B. L., and HERSEY, D. V. A current awareness program for the field of water resources. 1965 Congress International Federation for Documentation (FID) Abstracts, October 10–15, 1965.

MARRON, H., and SNYDERMAN, M. On the economics of computer storage and retrieval. 1965 Congress International Federation for Documentation (FID) Abstracts, October 10–15, 1965; *American Documentation* (April 1966), vol. 17, no. 2.

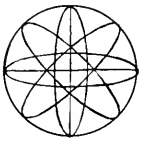
SUMMERS, R. W., and FREEMAN, M. E. Development of a programmatical technical index for the Office of Aerospace Research. 1965 Congress International Federation for Documentation (FID) Abstracts, October 10–15, 1966.

Smithsonian Activities

History and Art

Museum of History and Technology

ROBERT P. MULTHAUF, *Director*



HISTORICAL MUSEUMS ARE conventionally—and appropriately—composed of collections of familiar objects worthy of preservation either as exotic or archaic examples of the artifacts of daily life or as examples of things the collection of which is traditional. The visitor can hardly be surprised by the kind of things he finds in a museum; he can and should, however, find the unexpected in the individual object. This involves not only its quality, but innovations in display methods and in novel exploitation of these objects through the research activities of the museum. The activities of the Museum of History and Technology in utilizing collections which are otherwise conventional are well illustrated in the following account of the recent accomplishments and future plans of our division of numismatics.

Numismatics at the Smithsonian

Numismatics, a scholarly discipline at least since the 13th century, often suffered in prestige because of its early methods, which tended to be largely descriptive. It has emerged in recent times as an interpretive science in which the application of established data became the basis for broader research.

The Smithsonian Institution has been conducting a widely traced survey of numismatic cabinets and research groups within the framework of the general reappraisal of numismatics as a science. A product of this work is Elvira Clain-Stefanelli's review of past and present trends in numismatic research published in her *Numismatics—An Ancient Science* (1965).

Through years of research in numismatic cabinets throughout the world, the following general new trends have been noted:

1. Concentrated activities in the research and publication of source material: catalogs of coins of certain periods accompanied sometimes by introductory studies, such as those conducted by the British Museum, and numismatic cabinets in Copenhagen, Paris, Glasgow, Cambridge, Oxford, New York, and Boston.

2. Activities devoted to the registration, publication and sometimes interpretation of hoard finds, such as has been done in Stockholm, Hamburg, Paris, Vienna, Munich, Prague, Sofia, Bucharest, and Leningrad.

3. The publication of monographs on subjects which range the Orient and Occident from ancient to modern coins, and from historical medals to decorations, such as has been done in New York, Leningrad, Vienna, Prague, Tel Aviv, and elsewhere.

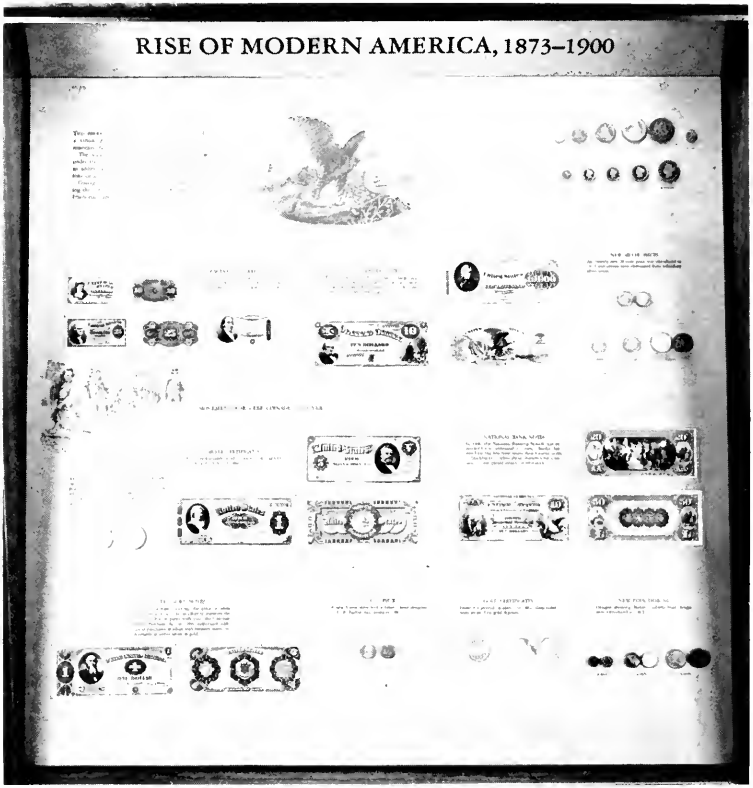
The Smithsonian's numismatists are participating in this comprehensive endeavor through a numismatic survey of Israel, begun in 1966, with particular reference to enlarging knowledge of the history of Israel's ancient money economy. This entails a gradual inventory of collections, drawing on materials found on or near ancient sites. Scatter finds and hoards are both of great significance, and local collections often provide excellent cross-sections of circulating media from the areas where they were assembled. A goal of this survey is to produce fully illustrated catalogs of collections which would make available to students material otherwise practically inaccessible for research, and would at the same time contribute to knowledge of monetary circulation patterns.

The purpose of the division of numismatics at the Smithsonian Institution is to accomplish a double-fold mission: to try to bring the great wealth of historic and artistic elements of numismatics to the attention of the general public, and to serve the advancement of the discipline through a well-planned activity of research and publications.

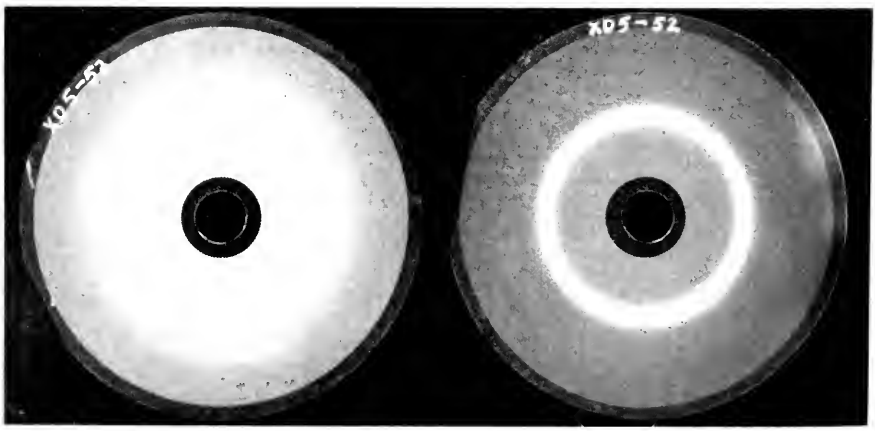
The search into the history of all forms of money—attempting to explain their origin, evolution, appearance, intrinsic qualities, and relation to economics, and their social and cultural history—is the real scope of numismatics as a scientific and historical discipline. This viewpoint has been taken by Vladimir Clain-Stefanelli in his forthcoming history of the national numismatic collections.

When the modern researcher examines the economic function of money, many new factors—such as cross-cultural valuation practices and distributive processes—enter his field of vision. Accordingly, numismatics has had to broaden its scope from that of a study restricted to metallic and paper currency to the science of all forms of exchange—including primitive media, money substitutes, and documents of value. Accordingly, the exhibit of numismatics in the Smithsonian Institution

Renaissance coin collector holding Sestertius of Nero (A.D. 54–68), by Hans Memling (1430–1494), photo courtesy Musée Royal, Antwerp. Below: New hall of numismatics.



Above: Typical display in new hall of numismatics, tracing history of money in the United States. Below: X-ray diffraction patterns of two coins: A struck silver stater (left), 6th century B.C., of Aegina (Greece) and a modern cast imitation, also silver, of the same coin. Clearly defined lines of right-hand pattern indicate the relatively undistorted crystalline structure of a metal casting; diffuse and broadened lines of the left indicate the distorted crystalline lattice of a cold-worked metal. Area represented is approximately 0.5 mm. in diameter, depth of X-ray penetration is on the order of 0.1 mm.



arranges displays of coins, tokens, and paper currencies in their historical and cultural context, rather than by the conventional catalog classification. The exhibits not only show the evolution of money by means of characteristic examples selected from crossroads of history, they also convey the spirit of various periods through the use of illustrations, background material, and reproductions of typical artifacts.

The history of art also offers a close and pertinent relationship with the field of numismatics; indeed, aesthetic qualities of coins have probably been until recently a most powerful inducement to collecting. Elvira Clain-Stefanelli's *Italian Coin Engravers Since 1800* (1965)—her most recent contribution to the elucidation of this field—is innovative in the study of the work of these Italian artists.

To the trained eye of the archeologist, coins may reveal aspects of civilizations which have disappeared and left few or no records. In many cases coins can help to date ancient monuments, the composition of coin hoards may serve as circumstantial evidence in tracing migrations, army encampments, trade routes, or tides of colonization and national expansion.

An example of pure research directed toward the specialist is X-ray diffraction analysis in numismatics to determine the crystal structure and spatial arrangement of atoms in the crystalline lattice of coins. This non-destructive method reveals significant information about coin manufacturing—whether struck or cast, and if struck, whether hot or cold struck. Thus we gain a better knowledge concerning coining methods of the past and in this way it is frequently possible also to distinguish between genuine and counterfeit coins.

Future plans of our division of numismatics call for the exploitation of all these avenues for the benefit of the National collections. The cooperation of all pertinent departments and museums of the Smithsonian Institution will be sought in the accomplishment of this purpose.

VLADIMIR CLAIN-STEFANELLI, *Curator*
ELVIRA CLAIN-STEFANELLI, *Associate Curator*
Division of Numismatics

Research and Publication

SCIENCE AND TECHNOLOGY

With the appointment of Robert P. Multhauf to the Directorship of the Museum of History and Technology, Walter F. Cannon took over as chairman of the department on May 31, 1966. Cannon is also editor of *The Smithsonian Journal of History*, the first issue of which was published in the spring of 1966. To fill the vacancy in the curatorship of tools caused by the promotion of Silvio A. Bedini to Assistant Director last year, Monte A. Calvert joined the staff this year. Calvert was formerly the curator of the Archives of Industrial Society at the University of Pittsburgh, and has a book-length study, *The Professionalization of the American Mechanical Engineer, 1830–1910*, accepted for publication by The Johns Hopkins Press.

Melvin H. Jackson, formerly associate curator in the division of naval history, joined the department in April as associate curator in the section of marine transportation. Jackson is continuing his researches in oceanic history and affairs.

The new cooperative graduate-teaching program with the University of Pennsylvania was initiated in January when Cannon went on leave to become the first Smithsonian visiting professor in the University's Department of the History and Philosophy of Science. He taught an advanced graduate course on "Physical Science from Young to Planck." Several students came to Washington to consult with our staff; Uta C. Merzbach and Calvert went to Philadelphia for individual class sessions and Ph.D. qualifying examinations. Standards for the M.A. and Ph.D. degrees were mutually agreed upon, and plans were made for next year, when Merzbach in the fall semester and Calvert in the spring will be visiting professors in Philadelphia.

Two curators were honored by professional bodies for their scholarship. In April Sami K. Hamarneh was the recipient of the Edward Kremers award for distinguished pharmaco-historical writing of the American Institute of the History of Pharmacy. He was cited at its 25th-anniversary symposium "for his meticulous scholarship and important revisionary interpretations concerning the history of pharmacy in Islamic culture." He has also been elected secretary of the section on historical pharmacy, and a member of the committee on awards of

the Institute. Multhauf's article, "Sal Ammoniac: A Case History in Industrialization," published in *Technology and Culture*, won the Usher prize of the Society for the History of Technology.

John H. White's book length monograph, *Cincinnati Locomotive Builders 1845–1868*, was published as a Museum bulletin. Three other books completed by the staff are in process of publication: Howard I. Chapelle, *Search for Speed Under Sail in North America, 1700–1855;* John H. White, Jr., *Representative American Locomotives Before 1880;* Bernard S. Finn, *Source Book on Thermoelectricity.*

Silvio A. Bedini completely revised and substantially enlarged his *Early American Scientific Instruments and Their Makers*, now out of print, and will republish it as *Scientific Instruments in 18th-Century America*, part two of a 3-volume work; his research is substantially advanced on the other parts—*Colonial American Scientific Artifacts* and *19th-Century American Instrument Makers and Dealers.* His monograph on the 17th-century Italian astronomer de Dondi, "Mechanical Universe," is to be published by the American Philosophical Society in the fall; and his book-length history of planetaria is in progress.

Robert M. Vogel completed a detailed industrial-archeological survey of the C. P. Bradway Machine Works of West Stafford, Connecticut, in cooperation with the Historic American Buildings Survey of the U.S. Department of the Interior. Under a Smithsonian research grant, Vogel obtained complete drawings, photographs, interviews, and written accounts of this small water-turbine factory, most of the machinery of which is largely unchanged since it was installed in 1890. The results give an unusually accurate view of the equipment and operational techniques of a specialized machine works of the period. Copies of the survey report have been deposited in the division's archival collections and in the HABS collection at the Library of Congress; a scholarly article describing the methods of the survey and its principal results is being prepared. Vogel also took part in a project to ensure the permanent preservation of a historical Bollman-truss bridge at Savage, Maryland, the last surviving example of the first system of iron trussing used by an American railroad, and he continued his cooperative work with the American Society of Civil Engineers on the location and preservation of historic sites and documents.

Edwin A. Battison continued to supervise the translation of Russian books through the National Science Foundation-Smithsonian Institution cooperative program. The third of the series is V. V. Danielevskii, *Nartov's Theatrum Machinarum.* The books have a technical introduction by Battison. He also continued preparation of an edition of Jacques Besson's *Theatrum Instrumentorum et Machinarum.*

Battison's investigation of the origin of the milling machine in America produced an article, "Eli Whitney and the Milling Machine," to be published in the second issue of *The Smithsonian Journal of History*. He continued to work with the group hoping to preserve as a museum the Robbins & Lawrence armory at Windsor, Vermont.

Monte A. Calvert completed the first draft of a book on American mechanical technology at world fairs, 1851–1876; and began a study of the American municipal engineer.

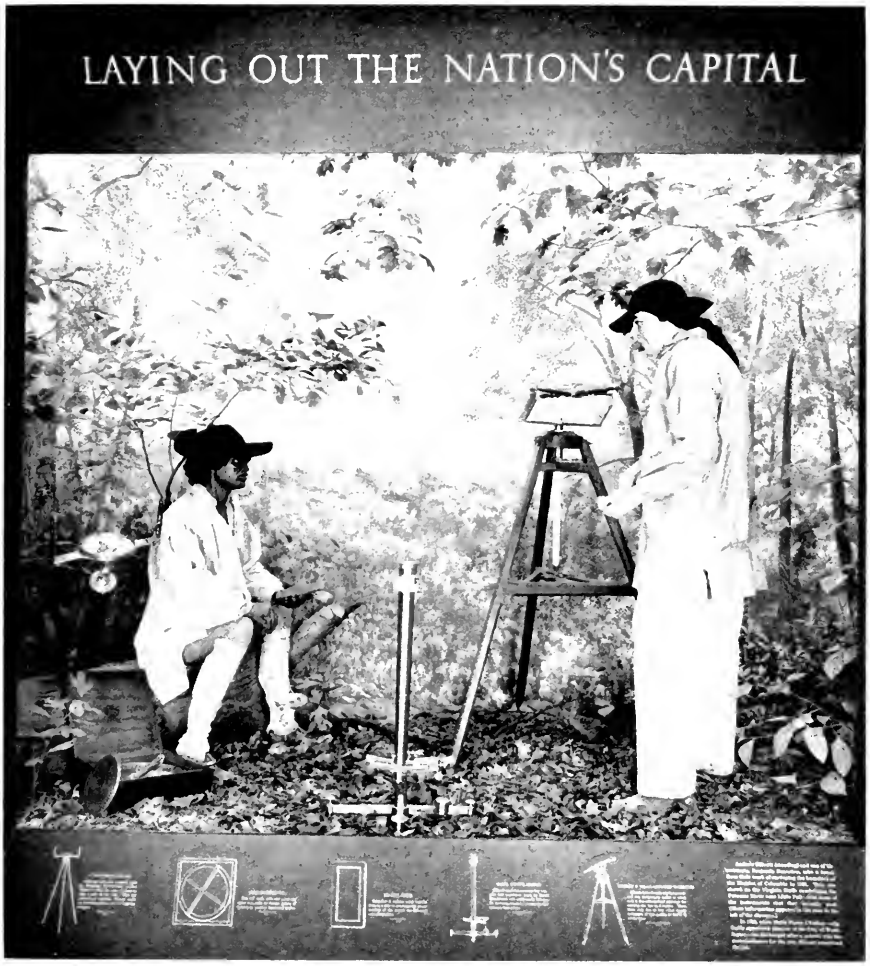
Bernard S. Finn continued his re-creation of the early history of the telephone through experiments with primitive telephone apparatus, in an attempt to understand Alexander Graham Bell's problems as he performed his experiments in the 1870s. The first results were given in a paper to the Society for the History of Technology at its annual meeting in December, and will be published in the third issue of *The Smithsonian Journal of History*. At the Eleventh International Congress of the History of Science, in Warsaw, Finn gave a paper on electron theories in the 19th century. He continued to serve as managing editor of *Isis*, the journal of the History of Science Society.

Howard I. Chapelle in October resumed his studies of the admiralty collection of draughts at the National Maritime Museum, London, then attended the World Fishing Boat Congress in Göteborg, Sweden. He also studied marine collections in Museums there and in Bergen, Oslo, Copenhagen, and Barcelona. He brought near to conclusion his search in the Public Records office, London, on 17th-, 18th-, and early-19th-century American ship building.

White's article on the use of locomotive advertising lithographs as detailed technical evidence, "Locomotives on Stone," was published in the first issue of *The Smithsonian Journal of History*, with four of the lithographs reproduced in full color. On a field trip to Copiapo, Chile, he studied and sketched a Norris locomotive of 1850; work that provided the Museum with a set of engineering drawings of this unique American locomotive.

Uta C. Merzbach continued her research on Liebnitz, delivering a paper on "Leibniz's Mathematical Contributions in the Context of his Time" at the Leibniz symposium held at Brooklyn Polytechnic Institute in spring 1966, and one on "The Interrelationship of Mathematics and Geographical Discovery" at the annual meeting of the Society for the History of Discoveries at the University of Indiana.

Deborah J. Warner published in the *American Scientist* a detailed study of the work of George Willis Ritchey, the American astronomer responsible for the development of the large photographic reflecting telescope, culminating in the 100-inch reflector on Mount Wilson.



Hall of physical sciences: Diorama showing Andrew Ellicott (right) and one of his assistants, Benjamin Banneker, taking a break from their work of surveying the boundary of the District of Columbia in 1791. They are shown on the Virginia bluffs overlooking the Potomac River near Little Falls with some of the instruments that they actually used. (In 1792, when Major Pierre L'Enfant—originally appointed planner of the City of Washington—was discharged after a quarrel with the commissioners for the city, Ellicott completed the job.)

Hall of physical sciences: Instruments used to lay out the Nation's Capital and for other precise surveying in the late 18th century. Some of these were used by Andrew Ellicott. On the right is the 6-foot zenith sector built by David Rittenhouse of Philadelphia, with additions by Ellicott. It was the most accurate scientific instrument built in this country in the 18th century.

ARTS AND MANUFACTURES

Curator John T. Schlebecker has in progress a scientific and technical history of American agriculture. With the assistance of a summer intern, this project should be accelerated in the coming year. His long-term study of American farm life in its socioeconomic aspects, begun in 1964, is also in progress, with publication not expected before 1969. Schlebecker is collaborating with Homer Socolofsky of Kansas State University in the preparation of a history of Nebraska agriculture in anticipation of the centennial of that state in 1967.

Schlebecker and the department chairman collaborated with Wayne Rasmussen, historian of the Department of Agriculture, and an ad hoc committee of the Departments of Agriculture and Interior to examine a proposal for a series of "Living Historical Farms." Suggested by Marion Clawson of Resources for the Future, Inc., these farms would be operated under conditions and with the crops typical of various time periods in the growth of American agriculture. A proposal for financing the detailed preliminary study, prepared by the Museum of History and Technology representatives, is now before the Secretaries of Agriculture and Interior. It is expected that the division will continue to work with the committee in an advisory capacity.

Museum technician Thomas Wessel, under the direction of the curator, is working on a history of the shelterbelts of the Great Plains, 1874–1967.

In the division of ceramics and glass, compilation of the catalog of the Hans Syz collection continued, involving research by curators Paul V. Gardner and J. Jefferson Miller II in some fifteen private and museum collections and correspondence with many European collectors and museums. Dr. Hans Syz, donor of the collection, spent several days on this project each month at the Smithsonian and additional time in Europe and Westport, Connecticut.

Gardner's biography of Frederick Carder is scheduled for completion in fall 1966. During the year he completed a definitive compilation of Steuben designs, and continued work on a catalog of the International Congress on Glass Exhibit, 1962, and a Museum handbook on millifiori glass at the Smithsonian Institution.

Noteworthy among the six lectures given during the year by Gardner were "The Hans Syz Collection of 18th Century European Porcelain at the Smithsonian Institution," at the Antiquarian Society of The Art Institute of Chicago, November 23, 1965; and "Eighteen-Century Chinese Export Porcelain," at the National Society of Arts and Letters, Washington, D.C., March 1, 1966.

In addition to his work on the catalog on the Hanz Syz collection associate curator J. Jefferson Miller began studies of ceramic artifacts recovered in archaeological excavations at Alexandria, Virginia, and Fort Michilimackinac, Michigan. His eight lectures during the year included one on "English Porcelain of the 18th Century," at the Washington Antique Show, January 1966. In September 1965 Miller chaired a 3-day session on ceramics at the Pennsylvania Historical and Museum Commission annual Americana Forum at Pennsbury Manor. He will conduct the ceramic seminar again in October 1966. In May 1966, Miller was elected a Trustee of the Wedgwood International Seminar.

Curator Jacob Kainen completed a study of the etchings of Antonio Canal, called Canaletto (1697–1768). Now in press, the study will include illustrations of all of Canaletto's etchings. Kainen also continued work on his study of the prints of Hendrick Goltzius, contributed several articles to the *New Catholic Encyclopedia*, and served on the editorial board of *The Smithsonian Journal of History*.

Associate curator Peter Morse published a paper on Rembrandt's etching technique, using as an example an etching from the Smithsonian's graphic arts collection. He began research for a catalogue raisonné of the prints of John Sloan.

Kainen served as panelist for a symposium, "Originality in Prints," held February 15, 1966; and as judge for the Scholastic Art Awards Competition, the Winston-Salem Gallery of Fine Arts Annual Show, and the All-Army Photographic Exhibition. He lectured to the B'nai B'rith Youth Organization on contemporary Israeli prints and to the Washington Print Club on contemporary Japanese prints; and he presented a series of lectures on modern industrial printing to a group of F.B.I. document inspectors, to help in determining fraud and forgery. In addition, he had an exhibition of his own paintings at the Roko Gallery in New York in March 1966. Kainen and Morse visited New York in October 1965 to study modern printmaking techniques and to obtain new prints for exhibition. Morse was a juror for an art exhibition sponsored by the Internal Revenue Service and served throughout the year as first editor of the Washington Print Club *Newsletter*.

Associate curator Eugene Ostroff was awarded a 3-year research grant to continue his work, started last year, on the preservation and restoration of photographs, and he prepared interim reports for publication.

In the Smithsonian collection Ostroff uncovered the earliest extant example of W. H. Fox Talbot's experiments with light-sensitive materials, a picture made in 1835 that predates his first photographic

negative invented in 1839. The example consists of a paper print made from an artifically created negative. Talbot coated a sheet of glass with a darkened varnish through which he scribed lines. Paper coated with a light-sensitive solution was placed in contact with this negative and exposed to light. In cooperation with Kodak Research Laboratories, Rochester, New York, Ostroff examined the faded print with self-emission and low-voltage X-ray photography, direct infrared and ultra-violet photography, infrared luminescence photography, and photographic contrast enhancement. These tests revealed the written message "June 20th 1835, written with a pencil of tin, Lacock Abbey, Wilts." and the alphabet from A–Z.

In cooperation with Kodak Research Laboratories, chemical analyses were also conducted on the early Fox Talbot experimental material uncovered by Ostroff during his 1965 European field trip. The results are being analyzed and the findings are being prepared for publication.

Ostroff visited paper mills which manufacture photographic bases to survey quality-control techniques. Laboratory test procedures were established for investigating photographic image fading and the appropriate investigations were started.

Museum technician David Haberstich assisted Ostroff in his research related to the preservation and restoration of photographs. Applying optical restoration procedures wherever necessary, Haberstich photocopied a large group of important early photographic experiments by Fox Talbot and he assisted in the regulating and standardization of new laboratory research equipment.

Curator Grace R. Cooper continued her research on the spinning wheel in America in the 17th through 19th centuries. She has completed an initial survey of private and public collections in 29 states. Completion of this project is scheduled for the coming year. As a senior technical editor for *Encyclopaedia Britannica*, Mrs. Cooper reviewed a number of new textile articles for technical content, and she outlined and recommended the reorganization of several existing articles.

Associate curator Rita J. Adrosko continued her research on the use of natural dyes in 18th- and 19th-century American textiles. The results will be included in an ICOM report on "Dyestuffs Used in the Past for Dyeing of Textile Materials in America." Her investigations of Jacquard-woven silk pictures and Jacquard imitation tapestries continued. She also began research on 19th-century French shawls; extensive information on this subject was gathered during October and November 1965 when she visited various textile centers in France and also attended the biannual meeting and technical

sessions of the Centre International d'Études des Textiles Anciens, October 14–26.

Museum specialist Doris Bowman continued her study of early machine-made nets. Additional examples were located and identified. A monograph of this research is in preparation.

Acting curator Philip W. Bishop presented a paper at the annual meeting of the Society for the History of Technology on the growth of the American iron industry in relation to the development of the American economy through 1865. Using the techniques employed in the study of developing economies as evolved in recent years, the paper, which is being expanded for publication, involves a new approach to the technological history of the first half of the 19th century in America. Considerable research has been done in connection with the introduction of rolled iron and steel beams, arising out of a paper presented in preliminary form by Robert A. Jewett of the School of Engineering of the University of Illinois. Bishop also continued research into the origins of drilling methods employed in the United States. This involved collaboration with J. Edward Brantly, who is working on a definitive history of drilling for the American Petroleum Institute.

The coal research activities of associate curator John N. Hoffman were concentrated on the development of a suitable script for the hall of coal. He has been working closely with representatives of the coal industry. The history of the mechanization of the bituminous coal industry and the relation of the development of American anthracite resources to the evolution of transportation methods in the early 19th century were studied, and a number of contemporary archives were discovered.

All members of the department gave lectures in the graduate courses in American civilization organized by the department of American studies in collaboration with The George Washington University.

The department has been host to three Smithsonian Fellows: Elizabeth Harris of the University of Reading, England, who studied the development of early photomechanical printing methods, using the Museum's large collection in this field; James H. Brewer of North Carolina State University, who studied the contribution of the Negro artisan to the Confederate war effort; and Henry J. Kauffman of Millersville State College, Pennsylvania, who is preparing a history of technology for the use of the undergraduate. All have profited from access to the collections and the curators of the Museum, and have amply demonstrated the value of the fellowship program to the scholar and his host.

CIVIL HISTORY

The increasing interest in historic archeology as a scientific tool in the study of history was reflected in a 3-day seminar on the role of historic archeology, of which C. Malcolm Watkins, curator of cultural history, was chairman. Participants, who ranged from classical archeologists and anthropologists to historians and curators, were drawn from universities and museums extending from Exeter, England, to San Francisco.

An application of the role of the historic archeologist was demonstrated as a result of a request by the Urban Renewal Agency of Alexandria, Virginia, for assistance in salvage archeology in the Gadsby Urban Renewal area of downtown Alexandria. Archeological aid Richard J. Muzzrole, of the division of cultural history, was assigned to this task. He worked under dramatically adverse conditions, between the motions of bulldozers and piledrivers, to salvage rich material evidence of urban life in a Federal-period town. Many hundreds of artifacts recovered from wells and privy pits that had been filled between 1790 and 1835 provided a detailed picture of the ceramics, glass, and other objects that belonged to merchants, shop-owners, and inn-keepers of the time. This type of cooperation between the city of Alexandria and the Smithsonian Institution could well be a model for collaboration between urban renewal administrators and archeologists wherever historic areas are about to be disturbed and opportunity can be seized to secure knowledge and preserve evidence of the historic past.

In furtherance of the effort to develop research in the field of political campaigning, associate curator Keith E. Melder, in charge of the division of political history, organized a conference June 2–3, 1966, on needs and opportunities in the study of political campaigning. A panel of historians, political scientists, and representatives of the communications media discussed the scholarly neglect of campaigning, the 20th-century revolution in campaigning, and campaign collections and resources for their study.

Chairman Richard H. Howland, devoting a considerable part of his time to special assignments, continued to serve as chairman of the managing committee of the American School of Classical Studies, at Athens. He made three brief trips to the School, in October, January, and June, in connection with the initiation of a major excavation campaign in the ancient Agora of the city of Athens. He continued as a member of the 12-man U.S. National Committee of ICOMOS (International Council of Monuments and Sites), representing this committee and the United States at the annual meeting in Vienna of IBI (Internazionales Burgen Institut), and he read a paper at the joint meetings of IBI and the Oesterreichische Burgenverein.

Curator V. Clain-Stefanelli, of the division of numismatics, participated in Treasury Department hearings concerning the importation of certain gold coins, and continued his co-operation with the Treasury Department's Office of Domestic Gold and Silver Operations, in connection with establishing the status of gold coins and medals. He is engaged in developing practical procedures regarding the authentication of gold bars. He also conducted a survey of numismatic museums in Istanbul, Athens, Sofia, Bucharest, Moscow, and Leningrad, part of a long-range project that also includes a numismatic survey of Israel.

Associate curator Elvira Clain-Stefanelli addressed the Congress of the International Federation of the Medal in Athens, Greece, as United States delegate. For this occasion she prepared a special exhibit of contemporary United States medals. Mrs. Clain-Stefanelli was re-elected a member of the Central Bureau of the International Congress of the Medal.

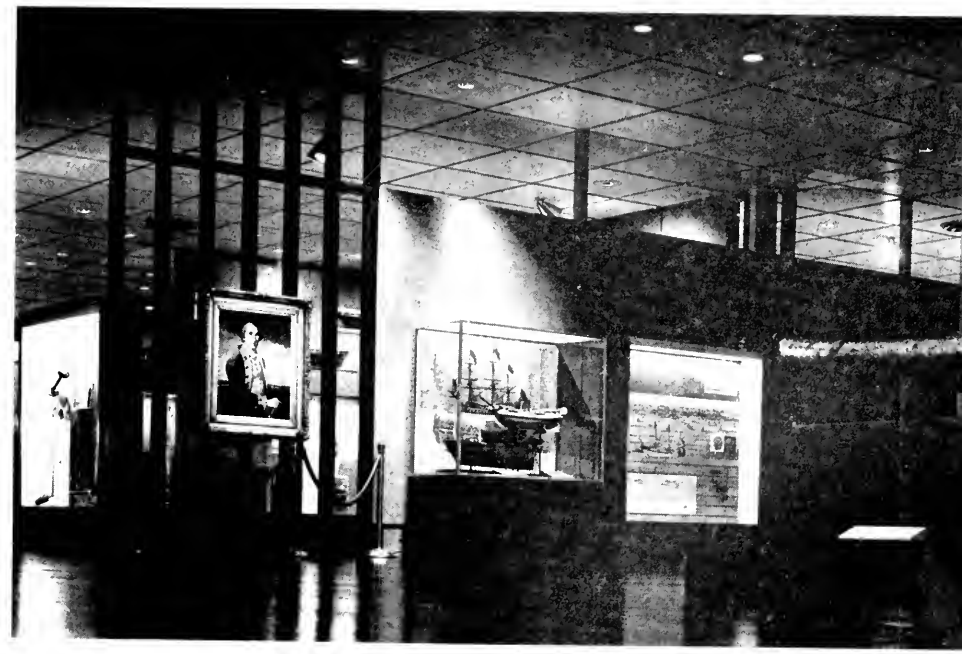
John Fesperman, newly appointed to supervise performance activities in the division of musical instruments, arranged for concerts by invited musicians who used the Smithsonian's 18th-century German clavichord, the Barak Norman gamba, and the Shudi and Dulcken harpsichords. Museum specialist Scott Odell spent several days in southwestern Virginia searching for and interviewing traditional dulcimer players. Several were found and tape recordings made of their playing in preparation for a record documenting this neglected and fast-disappearing folk tradition.

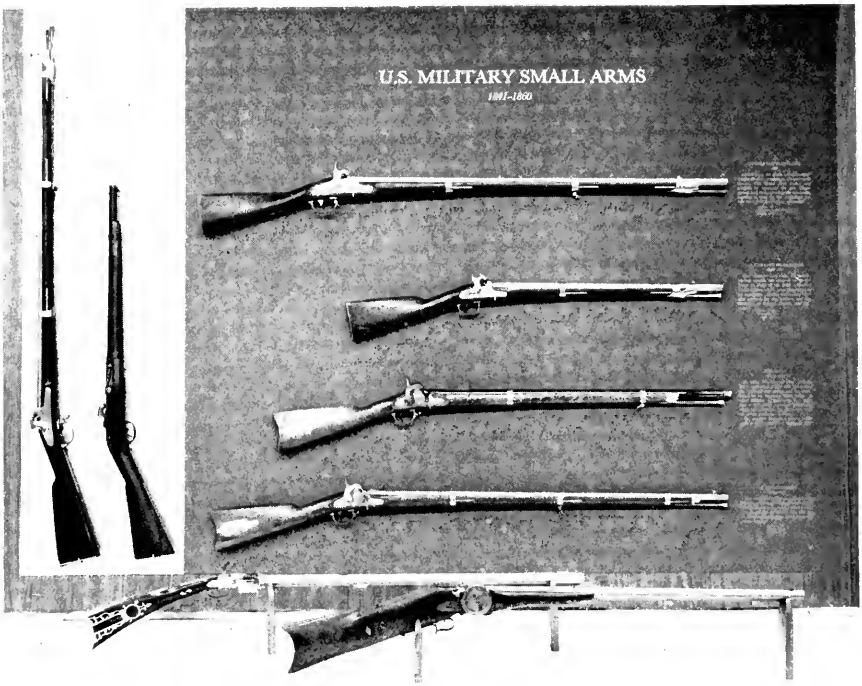
Extensive progress on the development of the iconographic file of illustrations of musical subjects represented in art was made by museum technician Helen Hollis. This archive, now numbering about 850 items will provide the Smithsonian with a valuable source of research information about the history of the construction and use of musical instruments.

Professor George E. Hargest of Clark University completed a survey and historical interpretation of 237 pieces of transatlantic mail in the collection of the division of philately and postal history. The work resulted in an important record of mail carried before the reform and standardization of international postal rates under conventions of the Universal Postal Union, effective in 1875. Professor Hargest's manuscript not only documents the holdings of the division with respect to this type of mail, but summarizes and interprets the various 19th-century postal treaties between the United States and foreign countries.

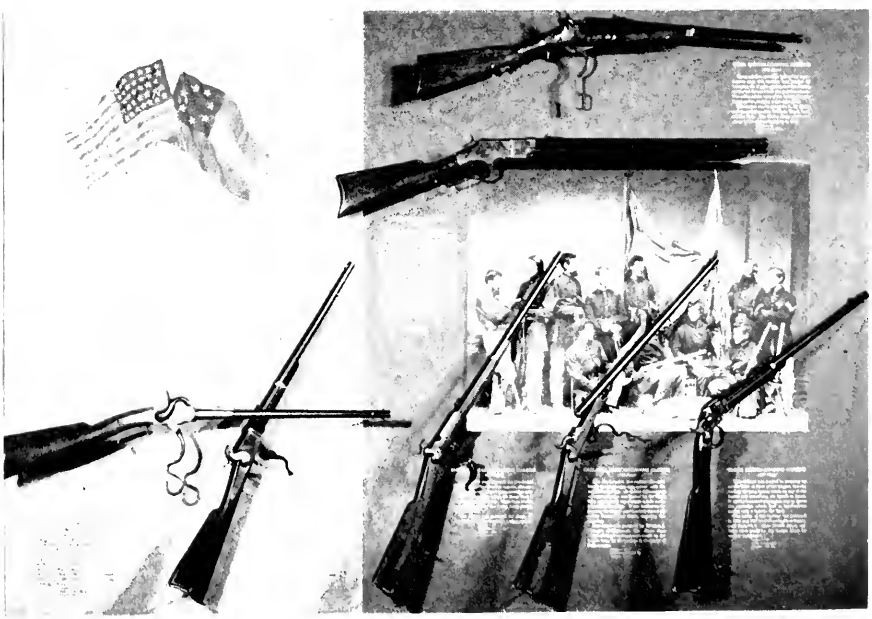
Associate curator Carl H. Scheele, in charge of the division of philately and postal history, completed a manuscript dealing with the general field of postal history, surveying postal services abroad from

Hall of medals and decorations: American eagle sculptured in wrought iron marks entrance to section of the hall. Below: Portion of series of halls illustrating U.S. armed forces history through the Civil War, opened this year along with hall of ordnance.





Hall of ordnance: Two of a series of exhibits illustrating the development of small arms.



ancient times to the 19th century, and American postal services from Colonial times to the present.

ARMED FORCES HISTORY

Underwater exploration and research into its methods and procedures continued as the major project of chairman Mendel L. Peterson.

An expedition to Bermuda during July and August explored wreck sites dating from the late 16th through the 19th centuries. A major accomplishment was the removal of a midship section of a large, as yet unidentified, Spanish ship believed to date from the late 16th century. This section is being preserved and will form an important element in a reconstructed site in the hall of underwater exploration. The section was removed by hand sawing with a crosscut saw and involved a considerable amount of physical exertion. The inner planking, floor timbers, futtocks, and sheathing of the ship were all carefully numbered as they were removed and will be reassembled exactly as found. In sectioning the ship a gunport cover was found, a discovery that gave additional information on the above-deck appearance of the vessel. Other areas under the remaining timber of the ship remain to be explored and are expected to yield additional artifacts which may be useful in establishing the exact identity of the ship.

Another site, potentially of importance to the history of the glass trade, was a site with an associated date of 1783 which yielded a large quantity of fragments of table glass. Over forty distinct forms were recognized in the many hundreds of specimens recovered. This cargo may have originated in England but a thorough search of the Bermuda Archives failed to identify the site definitely. It is possible that the cargo contains American as well as English glass and that it was transshipped, a fact which would add to the difficulties of exact identification. Even if not associated with a particular ship, however, the collection is important since it represents a precisely dated cargo which will be important in dating other table glass found in collections ashore.

Several other wreck sites which warrant further exploration included the *General Armstrong*, a sailing vessel of the Civil War period, the *Minnie Brassler*, a Confederate blockade runner, and an unidentified Spanish ship of the late 17th or early 18th centuries.

Museum specialist Alan B. Albright continued an investigation into the preservation of water-logged wood with polyethylene glycol, the

use of ultrasonics in the cleaning of encrusted objects, and the vacuum impregnation of wet organic materials.

The addition of a museum technician to the staff gives additional stimulus to the program for the preservation of materials recovered from underwater sites. Thaddeus S. Moore, who joined the staff in January 1966, is restoring several significant ceramic vessels dating from the 16th through the early 19th centuries. Much of the work of the laboratory now concerns itself with the preservation of the large section of ships' timber removed from the late 16th-century wreck site in Bermuda.

Chairman Peterson completed two papers relating to ordnance recovered from underwater sites: "Ordnance Materials Recovered From a Late Sixteenth Century Shipwreck Site" and "Wired Ball for Small Arms 1594–1715." Both of these papers will appear in *Military Collector and Historian, Journal of the Company of Military Historians.* He delivered some thirty lectures on the underwater exploration program during the year to professional and lay groups.

Curator Edgar M. Howell and museum specialist Donald E. Kloster accelerated work on a comprehensive, descriptive, critical, and documentary catalog of United States Army dress to include uniforms, headgear, and footwear. The first volume of this project, covering the subject of headgear through 1854, is complete and ready for editing. Much of the research for the second volume, that on uniforms through 1854, is complete, and work is continuing. This research is being performed in conjunction with a comprehensive recataloging and documenting of the uniform collections, a particularly significant project in that these, comprising more than 1,200 American uniforms plus a large number of foreign ones, are the most comprehensive in existence.

Howell has greatly expanded his efforts to locate original graphic material illustrative of the role of the United States Army in the opening and development of the West, publishing a third monograph and working on a fourth and fifth on the subject. This is a long-range and continuing project.

Kloster has completed most of the research on a monograph on Quartermaster General Montgomery C. Meigs' first attempt to publish specifications for clothing and equipage in his efforts to establish and maintain rigid standards for these types of materiel procured by the Army. The monograph, which will be illustrated, will include heretofore unpublished specifications, with documentation, for the period from the Civil War through 1872.

Between June 1 and July 4, 1966, associate curator Craddock R. Goins, Jr., participated in the Fourth International Congress of Museums of Arms and Military History in Moscow, and examined

weapons collections in Stockholm, Moscow, Leningrad, Vienna, Paris, Brussels, and London. His studies were directed toward identifying and documenting European arms in the collections of the Smithsonian Institution for publication in a catalog of the collections.

Colonel B. R. Lewis, USA (Ret.), consultant to the division, completed his manuscript "Small Arms Ammunition Displayed at the International Exposition, Philadelphia, 1876, Prepared by the Frankford Arsenal." In addition to being an excellent catalog of the display, which is now part of the Museum collections, Colonel Lewis' manuscript is a valuable study of the development of small-arms ammunition during the first three quarters of the 19th century.

Curator Philip K. Lundeberg revised for publication in two forthcoming issues of the *Smithsonian Journal of History* his study on the impact of undersea warfare upon Allied strategy during World War I. In this revision he examined more closely the technological, diplomatic, and geographical factors that discouraged Great Britain from undertaking the celebrated "Baltic Project," an amphibious thrust through the Danish Straits against the Baltic coast of Germany.

During the year Lundeberg conducted research at Philadelphia and Washington on the Continental gondola *Philadelphia*, publishing thereon a brief survey pamphlet entitled "The Continental Gunboat *Philadelphia* and the Northern Campaign of 1776," which includes an illustrated account of the Battle of Valcour Island, as well as a description of the raising and preservation of the *Philadelphia*. Final revisions and additions were made by Lundeberg to the American contribution to the *Bibliography of the Great Sea Routes* sponsored by The International Commission on Maritime History of UNESCO. A final report on this major international bibliographic enterprise was presented by Dr. Lundeberg in November 1965 at the Annual Meeting of the Society for the History of Discoveries held at the University of Indiana. Work continued on the catalog of United States warship models, and a special study of the 44-gun British ship-of-the-line *America* (1749) was well advanced by Merritt A. Edson, Jr., of Washington, D.C.

During the year associate curator Melvin H. Jackson continued his survey of cannon produced by Jan and Pieter Verbruggen between 1751–1782 as part of his study on fifty foundry drawings of Pieter Verbruggen. In addition Jackson continued his research on the history of the American privateer *Prince of Neufchâtel*. Material secured from British Admiralty archives, records of the Port of Brest, France, the United States National Archives, and the records of the New York Surrogate Court revealed much new information on the owners and fighting career of this celebrated privateer of the War of 1812.

During the year exhibits specialist Howard Hoffman prepared detailed plans of the Continental gondola *Philadelphia*, including drawings of her ordnance, anchors, and deck furniture, based on his detailed survey of that historic vessel. In addition, Hoffman prepared detailed plans for the gun carriage of a late-18th-century carronade and a privateer's deck section appropriate for its exhibition.

In association with the Naval Historical Foundation, the division of naval history continued a series of lectures on naval and maritime history. On October 14, 1965, Rear Admiral John B. Heffernan, former Director of Naval History, Department of the Navy, lectured on "The Union Blockade, 1861–1865," illuminating that critical maritime aspect of the Civil War by distinguishing between the concept of an effective and an efficient blockade. In addition, the division sponsored an illustrated lecture on February 17, 1966, by the noted British maritime historian, Commander David W. Waters, on "Convoy in the Age of Sail and Today."

AMERICAN STUDIES

Late in December 1965, a department of American studies was set up in the Museum of History and Technology and Wilcomb E. Washburn, formerly curator of the divison of political history, was appointed its chairman.

The principal function of the department is to carry on an American Studies Program in cooperation with universities throughout the country. An orientation seminar in the material culture of the United States, designed to acquaint graduate students in the local universities with the resources and with the scholars of the Museum, was offered during the spring semester of 1966. George Washington University was the only university administratively able to participate in the 1966 program, but the University of Maryland and other local universities are scheduled to participate when the Seminar is given again in spring 1967. Reading courses with individual members of the staff of the Museum and thesis direction are also available under the Program, and the first doctoral candidate was accepted. He will work under the joint supervision of Washburn and the chairman of the department of history at the University of Delaware on the development of museum education at the Smithsonian in the period of Spencer F. Baird and G. Brown Goode. As knowledge of the program spread, inquiries were received from department heads throughout the country, and tentative arrangements for advanced research by other graduate students were discussed. The program is expected to open up many

unexploited areas of research in material culture to doctoral students in American universities.

A second responsibility of the department of American studies is to plan a proposed Historical Studies Center, that will involve a historic sources survey, a historic sites survey, and other programs designed to make museum resources in the United States better known and more effectively exploited.

In August 1965 Washburn attended the International Congress of the History of Science at Warsaw and at Cracow, Poland; and in August–September 1965 the International Congress of Historical Sciences at Vienna, Austria, where he represented the Society for the History of Discoveries at the meetings of the International Commission on Maritime History. He prepared papers for the annual meeting of the American Indian Ethnohistoric Conference in Tucson, Arizona, on "Philanthropy and the American Indian"; and for the North American Fur Trade Conference, St. Paul, Minnesota, on "Symbol, Utility, and Aesthetics in the Indian Fur Trade." In November 1965 he presided at the annual meeting of the Society for the History of Discoveries at the University of Indiana.

Lectures were delivered by Washburn in March 1966 at the National Bureau of Standards on "The Evolution of Government Science Policy in the Nineteenth Century," with special reference to the Smithsonian Institution; and in June 1966, at the Foreign Service Institute, Department of State, on "Values in United States History."

GROWTH OF THE UNITED STATES

Curator Peter C. Welsh continued his work on the Harry T. Peters lithography collection, the Van Alstyne folk art collection, and upon various aspects of technological history, principally, the implements of the handcrafts. The principal work completed this year has been the manuscript, "Track and Road," a history of the American trotting horse based upon the visual record preserved in the Peters lithography collection. The principal publications by this curator have been *American Folk Art: The Art and Spirit of a People*, published by the Smithsonian Institution, and the article "The Metallic Woodworking Plane" which appeared in *Technology and Culture*, January 1966.

Assistant curator Anne Castrodale prepared the catalog entries for about 150 objects from the Eleanor and Mabel Van Alstyne Folk Art collection included in *American Folk Art: The Art and Spirit of a People*, by Peter C. Welsh. She completed the editing of the journal of William Wood Thackara, a volunteer from Philadelphia in the

War of 1812, and continued her study of the life and work of the 18th-century Philadelphia cabinetmaker Daniel Trotter.

Museum technician Robert R. Macdonald has been researching the history of the Benjamin Franklin press, and also tanning in the United States during the later half of the nineteenth century. He assisted in the preparation of a proposed exhibition on the Victorian woman and prepared the bibliography for it.

Laboratory of about 1790 in hall of chemistry. Nearby is an exhibit depicting a chemistry laboratory of the 1890s. Below: 1890 American pharmacy in hall of medical sciences. The fixtures were, until 1958, part of a drug store located in southeast Washington, D.C.

Starting late in spring 1966, lecture-demonstrations on the effect of nuclear radiation on plants, animals, and foods were given by staff members of the Oak Ridge Institute for Nuclear Studies, which sponsored the project. The exhibit also illustrated the use of radioisotopes in medicine.

The Collections

CARE AND CONSERVATION

SPECIMENS ACCESSIONED, IDENTIFIED, AND DISTRIBUTED—FISCAL YEAR 1966

Departments	*Accessions (transactions) 1966 (new)*	*Received on loan*	*Exchanged with other institutions*	*Transferred to other Government agencies*	*Lent for study to investigators and other institutions*	*Specimens identified*
Science and Technology	191	373	1	1	98	10
Arts and Manufactures	225	66	1	0	199	1,986
Civil History	675	123	0	1	1,011	146,505
Armed Forces History	114	5	0	1	3	1,788
TOTAL	1,205	567	2	3	1,311	150,289

As halls become completed, more staff time can be devoted to rearrangement of reference collections and up-dating of catalogs and files. This has begun in the division of electricity and in the growing archives of mechanical and civil engineering. Unpacking and storage of the very large James Arthur watch and clock collection is being carried out so as to eliminate later rearranging and recataloging.

In addition to the usual restoration work, we have a growing program of returning objects to operational status, both for making up more interesting displays and for facilitating research into the acutal utility and accuracy of the objects. Thus a number of internal combustion engines to be shown operating in the hall of heavy machinery were restored under the direction of technician William K. Henson, and the difficult task of restoring early television sets was undertaken by technician Roy V. LaRoche. Operating exhibits interest the public very much, but require much maintenance; thus many of the clocks in the timekeeping hall have required cleaning, lubrication, and the replacement of worn elements this year.

A survey of the entire agriculture and forest products collection is in progress to determine the need to eliminate redundant material, and

the collection of approximately 2,000 photographs on farm machinery implements and processes is being organized and cataloged.

Transfer of the reference collections of ceramics and glass to the Museum of History and Technology was completed, and plans were made to arrange, inventory, and index them. The move was greatly expedited by the assistance of Museum Specialist Abraham Richards and Technicians John Carter and Francis Gadson of the division of manufactures and heavy industry. Twelve important pieces in the Hans Syz collection were repaired during the year.

Research fellow Elizabeth M. Harris and museum technician James W. Norwood have undertaken a complete re-arrangement of the important collection of photomechanical prints in the division of graphic arts. Dr. Harris identified and documented numerous items hitherto undescribed, and with the help of Norwood made much-needed repairs on damaged specimens. Associate curator Eugene Ostroff treated a small selection of the collection's most valuable photographs with the new technique, devised by him, for restoring faded photographs though neutron irradiation. Museum specialist Elliott Hawkins continued a long-range project of verifying equipment specimens with catalog cards, and he is systematically arranging the collection.

The textiles laboratory completed the technical analysis and wet-cleaning of 86 items. Especially challenging were three bagpipe covers from the musical instrument collections, each of which had an outer leather cover and a separate inner lining that had obsorbed the sugary compound used to soften the leather of the bag. This compound was successfully removed by museum technician Maureen Collins, who is responsible for the cleaning work of the laboratory.

Several large specimens, attempted for the first time, including a large white embroidered counterpane, an embroidered shawl, and a hand-woven blanket, all needed for the new textile exhibit hall. Care in rinsing is of great importance in handling large items. A short, illustrated paper on the "How to Wet-Clean Undyed Cotton and Linen" submitted for publication by Miss Collins, covers the methods judged best by the division after the cleaning of over 500 articles in the laboratory during the past 4 years.

The musical instruments reference collections and restoration laboratory were provided with a constant and closely regulated relative humidity of 50 ± 2 percent. The improvement in stability of the specimens, especially of the restored keyboard instruments, has been noticeable. Robert Sheldon who joined the staff as a museum technician, is restoring to playing condition several wind instruments, including an early 19th-century serpent.

Work has begun on the complete documentation of every dress in the First Ladies collection. A professional pattern maker is preparing a pattern of each dress, making a muslin copy, and providing a set of instructions for its construction, accompanied by a water color drawing of the dress.

A long-range project was started to arrange systematically the entire study collection of coins, tokens, and medals in individual boxes of adequate sizes placed on shallow metal trays. The trays are all interchangeable and are arranged in metal cabinets, each provided with 79 sliding slots for the individual trays.

The restoration of numerous leather, paper, metal and wooden specimens, completed in preparation for use in the growth of the United States exhibits, was done in cooperation with the conservation-analytical laboratory (see p. 52).

Precautions against damage to specimens by all types of light were taken throughout the entire armed forces history exhibit area with the installation of filters, diffusers, and blackout curtains.

In the division of military history, emphasis was placed on reorganizing and cataloging collections in the new storage areas, and placing them in new types of storage containers. Restoration of flags continued, and research in this area was carried out in conjunction with the division of textiles, with whose help considerable work also was done on cleaning and restoring of some of the more fragile uniforms.

Approximately a third of the weapons in the reference collections were disassembled, cleaned, and treated for preservation by museum aid Zeb Spencer. A commercial rust inhibitor, Formula 3–36, prepared by the Corrosion Reaction Consultants, Dresher, Pennsylvania, has been most effective in protecting metal objects from moisture and toxicity.

Consultant Colonel B. R. Lewis examined the small arms ammunition collections and recommended a method of treating metallic coatings to prevent corrosion and oxidation of lead. Experiments are being made and the results will be published. Colonel Lewis also examined and identified all the specimens of small-arms ammunition, made recommendations for their arrangement in the reference collections, and suggested sources for obtaining additional specimens needed.

The division of naval history bent special efforts toward securing stable temperature and humidity conditions in exhibition halls and reference collection areas, with particular attention being given to the Continental gondola *Philadelphia*. Through the skillful efforts of conservator Charles Olin, a mutilated mid-19th-century oil painting of United States naval operations off Canton was completely restored and made available for exhibition. All printed material in the P.V.H.

230-457—66——20

Weems Memorial Library was cataloged and a large number of manuscripts relating to the history of modern navigation were microfilmed for use by scholars.

GIFTS AND ADDITIONS

SPECIMENS IN THE NATIONAL COLLECTIONS MAY 31, 1966

DEPARTMENT OF SCIENCE AND TECHNOLOGY		103, 307
Physical Sciences	4, 539	
Mechanical and Civil Engineering	12, 315	
Electricity	7, 452	
Transportation	42, 981	
Medical Sciences	36, 020	
DEPARTMENT OF ARTS AND MANUFACTURES		151, 572
Textiles	35, 467	
Ceramics and Glass	17, 448	
Graphic Arts	52, 485	
Manufactures and Heavy Industries	35, 561	
Agriculture and Forest Products	10, 611	
DEPARTMENT OF CIVIL HISTORY		10, 305, 667
Political History	48, 693	
Cultural History	24, 260	
Philately and Postal History	10, 032, 967	
Numismatics	199, 747	
DEPARTMENT OF ARMED FORCES HISTORY		54, 922
Military History	41, 969	
Naval History	12, 953	
TOTAL		10, 615, 468

SCIENCE AND TECHNOLOGY

As is usual, important accessions included both large scale collections and individual items of outstanding interest. Examples of the former were the acquisition of the Thomas Norrell railroad collection of some 12,000 prints, books, and negatives, the result of a lifetime of discriminating collecting, and 119 linen and eggshell-paper drawings of early locomotives and cars, donated by the Reading Company; an example of the latter was the gift by Marion M. Emery of a delicate racing sulky of about 1870.

An item of considerable public interest was the first Atlas ground guidance computer, Mod I, retired to us by the U.S. Air Force from its duties at Cape Kennedy. The computer, however, has a long history, and we were fortunate to be able to obtain one of the early attempts at a useful computing machine, that of de Lepine in 1725, as

well as the first practicable commercial calculating machine, the 1820 model of Charles X. Thomas.

Not all instruments age so swiftly; we received from the Bureau of Standards the Meggers infra-red spectroscope with which precision spectroscopy in this country was initiated by Dr. Meggers in 1914. The instrument, although in some ways outmoded, still holds the record for long-wave measurements in the far infra-red. And a large 18th-century copper still, marked "R. Bush, Bristol, 1787," was obtained from the U.S. Department of Internal Revenue.

The division of mechanical and civil engineering received a large group of documents related to the career of William Rich Hutton (1826–1901). It consists, apparently, of every piece of paper used by Hutton in his work as assistant engineer on the Washington, D.C., water supply system of 1857–1859 and as chief engineer of the C&O Canal through the 1870s, of the steel arch bridge over the Harlem River in New York, of the first Hudson River tunnel in 1888–1890, and of many lesser projects. It may well be the most comprehensive documentation of the work of any single civil engineer of the latter 19th century. From Brown University came a unique collection of models connected with George Corliss. Other accessions include a number of sundials; an important clock made by Whitehurst of Derby; and an 1876 Gleason bevel-gear planer, the first commercially successful bevel-gear cutter, which will go on display in the hall of tools.

The medical sciences collections received 40 Limoges apothecary jars, a gift from Smith Kline & French Laboratories; and an 1896 syrup dispensing urn, donated by the Coca-Cola Co. Two 17th-century Italian majolica drug jars, a 13th-century Persian glazed-pottery mortar, and a 12th-century Persian pottery jar were purchased through the Squibb fund. The dental collections of Dr. Charles H. Land was donated by Columbia University.

The division of electricity received four major donations: A 200-kilowatt Alexanderson alternator, dating from 1921, marking the culmination of the alternator method of producing radio waves; apparatus used in the first commercial microwave communications system of 1945 between New York and Philadelphia; an alternating current generator and a transformer of the mid-1880s, donated by Sebastian de Ferranti, grandson of the inventor, representing unique early design in alternating current; and photomicrographs taken by Ladislaus Marton with his first three electron microscopes.

The marine transportation section received from the Socony Oil Co., a model of a Mobil-Socony tanker and from the Luckenbach Lines a sectionalized model, on ¼-inch scale, of a large freight steamer.

ARTS AND MANUFACTURES

A model of a Swedish gang mill was acquired from the Soderhamn Machine Manufacturing Company of Talladega, Alabama. Also acquired were a partially framed model of the ship *Ocean Monarch*, constructed by Boucher Lewis Precision Models, Inc., New York; and an operating model of a dry kiln made by the Moore Dry Kiln Company of Jacksonville, Florida. All these models will be incorporated in forest products hall.

Raymond Stout of Washington, D. C., presented a 1901 Huber model steam tractor. An excellent collection of barbed wire was lonated by Frank Horsfall, Department of Horticulture, Virginia Polytechnic Institute, Blacksburg, Virginia. K. E. Clark of Los Angeles, California, gave a cast iron seat to complete the one-horse, front-cut mowing machine of 1880 now in the farm machinery hall.

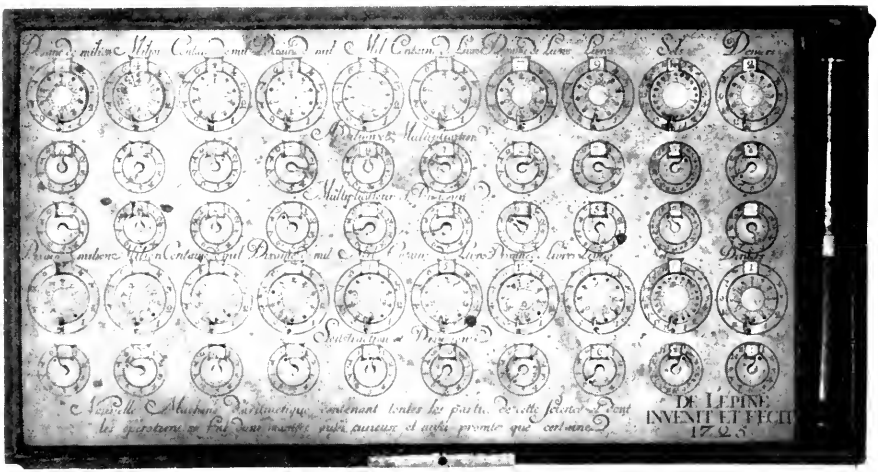
Many of the 291 pieces of ceramics and glass accessioned during the year came from donors who over the years have demonstrated a continued interest in building a strong and diverse collection. Mrs. Florence E. Bushee gave 42 rare 19th century paperweights. Mrs. William A. Sutherland gave 14 pieces of 18th-century English porcelain, including a very rare pair of Bow sauceboats and a fine pair of Bow figures. Mr. and Mrs. George W. Ware presented 11 pieces of antique German glass; several were types previously unrepresented in the collections. Mr. and Mrs. L. Wagner gave 11 pieces of early Steuben glass; a welcome addition to the division's strong collection of Steuben glass. And Dr. Hans Syz gave 15 pieces of 18th-century German and English porcelain; included among these were an important Meissen tureen and an extremely fine Derby sweetmeat stand.

Four pieces of 19th-century American Tucker porcelain were purchased through the Joanne Toor Cummings Fund. Mr. and Mrs. Mayer Greenberg established a fund from which was purchased 7 pieces of contemporary pottery from the studio of Otto and Gertrud Natzler. The A. D. Alpine Company presented an electric kiln which will be used in live demonstrations of the potter's art.

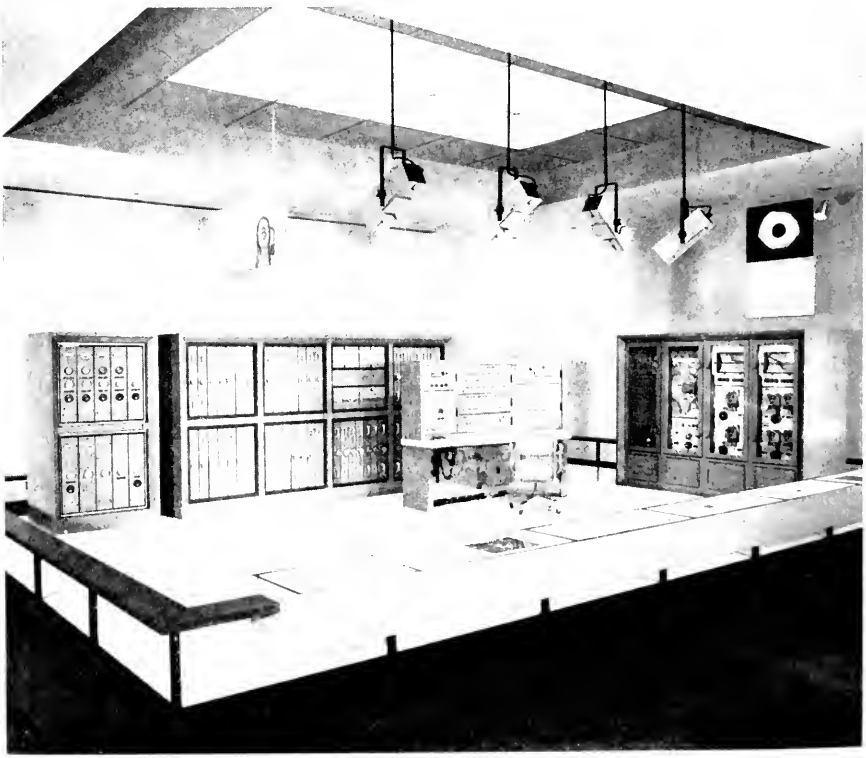
The significant acquisition of the division of graphic arts was the Harris Model S4L offset press, serial no. 101, now on display. Built in 1906, it was the first commercially successful offset press and marked the beginning of the large and growing industry of offset lithography. It was a gift from the Harris-Intertype Corporation.

The most important print accession was Kaethe Kollwitz's lithograph, *Saatfrüchte sollen nicht vermahlen werden*, her last print and one of only three known copies. This print was obtained with the help of a generous gift from Dr. Otto Kallir. The German Expressionist print

Lithograph by Kaethe Kollwitz, *Saatfrüchte sollen nicht vermahlen werden*, recently acquired for the print collection. Below: Briefcase and other personal possessions of the late Adlai E. Stevenson, used by him when he was the U.S. Ambassador to the United Nations, gift of Mrs. Ernest L. Ives.



Early attempt at a useful computing machine, made by de Lepine in 1725. Below: The Atlas guidance computer Mod I set up as a special operating exhibit in the hall of chemistry, September 1965.



holdings were strengthened by the addition of works by Karl Schmidt-Rottluff and Lovis Corinth. Original blocks and prints by Uniichi Hiratsuka and George O'Connell were gifts of the Washington Print Club. Other important accessions were Edouard Manet's color lithograph, *Polichinelle*, John Baptist Jackson's *Descent from the Cross*, and important works by American artists, including Edward Hopper's *Night Shadows*, five posters by John Sloan, and prints by Bellows, Hartley, Lasansky, Frasconi, Kohn, and Baskin. Examples of contemporary printmaking techniques were enriched by the acquisition of original plates and prints by Michael Ponce de Leon and Andrew Stasik. Twenty-five old manuscripts were given by the University of Montana.

A number of accessions of significance to the history of photography were received. The Bell Telephone Laboratories presented the prototype and the earliest production model of the Fastax, the first commercially successful high-speed motion-picture camera, first manufactured in 1943. C. F. Carlson and the Xerox Corporation presented Carlson's laboratory experimental materials leading to the development of the Xerographic process, and the apparatus built by Carlson to demonstrate the practicability of automating his image duplicating process. Richard Avedon donated 100 of the original negatives (with prints) used in his books, *Observations* (1959) and *Nothing Personal* (1964). Graflex, Inc. donated 16 early examples of their cameras. The Technicolor Corporation gave their first two color motion-picture camersa which, with the two received last year, provide the section with a thorough technological documentation of that process from 1916 to the present time. The Johns Hopkins University has made available four early rocket-borne cameras, including the first cameras to take pictures from a rocket above the earth's atmosphere. This historical event took place in 1946 when the photographic equipment was carried in a captured V–2 rocket to an altitude of 70 miles over New Mexico. The U.S. Navy prepared and presented the world's longest panoramic photograph, a single color transparency 175 feet long that covers a 4-mile section of the United States from the east to the west coast.

An interesting late-17th-century tapestry was presented by Gerson Nordlinger. A handsome brocaded silk fabric of the first half of the 18th century was given by Lt. Col. Kibbey M. Horne, U.S.A. This example from France is especially fine because of the rich use of gold and silver threads and the fine condition of the richly colored silk yarns.

An important early Jacquard woven picture of 1844 was received. The woven design commemorates the visit of the Duc d'Anmale to the atelier of M. Carquillat, the weaver of the picture. An excellent

detailed rendering of a Jacquard loom is included in the design. Eight outstanding examples of lace and embroidery of the 17th through the 19th centuries were presented by Mrs. Hugh Bullock and Mrs. Robert Goetz. Included in this group is a deep flounce of beautiful 17th-century Gros Point de Venise lace. Mrs. Frank D. Edgington presented a poignant mourning picture, painted in 1828 on cotton velvet by Hannah Converse, grandmother of Mark Hanna. An indigo-blue wool quilted counterpane, ca. 1800, gift of Mr. and Mrs. Wilbur James Fraser, was added to the collection of bed coverings.

For the hall of petroleum a number of items were acquired. Baroid Division of the National Lead Company prepared, in cooperation with the curator, an exhibit explaining the use of drilling muds. Camco Inc. gave two working models of gas-pumping methods; an original Amerada bottom hole pressure gauge came from the Geophysical Research Corporation; while the French Atomic Authority provided an elegant model of Deca II, their experiment in thermonuclear fusion. The Shell Development Company collaborated with the curator in the design of a demonstration of underwater completion methods. The Museum acquired the Dunning cyclotron and arranged to take the McMillan synchrotron; both are pioneer acceleration machines important in the history of nuclear physics. Kenneth Jewett presented to the national collections a further installment of his collection of tinware.

CIVIL HISTORY

Of architectural interest is the generous gift of Bruce and Calderon Howe of several mantels, stair rails, doors, and other elements from their now dismantled H Street, NW., house in Washington. Mrs. Van Horn Ely gave two fine side chairs made in New York, ca. 1830. An example of frontier folk life is a chair made about 1870 on a ranch in Mendocino, California, the gift of Mr. and Mrs. Eaton L. Grimes. An inevitable phase of 19th-century life was a horse-drawn hearse; a good example was given jointly by the Litchfield Historical Society and the Torrington Historical Society, both of Connecticut. Some fifty pieces of American furniture, dating from the third quarter of the 19th century, have been acquired for the offices and conference rooms of the original Smithsonian Institution building, designed by James Renwick. The principal rooms will gradually be furnished with material reflecting the early decades of the building's use and the Institution's growth.

As a result of the collecting activities of Scott Odell, of the division of musical instruments, in the southern mountains, notable additions were made to the collections of traditional American musical instruments: These include several Appalachian dulcimers, two frettless

banjos from Virginia and Tennessee, and two fold violins. The collections also were augmented by a cello made by Abraham Prescott, a cello-shop sign of the late 18th century, and a Rhythmicon, an electronic device used in the teaching of rhythmic counterpoint by Joseph Schillinger, author of *The Mathematical Basis of the Arts*, generously donated by Mrs. Joseph Schillinger. Several exceptional musical instruments of European origin were also acquired: A French harpsichord made by Benoist Stehlin in Paris in 1760, one of the few French harpsichords still in existence; a fine 4-keyed bassoon made by Milhouse in England in the 18th century; and a rare bassoon tutor.

Significant association objects acquired during the past year, include a sack suit worn by Dwight D. Eisenhower during his term as President, and other personal items, gifts from General Eisenhower. The First Ladies collection was enriched by a sequined ball gown and wrap worn by Mrs. Warren G. Harding. A briefcase and personal items of Adlai Stevenson, used during his tenure as Ambassador to the United Nations, were the gifts of Mrs. Ernest L. Ives, his sister. Among the additions to the collections of political Americana were a banner representing the candidates Polk and Dallas from the campaign of 1844, a gift of Robert Cochran, and a portrait of Henry Clay by J. W. Dodge, painted in 1843, the gift of Mrs. Randolph Kidder.

A large number of foreign banks and financial institutions, representing more than 40 countries, contributed to the growth of the numismatic collections. Many additions of ancient coins, mainly Greek bronzes, came from Mr. Harvey Stack and from Mr. and Mrs. Mortimer Neinken, who also donated a comprehensive collection of paper currencies of the Austrian Empire. The series of medieval coins was increased through donations received from Mrs. Milton Holmes. Remarkable additions were received in the field of United States paper currencies, among them an extremely rare 3-penny note issued by the Colony of Massachusetts in 1722, given by B. M. Douglas, and a unique $10,000 United States Treasury Note (1862) donated by Grover Criswell. An historically significant group of designs and engravings by Christian Gobrecht, one of the foremost United States Mint engravers of the first half of the 19th century, was received from Max J. Humbert, James Harper, Frank Darner, and Clark A. Keyser. The collections of foreign medals were increased particularly by 302 Latin-American medals and tokens contributed by the Hon. and Mrs. R. Henry Norweb.

The rare Sullivan's Dispatch Post stamp of 1853, affixed to a magazine mailed in Cincinnati, was received as a gift from an anonymous donor in memory of the late George B. Sloane, a writer well known for his philatelic scholarship. The stamp is one of two

known copies preserved on an original cover. A letter of 1769, sent from Dinwiddie County, Virginia, to Ayr, England, in 1769 and containing interesting references to discussions in the House of Burgesses, was purchased through the Milton A. Holmes Memorial fund. Rare airmail stamps and souvenir sheets of Korea were purchased through the Charles and Rosanna Batchelor Memorial fund. Mrs. Renée R. Bowden donated an outstanding group of 19th-century stampless covers and folded letters of Thurn & Taxis, Bavaria, Hanover, Prussia, Saxony, and Wurttemberg. Mr. and Mrs. Robert O. D. Hopkins donated additional drawings, models, essays, proofs, and stamps of China and a significant collection of stamp-engraving tools.

ARMED FORCES HISTORY

A collection of several hundred glass fragments from a wreck site with an associated date of 1783 may prove to be of great significance to the student of glass, as it is possible that a number of the fragments are from the Amelung Glass Works.

A large collection of ordnance materials from *L'Herminie*, 1838, was added to the already substantial finds from that site.

Several brass engine-room fittings from the *Marie Celeste*, a Confederate blockade runner sunk in Bermuda waters, has given the collections a group of significant materials not hitherto represented.

A rare Colt Texas Patterson revolver was received from Charles M. Williams, and a rare and unusual engraved powder horn of the period of the French and Indian War was received from Lewis Allen. General Nathan Twining, former Chairman of the Joint Chiefs of Staff, presented his entire collection of uniforms, including a unique dress uniform designed by himself. A large collection of interesting Civil War material, including a number of rare specimens, was acquired as a gift from Mrs. Florence Wieland.

Among donations related to naval history particularly notable was an original manuscript copy of Francis Drake's famous letter announcing his daring attack on the Spanish Fleet at Cadiz on April 19, 1587, presented by James G. Stahlman of Nashville, Tennessee. This historic document, recording an event that significantly contributed to the defeat of the Armada and the emergence of British sea power, represents a superb element of the colonial exhibits introductory to the halls of the Armed Forces of the United States. Also outstanding was the donation by John A. Foard of two pigs of lead ballast founded at Liverpool during the Civil War and recently recovered from the wreck

of the Confederate blockade runner *Modern Greece* off Wilmington, North Carolina.

A handsomely wrought model of the American privateer *Prince de Neufchâtel*, which had a distinguished fighting career during the War of 1812, was completed and placed on display. The model of another celebrated American commerce raider, the Confederate cruiser *Alabama*, also was received, as was a model of the USS *Cushing*, first of the United States Navy's commissioned torpedo boats and an important precursor of the modern destroyer.

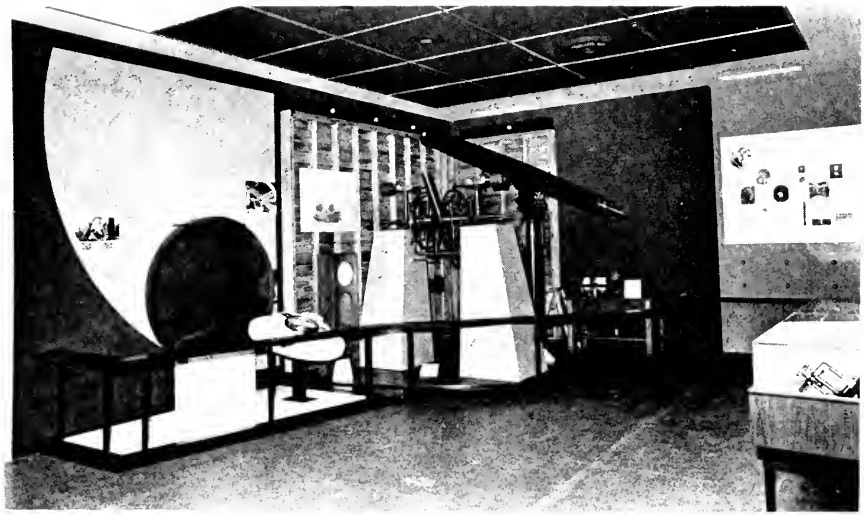
Exhibits

Two Science and Technology halls were opened in part. The section of the hall of physical sciences devoted to classical physics, plus all of mathematics and two period rooms in chemistry, were available for viewing at the 50th Anniversary Meeting of the American Optical Society in March, and were opened to the public on April 1. Sections on modern physics and on chemistry remain to be completed. The hall of medical sciences was open to the public in May, although the hall of health is still incompleted.

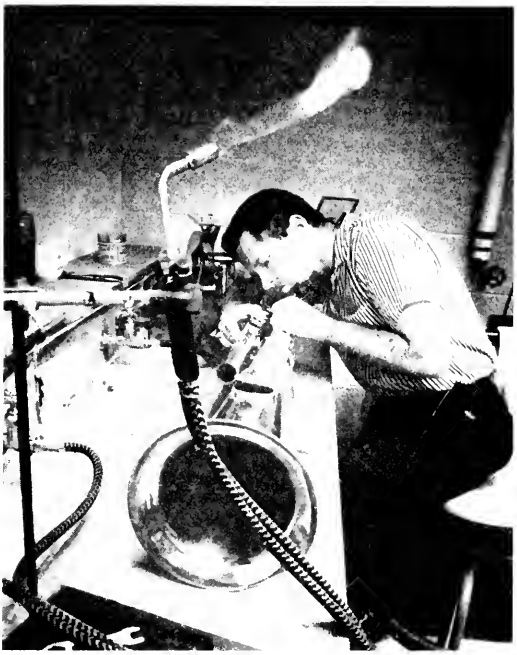
A special exhibit of the Atlas ground guidance computer Mod I, planned by associate curator Uta Merzbach, was opened in the hall of physical sciences and will be on display through the first half of 1967. The Burroughs Corporation, manufacturers of the computer, assisted in making it operational, and daily lecture-demonstrations are being given by museum technicians George A. Norton and Charles E. Dennison. The exhibit includes a film of the computer at work guiding rockets from Cape Kennedy. Dr. Merzbach also prepared a special exhibit of ruling and dividing engines for the American Optical Society meeting, and this will continue to be on view throughout the year in the special exhibits area of the hall of physical sciences. The exhibit features equipment by Nobert, Fasoldt, Rogers, Rutherfurd, and Rowland, to complement the classic machines by Ramsden and Michelson on display in the permanent exhibit.

A special show of fine prints from the civil engineering collection was assembled for the Smithsonian Institution Traveling Exhibition Service. Two special exhibits of watches were held: one, featuring the Zale collection from Dallas, consisted of finely enameled and richly decorated pieces, and the other, watches and chronometers from the newly acquired James Arthur collection. A dental exhibit of 19th-century office furnishings and instruments was prepared and loaned to the District of Columbia Dental Society for display and lecture-demonstrations were begun by technician Elliot Sivowitch in the hall of electricity and by technician Marion Jarboe, in the 1855 machine shop in the hall of tools.

The popular beehive exhibit is again on public view in the farm machinery hall, a new hive having been furnished by the Department of Agriculture, Beltsville, Maryland. A feeding station to supplement

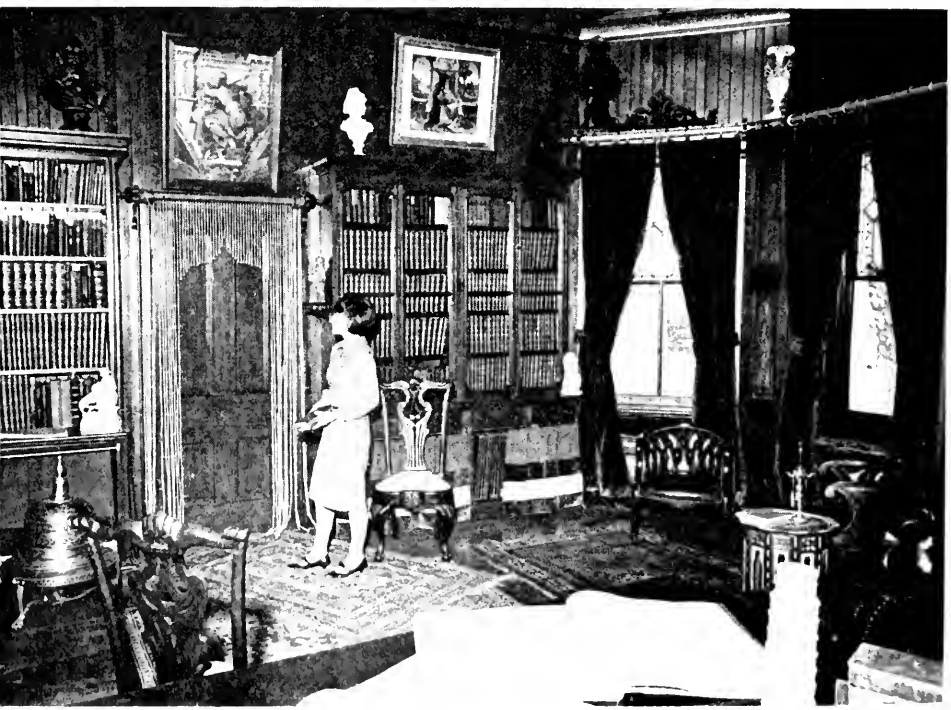


Hall of physical sciences: Telescope and other equipment for a 19th-century observatory. In the exhibit of telescope lens and mirrors (left) is the glass for a 62-inch reflecting telescope mirror cast and polished in the 1890s. Never used, it was for years the largest ever made in the United States. Below: Shop front of 19th-century optician and walk-in exhibit.



Repairing an early-19th-century ophiclcide in the music restoration laboratory (photo courtesy Washington Post).

Hall of everyday life in the American past: Library of about 1890 from the house of B. B. Comegys of Philadelphia, re-erected as a period-room exhibit. Most of the original furnishings and books of this library, which is sheathed in wood, have been recovered.



the nectar available in the area was established on the roof of the Museum. A model of a 1901 Huber steam tractor was put on display in September, as was a temporary exhibit of the Frick steam engine.

The hall of ceramics and gallery of glass were formally opened on April 22, 1966, in the presence of a distinguished company of donors and collectors. Three special exhibitions were held during the year.

The *10th International Exhibition of Ceramic Arts*, sponsored by the Kiln Club of Washington, D.C., was on view from October 29 to December 13, 1965.

Glass in Germany, illustrating German glass from ancient times to the present and sponsored by the German Arts Council in cooperation with the National Carl Schurz Association, was on view January 1 to February 20, 1966.

Ceramic Arts—U.S.A.—1966, presenting the latest work of a number of important contemporary American ceramic artists and sponsored by the International Minerals and Chemical Corporation, was on view May 2 to June 30, 1966, and will be circulated nationally by the Smithsonian Institution Traveling Exhibition Service.

Completion of wall cases for the graphic arts gallery provided needed space for special exhibitions. The following shows were presented:

The Etchings of Canaletto, September 15 to November 15, 1965.

Making Faces, caricatures by Aline Fruhauf, November 16, 1965 to January 16, 1966.

Old Master Prints from the Collections, December 8, 1965 to May 2, 1966.

German Expressionist Prints, January 17 to May 2, 1966.

Preparatory work was done for a major exhibition, *Australian Prints Today*, to open July 15, 1966, that will be the first full showing of Australian prints in the United States.

The special print display program of the new gallery of photography was inaugurated, June 17–August 1, 1965, with the show originally produced for the 1965 White House Festival of the Arts. It featured work by American photographers, selected from the collections of the Metropolitan Museum of Art, Museum of the City of New York, Museum of Modern Art, Library of Congress, and the Smithsonian Institution. Other exhibitions were:

Children of the World, a one-man show of photographs by Ken Heyman, one of America's notable young photographers, September 15 to December 8, 1965.

Twenty Years of News Photography, selected from the files of the AP and the UPI news agencies, and including all the Pulitzer prize-winning news photographs, 1942–1966, May 12 to July 15, 1966.

To test the feasibility of exhibits for the blind, curator Grace R. Cooper selected objects from the reference collections that would best illustrate the textile subjects to be discussed in two half-hour sessions. These included the basic fibers cotton, wool, flax, silk, and man-made fibers, and the basic processes of ginning, carding, spinning, and weaving. A 4-harness loom with examples of plain, patterned, brocaded, tapestry, and related fabrics was provided, and three docents were trained to conduct sightless persons on tours of the exhibit. This special project was run in conjunction with a NASA exhibit on the history of flight, also designed for the blind, and together they gave experience of great value to the division of vocational guidance, U.S. Department of Health, Education, and Welfare, which had supported the project with a grant. The weekly weaving demonstrations, discontinued to permit restoration of the wood frame of the loom, were replaced by weekly demonstrations of handspinning by associate curator Rita Adrosko and museum technician Lois Vann. Miss Adrosko also explained the art of handspinning on TV Channel 26 in *Window on Our World*, an educational program designed for Metropolitan Washington school children. A temporary exhibit of Victorian Needlework is being prepared for initial showing in the Museum, after which it will be circulated by the Smithsonian Institution Traveling Exhibition Service.

Important recent acquisitions are being incorporated into the new textile hall in the Museum of History and Technology now being prepared for opening in 1967.

Active installation of the hall of petroleum has begun. The mural to be installed at the entrance to the hall was shown to the visitors to the International Petroleum Exposition at Tulsa, Oklahoma. Designed to be a guide to the hall as well as a realistic summary of oil technology and skills, it was painted by Delbert Jackson, staff artist of the Pan American Oil Corporation under the sponsorship of a group organized by Helmerich and Payne of Tulsa. Plans for the hall of nuclear energy were virtually completed, as were those for hall of iron and steel. Substantial gifts for the construction of models were received from the Ford Motor Company fund and from the United States Steel Corporation, and four fine models prepared by Bethlehem Steel Company, among the recent deliveries, were placed on temporary exhibition.

The division of manufactuers and heavy industries acting as host to the Los Alamos Scientific Laboratory, provided space for and assisted in the installation of a life sciences radiation laboratory as a temporary exhibit. Manned by LASL staff members with the assistance of local students, it provided live demonstrations of the uses of radiation in modern life and has been of exceptional interest to the public. With

the completion of the installation of the Tuve Van de Graaff accelerator by museum specialist Abraham Richards and museum technicians John Carter and Francis Gadson, the opportunity was taken to set up a small exhibit of nuclear energy material, including the Spitzer Stellarator, the "pickle barrel" reactor, and the Dunning cyclotron.

An additional period room was opened in the hall of everyday life in the American past, the private library of Benjamin B. Comegys, originally added to his Philadelphia house about 1880. Through Comegys' relatives and with the assistance of Hubert H. Howson, who administered his estate, many of the original furnishings and most of the books were recovered. Numerous photographs taken between 1880 and 1900, some of which were published in Comegys' book *A Tour Around My Library*, made it possible to re-create the room very nearly as it was lived in—an example of the taste and customs of a prosperous Philadelphian of the late 19th century.

In conjunction with the Smithsonian conference on the role of historic archeology, an exhibit of artifacts recovered in salvage archeology in the Gadsby Urban Renewal project in Alexandria, Virginia, was displayed in the first-floor rotunda.

An exhibition of keyboard instruments in honor of the Smithsonian Bicentennial was opened in the hall of musical instruments for September 1965. During this month museum technician Helen Hollis gave daily lecture-recitals for museum visitors on and about the restored keyboard instruments.

A special security case for historic jewelry placed in the hall of American costume, holds the Napoleon necklace, Marie-Antoinette earrings, and Empress Eugenie blue diamond, all presented by Mrs. Merriweather Post, as well as fine jewels of the 20th century, including important examples made by Harry Winston.

A special display featuring Smithsonian Institution award medals, arranged by associate curator Elvira Clain-Stefanelli on the occasion of the James Smithson Bicentennial, contained original models and bronze strikings of the new Hodgkins medal, designed in 1965 by Albino Manca, and the Smithsonian Award medal by Paul Vincze. The latter, presented for the first time to The Royal Society of London, shows on the obverse a portrait of James Smithson and on the reverse the Smithsonian's first building on the Mall.

United States and foreign gold coins and medals from the F. A. Hauck donation were selected for a display arranged in a semiautomatic exhibit case containing 30 trays, each with an average of 14 coins. The trays are suspended on a continuous chain device driven by an electrical motor, and two command buttons enable the visitor to select

and move into view the tray he wishes to examine. Electronic devices prevent unauthorized access to the material on display.

The plaster-of-paris mannequins in the First Ladies hall are being replaced with identical mannequins of light polyester resin, which are easier to handle and aid the technical staff in preserving the dresses when they must be moved.

A revised exhibit, installed in the hall of philately and postal history to coincide with the opening of the Sixth International Philatelic Exhibition, was especially designed to show portions of the collection never previously exhibited or representative of materials generally held in the reference collections.

During the year the department of armed forces history opened halls illustrating U.S. armed forces history through the Civil War, the hall of medals and decorations, the hall of ordnance, and the exhibit of gondola *Philadelphia*. Installation of individual exhibits in these halls is continuing.

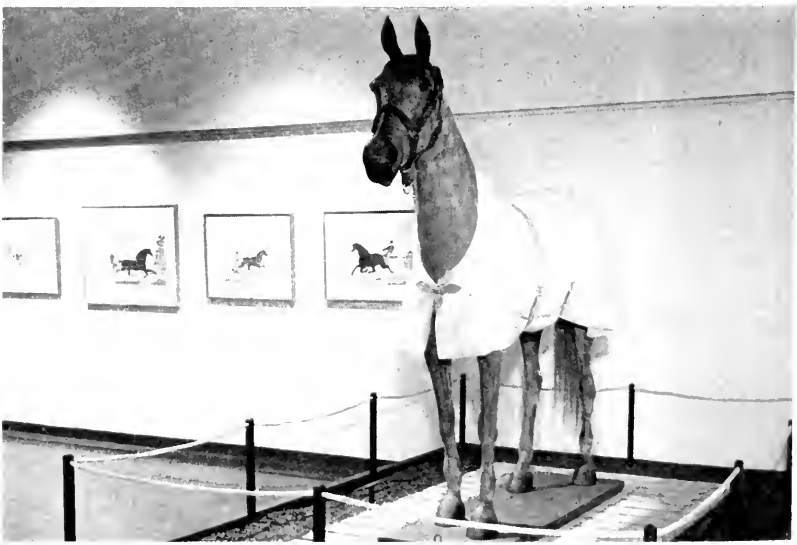
Curator Peter C. Welsh organized two special exhibits, each accompanied by a publication: "The Trotter in America," designed by Nadya Kayaloff, a study of America's first sports hero based on 19th-century prints from the Harry T. Peters lithography collection, supplemented by a selection of related objects from the Museum collections; and "The Art and Spirit of a People," designed by Robert Widder, a continuing special exhibit in which approximately 150 objects from the Eleanor and Mabel Van Alstyne folk art collection are used to illustrate values, attitudes, and interests prevalent in 19th-century America. Plans were made for a temporary exhibit of lithographs and objects relating to the genteel female of the Victorian era.

Two major installations were completed for permanent exhibits in the growth of the United States halls being designed by Mrs. Deborah Bretzfelder: the wheels and gearing from a 1774 grist mill in Chester County, Pennsylvania, and a house frame from Ipswich, Massachusetts, dating from the 1690s and the 1750s.

Further details concerning the construction of exhibits for the Museum of History and Technology are to be found in the report of the U.S. National Museum, Office of Exhibits, pages 47–50.

Special exhibit honoring Jawaharlal Nehru, showing scenes from his life and containing objects illustrating the culture of India. Below: Hall of ceramics which, with the nearby hall of glass, was formally opened in April 1966.

Possibly the earliest American-made carriage in existence, this 18th-century chaise, recently restored, is exhibited in the vehicle hall. Below: The Trotter in America, a special exhibit based on prints in the Harry T. Peters lithography collection, also contained equipment used in this sport, which rose to popularity in the 19th century.



Staff Publications

SCIENCE AND TECHNOLOGY

BATTISON, EDWIN A. 100 years of machine tool progress. *Metalworking Magazine* (September 1965), pp. 1–8.

———. Stone-cutting and polishing lathe by Jacques Besson. *Technology and Culture* (Spring 1966), vol. 7, no. 2, pp. 202–205.

BEDINI, SILVIO A. Lens-making for scientific instrumentation in the seventeenth century. *Applied Optics* (May 1966), vol. 5, no. 5, pp. 687–694, 12 figs.

———. The makers of Galileo's scientific instruments. In *Atti del Simposio su "Galileo Galilei nella storia e nella filosofia della scienza"* (Florence, 1966), pp. 1–27, 8 figs.

CANNON, WALTER F. History at the Smithsonian. *Smithsonian Journal of History* (Spring 1966), vol. 1, no. 1, pp. 65–72.

CHAPELLE, HOWARD I. The Chesapeake Bay. *Popular Boating* (July 1965), vol. 18, no. 1, pp. 4–6.

FINN, BERNARD S. Controversy and the growth of the electrical art. *IEEE Spectrum* (January 1966), vol. 3, no. 1, pp. 52–56.

HAMARNEH, SAMI K. The first independent treatise on cosmetology in Spain. *Bulletin of the History of Medicine* (July–August 1965), vol. 39, no. 4, pp. 309–325.

———. Smithsonian exhibits on pharmaceutical history. *Journal of the American Pharmaceutical Association* (August 1965), vol. n.s.5, no. 8, pp. 434–435, 438.

———. Al-Kindi, a ninth-century philosopher, physician, and scholar. *Medical History* (October 1965), vol. 9, no. 4, pp. 328–342.

JACKSON, MELVIN H. Greenland and the "Vinland Map." *Cartographer* (June 1966) (in press).

MULTHAUF, ROBERT P. Sal ammoniac: a case history in industrialization. *Technology and Culture* (Fall 1965), vol. 6, no. 4, pp. 569–586.

———. What is a metal? In *The Sorby centennial symposium on the history of metallurgy*, ed. C. S. Smith. New York: Gorden and Breach, 1965, pp. 139–144.

WARNER, DEBORAH J. George Willis Ritchey and the development of celestial photography. *American Scientist* (March 1966), vol. 54, no. 1, pp. 64–94.

WHITE, JOHN H. *Cincinnati locomotive builders 1845–1868.* (U.S. National Museum Bulletin 245), 167 pp., 56 figs., 1965.

———. American high wheel singles. *Railway and Locomotive Historical Society Bulletin*, no. 114 (April 1966), pp. 27–36, 6 figs.

———. Locomotives on stone. *Smithsonian Journal of History* (Spring 1966), vol. 1, no. 1, pp. 49–60, 14 figs.

ARTS AND MANUFACTURES

BISHOP, PHILIP W. [Review] Iron and Steel in Nineteenth Century America, by Peter Temin. *Isis*, vol. 56, pt. 4, p. 483.

COOPER, GRACE R. Quilting. *Encyclopaedia Britannica*, vol. 18, pp. 965–966, 1966.

———. The carpet-bag. *Spinning Wheel, a National Magazine About Antiques* (July–August 1966), vol. 22, no. 7–8, pp. 14–16, 37.

GARDNER, P. V. *Meissen and Other German Porcelain in the Alfred Duane Pell Collection*. Smithsonian publ. 4256 (1956) revised (Washington: Smithsonian Institution, 1966), pp. 68.

———. Eighteenth-century porcelain at the Smithsonian. *Antiques* (September 1965), vol. 87, no. 3, pp. 336–340.

HABERSTICH, DAVID E. Which history of photography is best? *Popular Photography*, vol. 59, no. 1, pp. 75, 122–125, 1966.

MILLER, J. JEFFERSON II. The Larsen and McCauley collections at the Smithsonian Institution. *Antiques* (October 1965), vol. 87, no. 4, pp. 522–525.

———. *The Washington Monument in Baltimore*. Baltimore: Peale Museum, January 1966, pp. 16.

MORSE, PETER. Rembrandt's etching technique: an example, Paper 61 in *Contributions from the Museum of History and Technology* (U.S. National Museum Bulletin 250), pp. 93–108, 1966.

OSTROFF, EUGENE. Early Fox Talbot photographs and restoration by neutron irradiation. *Journal of Photographic Science*, vol. 13, no. 5, pp. 213–227, 1965.

SCHLEBECKER, JOHN T. The Great Holding Action: The NFO in September, 1962. *Agricultural History* (October 1965) pp. 204–213.

CIVIL HISTORY

BROWN, HOWARD MAYER. Instrumental music printed before 1600. Cambridge, Massachusetts: Harvard University Press, 1965, 559 pp.

CLAIN-STEFANELLI, ELVIRA. Italian coin engravers since 1800. Paper 33 in *Contributions from the Museum of History and Technology* (U.S. National Museum Bulletin 229) 68 pp., illus., 1965.

———. Numismatics—an ancient science. Paper 32 in *Contributions from the Museum of History and Technology* (U.S. National Museum Bulletin 229), 102 pp., illus., 1965.

CLAIN-STEFANELLI, VLADIMIR. Money. In *The World Book Encyclopedia*, pp. 588–598d, 1965.

———. Historical notes on coinage metals. *Coins*, pp. 32–36, 50–53, 1965.

———. Monetary history and medallic art at the Smithsonian Institution. *Numisma*, no. 75, pp. 31–48, 1965.

———. An application of physics in ancient numismatics: detection of certain counterfeit Aegina staters through X-ray diffraction analysis. *American Journal of Archaeology*, vol. 70, p. 185, 1966.

COLLINS, HERBERT R. Original panels from Jackson's phaeton found. *Carriage Journal* (Autumn 1965), vol. 3, no. 2, pp. 73–75.

———. White House stables and garages. *Records of the Columbia Historical Society*, Washington, D.C., 1966.

FESPERMAN, JOHN. Music for a small organ. *Journal of Church Music* (July–August, 1966), vol. 8, no. 7, pp. 6–11.

HOWLAND, RICHARD H. Icomos in Poland. *Newsletter of The Society of Architectural Historians* (September 1965), vol. 9, no. 4, p. 2.

———. The American school of classical studies in Athens. *Bulletin of the Archaeological Institute of America* (November 1965), vol. 56, p. 21.

———. Travelers to Olympus. Pp. 147–150 in *With heritage so rich* (A Report of a Special Committee on Historic Preservation, Albert Rains, Chairman). New York: Random House, N.Y., 1966.

KLAPTHOR, MARGARET BROWN. Presentation Pieces in the Museum of History and Technology. Paper 47 in *Contributions from the Museum of History and Technology* (U.S. National Museum Bulletin 241), pp. 81–108, 1965.

———. Benjamin Latrobe and Dolley Madison decorate the White House, 1809–1811. Paper 49 in *Contributions from the Museum of History and Technology* (U.S. National Museum Bulletin 241), pp. 153–164, 1965.

MELDER, KEITH E. Angel of mercy in Washington: Josephine Griffing and the Freedmen, 1864–1872. *Records of the Columbia Historical Society*, Washington, D.C., 1966.

SCHEELE, CARL H. Pneumatic tube mail service in the United States. *Society of Philatelic Americans, Journal* (May 1966), vol. 28, no. 9, pp. 639–648, 4 figs.

———. The Smithsonian's philatelic and postal history exhibits. *Stamps* (May 14, 1966), vol. 135, no. 7, pp. 330–331, 2 figs.

———. Smithsonian's philatelic and postal history holdings grew from 1,733-stamp gift in 1888. *Linn's Weekly Stamp News* (May 16, 1966), vol. 39, no. 12, pp. 36–37, 3 figs.

ARMED FORCES HISTORY

HOWELL, EDGAR M. Harvey Dunn: the searching artist who came home to his first horizon. *Montana, The Magazine of Western History*, vol. 16, no. 1, pp. 41–56, 27 pls., 1966.

LUNDEBERG, PHILIP K. The continental gunboat *Philadelphia* and the northern campaign of 1776. pp. 20, 1966.

PETERSON, MENDEL. Underwater thesaurus. *Antiques* (September 1965), vol. 88, pp. 319–324.

AMERICAN STUDIES

WASHBURN, WILCOMB E., The museum and Joseph Henry. *Curator* (May 1965), vol. 8, no. 1, pp. 35–54.

———. Law and authority in Colonial Virginia. Chapter in *Law and authority in Colonial America*, edit. George A. Billias (Barre, Mass., 1965), pp. 116–135.

———. Virginia's first families and the first families of Virginia. Chapter in *Exploring Virginia's human resources*, edit. Roscoe D. Hughes and Henry Leidheiser, Jr. (Charlottesville: University of Virginia Press, 1965) pp. 8–18.

———. A proposal concerning a war game involving guerrillas, counter-guerrillas, and civilians. *Background, the Journal of the International Studies Association* (August 1965) pp. 147–153.

———(ed.) *The great design: Two lectures on the Smithson bequest by John Quincy Adams*. Washington, D. C.: Smithsonian Institution, 1965, pp. 100.

GROWTH OF THE UNITED STATES

WELSH, PETER C. *American folk art: The art and spirit of a people*. Washington, 1965. 100 pp., 65 illus.

———. *The trotter in America*. Washington: Smithsonian Institution (publ. 4637), 1965. 20 pp., 30 illus.

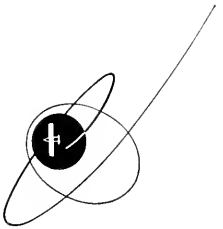
———. The Van Alstyne American folk art collection *Antiques* (August 1965), vol. 88, pp. 208–211, 15 illus.

———. The metallic woodworking plane. An American contribution to hand-tool design, *Technology and Culture* (January 1966, Winter), pp. 38–47.

———. Woodworking tools 1600–1900. Paper 51 in *Contributions from the Museum of History and Technology* (U.S. National Museum Bulletin 241), pp. 178–228, 65 illus., 1966.

National Air and Space Museum

S. Paul Johnston, *Director*



Legislation authorizing construction of a National Air and Space Museum was cleared by both Houses of Congress late in June 1966, after several years of consideration by the 88th and 89th Congresses.

During this period of legislative consideration, plans and programs for the proposed facility and its exhibits had gone forward as rapidly as current personnel and budgetary limitations permitted. All such activities conducted throughout the fiscal year were consistent with the master operational plan approved by the Secretary in August 1965.

Résumé of Legislative Action

S. 2602 of the 88th Congress, "The National Air Museum Amendments Act of 1964," passed the Senate on July 23, 1964, following an extended hearing in the Subcommittee on the Smithsonian Institution of the Committee on Rules and Administration. That Committee reported S. 2602 to the floor of the Senate on July 22, 1964. The House did not complete favorable action on this bill before adjournment, thus it was necessary to reintroduce the legislation during the 89th Congress. H.R. 6125 of the 89th Congress, "The National Air Museum Amendments Act of 1965," was reported from the Committee on House Administration on September 21, 1965, and was passed by the House of Representatives on February 7, 1966. It was then referred to the

Senate Committee on Rules and Administration, which reported it to the floor of the Senate on June 28, 1966. The Senate passed this legislation on June 29, 1966, thus finalizing Congressional action on legislation to authorize a suitable museum for the national air and space collections, a project initiated nearly 20 years ago.* Funds to construct this Museum remain to be appropriated by the Congress.

New Facility Planning Program

Staff planning for the distribution of floor space and the development of specific exhibits in the new facility have been under study continuously throughout the year. An analysis of the Air Museum's role and missions, both with respect to the Smithsonian Institution and to its own internal programming, is continuously under review. From such considerations a clearer picture is beginning to emerge as to how the large and complicated structure designed by Gyo Obata can best be adapted to serve the needs of the millions of Americans who are expected to stream through its halls annually.

As an aid to such planning, a relatively large scale (1 in. = 6 ft.) model of the building has been procured. The scale was selected to match the scale of a large collection of aircraft and spacecraft models now on hand. Strictly a planning tool, it has been designed to be completely demountable, both vertically and horizontally, so that every part of the building can be exposed for detail study and for the correlation of all its elements. The model, presently on display, will eventually be moved into the exhibits planning department.

Organizational Changes

Certain changes in personnel alignment were carried out in accordance with the master plan, approved in August 1965, which establishes five major departments in the museum: Aeronautics, astronautics, education and information, exhibits, and administration. Considerable assistance was rendered during this year to the education and information department by an outside consultant, and progress was made in analyzing the problem involved in the establishment of an NASM Research Center. This problem involved sorting out, segregating, rearranging, and indexing the vast amount of specimen and research material which had accumulated over the years at the Silver Hill facility.

---

*On July 19, 1966, President Lyndon B. Johnson signed the Bill into law.

As a first step toward defining the problem and developing corrective procedures, a rough screening process for all NASM material at Silver Hill was inaugurated and all items were separated and relocated as follows:

1. Full-scale flightcraft, engines, and ancillary equipment remain at Silver Hill.
2. Aircraft models, miscellaneous art, and memorabilia were removed to the 24th Street facility.
3. All library material, books, pamphlets, reports, drawings, etc., were removed to designated sorting areas in the A&I Building.

Exhibits Department Established

A principal feature of the master plan was the establishment on April 1, 1966, of an integrated exhibits department to include not only the normal exhibit design and display function, but also the responsibility for storage, restoration, and preservation of the Museum's aeronautical and astronautical specimens. Headed by James Mahoney as assistant director (exhibits), the department includes three elements: the preservation and restoration division at Silver Hill with Donald Merchant in charge; the model shops and storage area at the 24th Street facility, under the supervision of Winthrop Shaw; and the visual presentation division (Harry Hart, chief) in the Arts and Industries building. It also includes an office of quality control under Walter Male, formerly superintendent of the preservation and restoration division at Silver Hill and one of the most knowledgeable men in the country in aircraft and engine preservation and restoration techniques.

Working closely with the curators, the quality control officer will establish specifications and requirements for preservation and restoration of aircraft, engine, and accessory specimens, and will recommend contractors capable of doing the special jobs that the specimens require. He will also keep in touch with the work as it progresses, both in our own shops and in outside shops, to insure that it is done in accordance with the high standards required.

Plan for Silver Hill Facility

Because the physical conditions at the Silver Hill facility leave something to be desired, despite the opening of a new building (building 20), restudy of the operations was undertaken. As a result, a long-term plan was set up for rearranging the storage and shop areas there, and a step-by-step program for physical rearrangement of

specimens both indoors and out. With the cooperation and help of the buildings management department, certain areas are being leveled and gravelled so that aircraft in outdoor storage are readily available as study material, and similar rearrangement of specimens stored indoors is also under way. Studies have also been made with respect to size and location of new buildings, if and when they may become available. The objective is to put the Silver Hill facility on a par with the best aircraft storage and restoration activity in the country.

Model Collection Reorganized

The Museum has in its collections somewhere between 750 and 1000 models of aircraft that vary widely as to scale, quality, and physical condition. A program of model evaluation, repair, and/or disposition was inaugurated under which models of unquestioned importance are to be put into exhibitable condition and preserved properly in individual, well-marked containers; models of less importance are to be properly preserved, but not necessarily in exhibitable condition; and models of no importance are to be disposed of. Winthrop Shaw is custodian of the model collection, and as soon as conditions permit, model makers will be added to the staff and a model shop equipped.

Reference Files Reorganized

The library and other reference material stored at Silver Hill include a vast collection of unsorted, uncataloged reference items, and after extensive study by an outside consultant, E. W. Robischon, plans were evolved for screening, cataloging, and organizing it as a nucleus for the eventual Research Center in the new Air and Space Museum. The entire collection has been brought into the Arts and Industries building, where a sorting center was established adjacent to the present research facility and a beginning was made in the task of sorting and indexing.

Meanwhile, with the cooperation of a number of other government and outside agencies, studies are going forward which will lead to the ultimate selection of a modern system, compatible with other systems in use by government agencies, of storage and retrieval of technical information for the maximum convenience of historical or technical researchers.

Scholarly Accomplishments

The Museum's small professional staff, although primarily occupied with internal reorganization and reorientation during the year, has

accomplished a certain amount of research in addition to supplying day-to-day responses to outside inquiries in their several fields of interest. Work has continued on 19th-century war rockets, U.S. and European, and Goddard's early research in rocketry and on electric propulsion and associated fields (Durant); on the Balzer-Manley contribution in early engine development for the Langley aerodromes and the development of the Liberty engine of World War I (Meyer); on the Wright brothers' methods of aircraft control and the history of U.S. Air Mail Service, 1918–1927 (Garber); on Curtiss aircraft developments, research in development of amphibious aircraft, and research in operational aspects of air cargo, military and commercial (Casey); on experimental research in para-wing kites and gliders (Newland); and also on a group project developing a definitive biography of Samuel P. Langley.

Special Activities and Events

An aerospace art gallery was opened in the Arts and Industries building with special showings of NASA art; an exhibit of creative drawings and paintings on "space" subjects by young children (opened April 1); an experimental exhibit, "Enlightenment for the Blind," developed by NASA in cooperation with the Smithsonian Office of Education and Training; and a permanent exhibit of the Guggenheim aeronautical print collection.

In October 1965 an Experimental Aircraft Association Exhibit was held. On February 17, 1966, the third Edwin A. Link lecture, "The Apollo Program—A Mid-Stream Appraisal," was given by George M. Low of NASA. On April 4–5, 1966, was held the first international meeting of air and space museum directors and curators, organized and programmed by the Museum staff.

Exhibits including Gemini-4 and associated materiel were produced for Vice President Hubert H. Humphrey's "Washington Briefing for Young Americans," May 3–12, 1966; and topical displays of current public interest included Mariner-4 equipment and pictures; Surveyor-1 equipment and pictures; Apollo Program equipment; Gemini-4 spacecraft and associated equipment, including Colonel White's space suit "umbilical" and maneuvering unit used for the first U.S. space walk; and the Thor rocket inertial guidance system (A/C) and related components.

Formal presentations of new specimens included a sounding rocket (ARCAS); fuel cell for Gemini (General Electric Co.); turbo-jet engine cutaway model (United Aircraft Corp.); components of a B–17 recovered after 25 years in arctic ice (Sperry Corp., Vickers Division); solid fuel rocket mock-up (UTC/United Aircraft Corp.).

Other additions to the National Air and Space collections are listed below.

Alan Shepard's Mercury spacecraft Freedom-7 was loaned to the Science Museum, London, and to the Royal Scottish Museum, Edinburgh, for display during fall 1965 and spring 1966.

A new exhibit, "from supercharger to turbo-jet engine," was designed and installed in the new aircraft propulsion hall, and a complete nose section of a Douglas DC-7 transport airplane was installed in the west hall.

The Museum staff rendered assistance and consulting services on request to members of Congress, to other government agencies (including NASA, FAA, Library of Congress, National Archives), to various Departments of the Government, to technical associations, and to many companies in the aerospace industry. Educational assistance was rendered to radio and television programs. Curator Paul Garber made 41 lectures on flight history before various historical bodies during the year. And individual staff members served on numerous advisory committees and awards committees (Collier Trophy, Wright Trophy, Brewer Trophy, White Trophy, etc.).

New Advisory Board Members

Durng the year two changes in the personnel of the NASM Advisory Board occurred: Major General Rollen H. Anthis, Commander, Headquarters Command, USAF, was designated by the Chief of the Air Staff a member vice Major General Brooke E. Allen, USAF (Ret.); and the President appointed Colonel John H. Glenn, Jr., USMC (Ret.), to serve in place of General James H. Doolittle, who resigned in January 1965.

Additions to the Collections

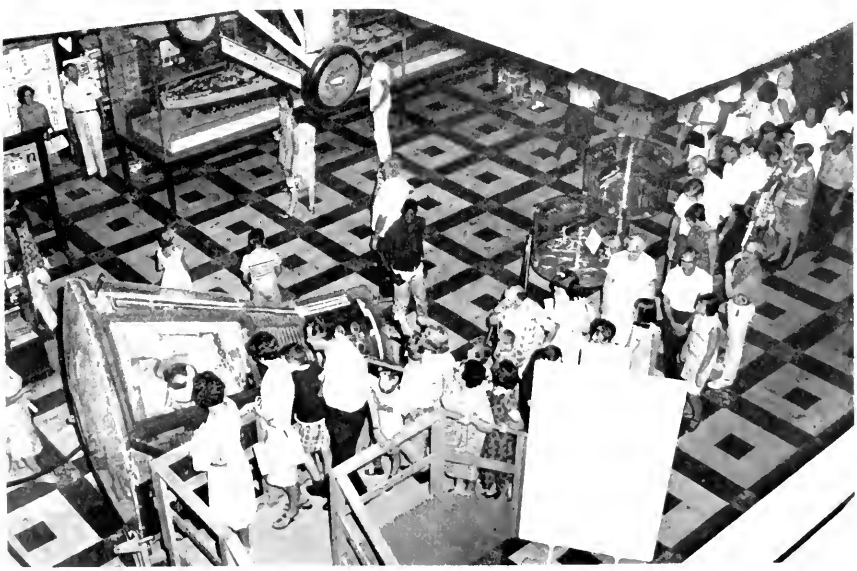
Additions to the national aeronautical and space collections, received and recorded during the fiscal year 1966, totaled 223 specimens in 59 separate accessions, as listed below. Those from Government departments are entered as transfers unless otherwise indicated; others were received as gifts or loans.

AIR FORCE, DEPARTMENT OF THE: Mercedes-Benz DB 601–1E (1944), inverted, in line engine, 1375 hp. (NAM 1636); *Wright-Patterson AFB:* Air Force models, Douglas A–20, A–26, C–47, C–54, C–118, C–124, C–133, B–66 1:48 size, (NAM 1667); *Scott AFB:* 45 aircraft hydraulic component units formerly from training devices board (cutaways) (NAM 1637).

AMERICAN AIRLINES, *Maintenance and Engineering Center:* Wright turbo-cyclone 18 R–3350 TC (1954) engine, 3500 hp., (NAM 1598).

National Air and Space Museum Advisory Board Member John H. Glenn, on a tour of the Museum with Assistant Director Frederick G. Durant (left) and Director S. Paul Johnston, pause at Glenn's Friendship–7 space capsule to greet a young visitor. Below: Inspecting new model of Museum building are Smithsonian Regents J. William Fulbright, Clinton P. Anderson, Crawford H. Greenewalt, John Nicholas Brown, and Robert V. Fleming.

Special exhibit "Lollypops and Launch Pads," illustrating children's impressions of space technology, intrigues young visitors. Below: Normal summer-day crowd waits to inspect the Gemini–4 space capsule.



American Bosch Arma Corp.: Full-scale guidance system mock-up for Atlas ICBM (NAM 1677).

American Institute of Aeronautics & Astronautics: 3 liquid-propellant rocket motors and 1 cast-aluminum blank used by American Rocket Society Experimental Committee, 1932–34 (NAM 1679).

Atlantic Research Corp.: ARCAS meteorological sounding rocket and instrumentation package (NAM 1657).

Bell Helicopter Co.: Model, Bell UH–1F, 1:32 size (NAM 1646).

Bensen Aircraft Corp.: First Bensen gyroglider, fabricated from readily available hardware and components (NAM 1609).

Bitsko, Maj. Leslie P.: 2 WW–II navigational instruments (NAM 1660).

Black, Archibald: Man's Elgin pocket watch used by donor in timing altitude flight of 18,200 ft. with first 8-cyl. Liberty engine, Aug. 31, 1918 (NAM 1654).

Commerce, Department of, *U.S. Weather Bureau:* Contemporary Russian Radiosonde (NAM 1661).

Donald, Jack: Two Australian native-made boomerangs (NAM 1665).

Douglas Aircraft Co.: Model of Douglas DC–7C transport, 1:50 size (NAM 1644).

General Electric Company: Fuel-cell battery developed for NASA Gemini spacecraft, cutaway model (NAM 1672).

Goddard, Mrs. Robert H.: Bronze reproduction of Daniel Guggenheim Medal awarded to Dr. Robert H. Goddard (NAM 1671).

Griffin, Lt. Col. Thomas P.: WW–II German Air Force pilot's helmet (NAM 1650).

Grumman Aircraft Engineering Corp.: Model, Grumman C–2A, carrier onboard delivery aircraft (transport), 1:16 size (NAM 1652).

Hartman, A. J.: Roberts 4X (ca. 1912) in-line engine, 50 hp. (NAM 1612).

Ide, Mrs. John J.: Collection of medals and award (NAM 1664).

Johnston, S. Paul: 2 aviation magnetic compasses, WW–II, 1 German, 1 Japanese (NAM 1663).

Kirk, Preston: Bentley B. 2, rotary, 9e-cyl., WW–II British engine, 250 hp. (NAM 1570).

Kuhn, Kenneth J.: Control-line model of Smith miniplane (NAM 1647).

L. L. Walker Co.: Curtiss OXX–6 (ca. 1916), in-line, engine, 100 hp. (NAM 1601); Hall-Scott A–7–A (1916), in-line engine, 110 hp. (NAM 1595).

Laskowitz, L. B.: Powered, scale model of helicopter rotor system, ca. 1945 (NAM 1640); 2 models of helicopter rotor systems and 20x33-in. wind tunnel (NAM 1674).

Loening, Grover: Model, Loening OA–1A (NAM 1656).

Martin Company: Model, Glenn L. Martin 1909 airplane (NAM 1649).

McDonnell Aircraft Co.: Model, McDonnell RF–4C in camouflage of Viet Nam war, 1966 (NAM 1645).

Munroe, Kenneth H.: Rubber stamp used in 1955 in ballistic missile program (NAM 1680).

Mussey, Robert: Model, of the Hannoveraner CL III, WW–I German 2-place biplane, 1:16 size (NAM 1655).

National Aeronautics and Space Administration, *Lewis Research Center:* Models aircraft and rocket-powered aircraft used for test purposes (NAM 1666).

Navy, Department of The, *Bureau of Aeronautics:* Model, Vought F8U–1 Crusader, single-place turbo-jet monoplane fighter 1:16 size (NAM 1639); Pratt & Whitney R4360–4A (ca. 1948), cutaway, radial ca. 28-cyl. engine, 3500 hp. (NAM 1616); Curtiss OX–5 (1917), water-cooled, V8 engine, 90 hp. (NAM 1613); Wheel of

B–36 airplane, weight 5500 pounds (NAM 1600); Allison XT40–A–4B (1950), turbojet prop engine and propeller, drive shaft, and gearing, 5500 E.S.H.P. (NAM 1597); Junkers "Jumo" 207 (1943), in line diesel engine, 1000 hp. (NAM 1568); Turbo-supercharged Liberty 12A (1922), in line liquid-cooled, V–12 engine, 405 hp. (NAM 1590); model, Martin XP6M2 Sea Master, 1:57 size (NAM 1648); model, Convair XFY1 Pogo, 1:22 size (NAM 1643); model, Piasecki HRP–2 helicopter 1:21 size (NAM 1642); high-wing twin tail, pulse-jet powered, pilotless, monoplane recovered by parachute, mfg. 1950 (NAM 1669); complete dummy SUBROC missile and handling dolly (NAM 1678); color photograph of Astronaut Edward White (NAM 1672).

PEASLEE, COLONEL JESSE C.: WW–II leather flight jacket used by donor as pilot in 9th Fighter Sq., 49th Fighter Gp. (NAM 1676).

PRATT AND WHITNEY AIRCRAFT: Model of JT3C turbojet engine, ¼ scale (NAM 1564).

REPUBLIC AVIATION DIVISION (Fairchild-Hiller Corp): Wind tunnel models of the Republic P–43, and P–47 aircraft, 1:10 size (NAM 1668).

ROBERT BOSCH CORP.: 1 Bosch (gasoline) fuel-injector pump used on Mercedes DB–601 engine which powered Messerschmitt ME113R to a world's record 481.4 mph in 1939 (NAM 1638).

SEDELL, C. J.: Parts for Hispano-Suiza Curtiss OX5, and Liberty engines; also parts for Dixie magneto (NAM 1634).

SMITH, J. C.: Model of L.W.F. biplane with 8-cyl. Liberty engine and model of Wright H–1914 airplane, 1:16 size (NAM 1662).

TUCKER, ROY: Model of Northrup XV35 flying wing, 1:22 size (NAM 1659).

UNITED TECHNOLOGY CENTER (Division of United Aircraft Corp.): Full-scale reproduction of P–1 solid-propellant rocket motor (NAM 1681).

VAN DRESSER, PETER: Rocket motor nozzle from experimental tests of American Rocket Society in early 1930's (NAM 1670).

VICKERS INC. (Division of Sperry Rand Corp.): B–17 accessory items—10 in. accumulator and electric hydraulic servo-transmission for operating gun turret, recovered from wreck of B–17 *My Gal Sal* which crashed on the Greenland ice cap in June 1942 (NAM 1641).

WILKINSON, MRS. MARY REILLY: Admission card to Lindbergh Day Celebration, June 11, 1927, for seating on Senate steps, East Front of Capitol (NAM 1651).

WOLF, ALFRED L.: Berling magneto type D–81–2 used on Curtiss OX–5 engine (NAM 1635).

ZINN, DR. (House of Representatives): Model collection, manufacturers desk-type models, various scales (NAM 1675).

The Museum's Historical Research Center was greatly enriched during the year with valuable research materials. The cooperation of the following persons and organizations in providing this material is sincerely appreciated and gratefully acknowledged:

Aero Publishers, Inc.
Alderman, A. K.
Allen, William S.
American Airlines
Berlstein, Chris
Bendix Corp.
Blaisdell, Lee
Bledsoe, John F., Jr.
Brooks, A. Raymond
California Institute of Technology, Jet Propulsion Laboratory
Casey, Louis S.
Ciesla, Chester
Coanda, Henri

Connecticut Aeronautical Historical Association
Cox, W. G.
Crotzer, Allan
Currie, James A.
Denehie, William A.
Dietrichson, P. W. K.
Dupont, Henry C.
Durant, F. C. III
Engel, Rolf
Experimental Aircraft Association, Chapter 190
Fahey, James C.
Field Enterprises Educational Corp.
General Aniline and Film Corp.
Glass, Richard
Gratz, Charles Murray
Grumman Aircraft Engineering Corp.
Hardie, George Jr.
Hatch, Fred
Hirsch, Robert S.
Hutchinson, J. D.
Huff, Marvin L.
Ide, Mrs. John Jay
Irvin, Leslie L.
Jablonski, Edward
Jacobs, J. W.
Jones, Mrs. L. Frances
Jordan, Richard D.
Kause, Selma
Kerley, Robert V.
Klingler, E. B.
Koch, Mrs. Alfred S.
Korn, Edward, A.
Martin-Baker Co. Ltd.
Martino, Joseph
Massin, Alex
Matt, Paul R.
McCarthy, Charles J.
McCay, Robert P.
Moore, Robert L.
Mongin, Alfred
Morales, Donald K.
National Aeronautic Association
National Museum of Canada, National Aviation Museum
Nye, Willis L.
Page, George Jr.
Page, Mrs. Stanley
Peasley, Jesse C.
Robischon, E. W.
Sanger-Bredt, Frau Dr. Irene
Sayler, James
Shaw, Winthrop
Shepard, Alan B. Jr.
Shepard, Morton B.
Smith, W. E.
Sperry-Rand Corp. Vickers, Inc. Div.
Stine, G. Harry
United Air Lines
U.S. Air Force
U.S. Air Force Museum
U.S. Library of Congress
U.S. National Bureau of Standards
U.S. National Aeronautics and Space Administration, Goddard Space Flight Center
U.S. Navy
U.S. Navy, Office of Aviation History
Vaeth, J. Gordon
Van Dresser, Peter
Van Hoorebeeck, A.
Van Zandt, J. Parker
Velkas, C. Frank
Western Airlines
Westland Aircraft Limited
Wigton, D.C.
Wright, Mrs. Burdette

National Armed Forces Museum Advisory Board

Colonel JOHN H. MAGRUDER III USMC, *Director*

RECOMMENDATIONS REGARDING AN alternate site plan for the National Armed Forces Museum Park were submitted to the Board of Regents by the National Armed Forces Museum Advisory Board at its fifth annual meeting, January 11, 1966. These had been developed as a result of opposition to the site plan submitted in January 1965, which proposed exclusive use of Fort Washington, Maryland. Working in conjunction with the National Park Service and the staff of the National Capital Planning Commission, the Advisory Board devised a site plan entailing location of the major museum elements in the so-termed Fort Foote-Smoot Bay area of Prince Georges County, Maryland. Here would be sited the large majority of the outdoor exhibits and reconstructions, the ship basin, and the combined visitor center and exhibit building proposed in the Advisory Board's report of January 12, 1965. Certain facilities at Fort Washington would be shared by the National Park Service with the Smithsonian for development as the coast defense exhibits of the Museum Park.

The specific recommendations submitted by the Advisory Board on January 24, 1966, were:

1. The Smithsonian Institution seek legislative authority to acquire, both by transfer from the National Park Service and by purchase, such lands in the Fort Foote-Smoot Bay area of Prince Georges County, Maryland, as are necessary for establishment of a National Armed Forces Museum Park.

2. The Smithsonian Institution negotiated with the Department of the Interior a joint use agreement permitting development of certain facilities at Fort Washington, Maryland, viz., the old masonry fort, Batteries Decatur and Many, and two supplemental water batteries, as elements of the overall National Armed Forces Museum Park.

Throughout the year the Board staff, in addition to implementing the decisions of the Advisory Board with regard to site planning and related matters, conducted negotiations with various agencies of the Armed Forces and the General Services Administration with a view to acquiring military and naval objects appropriate for the collections of the proposed Museum Park. In consequence a large and varied number of objects either were received during the year or were set aside by owning agencies for retention and eventual transfer to the Smithsonian. For example, there were acquired from the Department of the Army numerous components of the ENIAC, the first modern electronic digital computer, product of Army-sponsored research during World War II; and from the Department of the Navy the last operational Regulus II missile, complete with records chronicling its noteworthy career as a fleet weapon and, subsequently, a supersonic target drone. Designated for eventual transfer to the Smithsonian by the Department of the Air Force and the U.S. Marine Corps, respectively, were a mighty Titan I missile silo complete and a unique collection of 20 tracked landing vehicles reflecting developments in the field of amphibious warfare from early in World War II up to the middle 1950s. And from the General Services Administration the Smithsonian acquired title to the sunken U.S.S. *Tecumseh*, a monitor of the Ericcson type, lost in the battle of Mobile Bay, August 5, 1864.

In cooperation with the Smithsonian Library the staff continued to acquire from Armed Forces historical agencies and elsewhere publications in the field of military and naval history both to serve the immediate needs of staff members and to form the nucleus of the study center library of the National Armed Forces Museum Park.

Freer Gallery of Art

JOHN A. POPE, *Director*

THE GALLERY IS CONCERNED largely with the study of the civilizations of the East and with the promotion of the highest ideals of beauty. In accordance with the terms of the will of founder Charles Lang Freer, these two very broadly phrased conditions serve as guidelines for the work of all members of the staff. In general, each member of the staff has pursued individual research projects, depending on his specialty, in the fields of Chinese, Japanese, Indian, Persian, and Arabic art. This work is carried on in the Gallery and in other museums, libraries, and collections both in this country and abroad In addition to these activities, staff members have been concerned during the past year with the study of objects contemplated for purchase and with the further study and cataloging of those objects which have been added to the collection. Considerable time has also been spent preparing reports on objects submitted for examination.

The Freer Gallery received a number of grants during the year. Among these was an important one from the Kevorkian Foundation, to be used over a five-year period in assisting the library to expand its Near Eastern holdings, and for the publication of the Gandhara frieze (49.9). Another sizeable grant came from the JDR 3rd Fund, to be used by Professor Yukio Yashiro, the recipient of the Freer Medal. The National Geographic Society gave financial assistance to support the publication of the *IIC Abstracts;* and an unrestricted gift was received from Harold B. Cahn and Associates. The Felix and Helen Juda Foundation and the Ellen Bayard Weedon Foundation supported the purchase of important additions to the library.

Staff Changes

A great loss to the Freer Gallery was the death of Miss Katharine N. Rhoades in New York on October 26th. Associated with the Gallery from its beginning, she had been a close personal friend of the founder, Charles Lang Freer, and had been instrumental in helping with the cataloging of the collection. She was mentioned by Mr. Freer in his will as a friend and advisor of the gallery and continued in active service as honorary consultant until the time of her death.

The Gallery regretfully accepted the resignation, July 1, 1965, of Dr. James F. Cahill, curator of Chinese art, who is now with the University of California at Berkeley. Dr. Cahill had first come to the Gallery as a Hackney Scholar (American Oriental Society) in 1950 and studied in that capacity for approximately one year. In 1956 he returned as a Freer Fellow from the University of Michigan for another year, at the end of which time he became a regular staff member.

The end of 1965 saw the retirement of Mrs. Lnor O. West, administrative assistant, after 20 years of service with the Freer. In June Mrs. Constance B. Olsen resigned as librarian, and her place has been filled by Mrs. Priscilla P. Smith. Mr. William Thomas Chase III, assistant in the technical laboratory, resigned temporarily to return to the Gallery in the fall of 1966. His place was filled for the summer by Mrs. Meryl Johnson, chemist, from the University of Michigan.

Two volunteer summer interns served during the summer of 1965: Miss Barbara Bernhard (Oberlin College) and Miss Susan Lyles (Mary Baldwin College). Miss Masako Saito of the Conservation Center, Institute of Fine Arts, New York University, returned for another period of three weeks to study Mr. Sugiura's methods of restoring and mounting Oriental paintings. Miss Priscilla Parsons completed several months of study during the summer of 1965 in the Near Eastern field under a grant from New York University. In October, Mrs. Ellen Johnston Laing of the University of Michigan came to the Gallery as a Freer Fellow to do research in the field of Chinese art in preparation of her doctoral thesis. In January and February of 1966, Miss Thea Comins, a student at Bennington College, worked for Dr. Ettinghausen under the Smithsonian Institution's academic year research assistance program. On May 12, 1966, Miss Vicki Weinstein reported for duty as a Hackney Scholar from Cornell University; and in June, Miss Mary Watkins (Mount Holyoke College) and Miss Susan Frankel (Cornell University) reported for duty as summer interns.

The Collections

The Freer Gallery of Art acquired a total of 36 objects during the year, including two exceptional pieces of Persian metalwork: a Sasanian silver and gilt bust of a king, probably Khosrow I, dated mid-6th century (66.23), and a Parthian head of a lady (66.24); this latter is approximately 2,000 years old. The Japanese collection was enriched by the purchase of several outstanding paintings: a pair of Namban (foreigners) screens of the Momoyama period, 16th century, depicting harbor scenes (65.22–23); a landscape screen by the artist Sesson (1504–1589), from the Ashikaga period (66.3); a pair of hanging scrolls, the *Ryokai Mandara*, early Buddhist paintings of the late Fujiwara or early Kamakura periods (66.4–5); and a pair of handscrolls entitled *Kobo Daishi Zaito*, or *Life of the Priest Kobo*, of the Kamakura period (66.9–10). To the Indian section was added a very fine bronze, a shrine of Vishnu, dating to the Pala dynasty, 11th/12th century (66.15).

Other purchases consisted of:

BRONZE

Chinese, Han, 3rd/2nd century B.C.; vase with tall, cylindrical neck; incised decoration. (66.14)

Japanese, Kamakura, 13th century; *Suibyō*—water pot, seated lion on cover. (65.26)

LACQUER

Chinese, Ming, 15th century (early); round covered box, red lacquer carved in relief; *ch'i-lin* and peonies; three-character inscription; *Yang mao tsao*. (65.25)

METALWORK

Persian, Sasanian, early 4th century; silver and gilt bottle with repoussé reliefs of Dionysiac figures separated by fluted columns topped by bird figures. (65.20)

Persian, Sasanian, 4th century; silver and gilt bottle with repoussé reliefs of musicians and dancers, each with a child; Pehlevi inscription. (66.1)

Persian, Sasanian, 3rd–7th century; gold necklace of biconical beads of twisted wire and disc-shaped beads of granulated fretwork; square pendant. (66.6)

Persian, Seljuk, 12th century; gold necklace of openwork elements made of twisted wire and small grains. (66.7)

Persian, Seljuk, 12th century; gold necklace of wire and granulation work, some beads inlaid with turquoise. (66.8)

PAINTING

Chinese, Ch'ing, 18th century, by Ch'en Mai; figures in a wooded landscape. (65.24)

Indian, Deccani, early 17th century, Bijāpūr; barefoot warrior with round shield and straight-bladed sword. (65.21)

Indian, Mughal, mid-17th century; shepherd with goat, in a stylized landscape. (66.22)

Japanese, Edo, Ukiyoe, by Kaigetsudō Ando, early 18th century; figure of a courtesan. (66.2)

Japanese, Ashikaga, Muromachi Suiboku, att. to Sekkyakushi (14th/15th century); boy on a water buffalo. (66.16)

Japanese, Edo, early 17th century, Tosa School; *Tsuru no Monogatari* (Tale of the Crane), handscroll. (66.18)

Persian, Isfahan (1082 H./A.D. 1672), by Mu'īn Mosawvir; line drawing of monkey riding on a lion. (66.13)

POTTERY

Egyptian, Fatimid, 11th-12th century; white glazed bowl with red luster design of leaves and arabesques. (66.26)

Japanese, Momoyama, Seto ware, Sobokai; reddish brown stoneware jar, four loops on shoulder; *Sobokai tsukuru* incised on base. (66.17)

Japanese, Edo, 17th century, Kutani ware; porcelain dish decorated with overglaze enamels in yellow on green, with blackish-brown diaper patterns. (66.19)

Persian, Transoxania or eastern Iran, 10th century, Afrāsiyāb ware (so-called); small platter with black and brown floral designs, Kufic inscription. (65.27)

Persian, Kāshān, early 13th century; deep bowl with radial pattern of Naskhī writing, floral designs, and birds in cobalt blue and black on white. (65.28)

Persian, Samarra ware, 9th century; grayish bowl with originally white glaze and design of blue. (66.11)

Persian, Kāshān, early 13th century; vase with 8-sided body, decorated with leafy scrolls, plants and fishes in black under bluish glaze; iridescent. (66.20)

Persian, Nishapur, 10th century; deep bowl with luster design of peacock holding fish in its beak. (66.27)

Turkish, Iznik ware III, 17th century; square tile with design of two parrots; blue, green and red on white. (66.12)

Turkish, Iznik ware III, 16th century; plate with central leaf and floral design on coral red ground. (66.21)

Third presentation of the Freer Medal, September 15, 1965. Professor Yukio Yashiro receives Medal from Smithsonian Secretary S. Dillon Ripley. Seated left: Freer Gallery of Art Director John A. Pope.

Princess Margaret, accompanied by Director John A. Pope and Secretary S. Dillon Ripley, as she signs Freer Gallery guest book November 18, 1965.

Left: Silver bust. Persian metalwork, Parthian, 1st century B.C.-1st century A.D. (?). 66.24, Freer Gallery of Art.

Below: Silver and gilt bust of a king, probably Khosrow I. Persian metalwork, Sasanian, mid-6th century. 66.23, Freer Gallery of Art.

Shrine of Vishnu. Indian bronze, Pala dynasty, 11th/12th century. 66.15, Freer Gallery of Art.

Namban (foreigners) screen, harbor scene. Japanese painting, Momoyama period, 16th century, Ukiyoe school. 65.22, Freer Gallery of Art.

Turkish, Iznik ware III, 16th century; plate with floral design around central cypress tree; blue, green, red and black on white ground. (66.25)

Library

During the year, 219 items were incorporated by purchase, exchange, and gift into the library collection, which has been well used, both by the staff and by a total of 577 university students and other scholars doing reference work, including casual visitors wanting less scholarly material on the objects displayed in the galleries. In addition, over 500 photographs were added to the study files, and the slide collection has been greatly expanded with the acquisition of 2,263 slides.

The Ellen Bayard Weedon Foundation made it possible to purchase, in addition to other titles, the following outstanding books:

Cadière, L., *L'art à Hué* (Hanoi, *ca.* 1920).

Ecke, G., *Chinese painting in the Honolulu Academy of Arts and in private collections* (Honolulu, 1965).

Shang-hai po-wu-kuan ts'ang ch'ing-tung-chi' (Shanghai, 1964).

Care of Collections

Care of the works of art was shared by several of the staff members. The technical laboratory examined, cleaned and/or repaired, as necessary, a total of 27 objects and made 75 identifications by X-ray diffraction analysis, etc.; in addition, 48 objects were examined which were either contemplated for purchase or had been submitted for authentication by other museums or private owners. Ben B. Johnson, consultant on conservation work, under contract to the Gallery, examined and worked on 61 oil paintings in the American collections. Takashi Sugiura, with the help of two trainees (his daughter Kumi and Makoto Souta, who has been brought from Japan to serve his apprenticeship under Mr. Sugiura), cleaned, retouched and remounted a total of 19 Chinese and Japanese paintings. Illustrator Frank A. Haentschke rematted 43 Arabic, Indian and Persian paintings.

All the necessary equipment for the 204 exhibition changes made during the year was provided by the cabinet shop under the direction of superintendent Russell C. Mielke, who also maintained the building in the usual immaculate and sound condition, and supervised completion of the new storage facilities for the Oriental paintings.

Curatorial Activities

Director John A. Pope carried on extensive research on the ancient Chinese bronzes in the collection, in collaboration with Rutherford

J. Gettens head of the Freer technical laboratory, and other scholars, toward the publication of this material in the revision and enlargement of the Gallery's *Catalogue of Chinese Bronzes* (1946). A large part of this was carried on in conjunction with the technical laboratory, and is reported on page 278. He has also continued his research in the fields of Chinese and Japanese ceramics; in conjunction with this, he is at present on an extended journey which is taking him to several European countries, the Near East, India, Taiwan, and Japan.

During the year, he gave the following lectures:

"Chinese Porcelains in Early America," at George Washington University and at a meeting of the Trustees of the Frick Collection, New York City.

"Ancient Chinese Bronzes in the Freer Gallery of Art," at a meeting of the Society of Non-Destructive Testing in New York City.

"Art Collectors and Collections in Old China," at the University of Michigan and at the Cosmos Club.

"A Miracle of Rare Device," at Asia House Gallery, New York City.

Assistant Director Harold P. Stern continued research on Japanese *Ukiyoe* and *Yamatoe* paintings, including the study of numerous paintings of these schools while conducting a tour of the Archives of American Art (a group of 106 members) through the Far East. The group received briefing lectures in addition to being guided through such centers of Oriental art as Tokyo and Kyoto in Japan, Hong Kong, Thailand, and Taiwan.

In January, he assisted in the planning and presenting of the Symposium on Japanese Art held in connection with the Japanese Government's loan exhibition, "Art Treasures from Japan." At the same time, in conjunction with photographer Raymond A. Schwartz of the Freer Gallery of Art, Stern arranged and carried out the complete photographing and documentation of the objects in this exhibition, making slides (approximately 40,000) available through the Freer Gallery to other museums and educational institutions.

He continued serving in the honorary posts and duties assumed in previous years, and he supplied the introductory comments for two shows in the Washington area: the exhibition of works by Uinichi Hiratsuka at the Museum of Modern Art, and the exhibition of Contemporary Japanese Prints at the Cleveland Park Library, both sponsored by the Washington Print Club.

During the year, Stern gave the following lectures:

"Characteristics of Japanese Art," at the opening of the Japanese Government's loan exhibition at the Los Angeles County Museum of

Art and also at the Detroit Institute of Art and the Philadelphia Museum of Art when the exhibition was being held at those institutions.

"Narrative and Genre Aspects of Japanese Art," at the symposium held at the Detroit Institute of Art during the exhibition of treasures from Japan and also at the Royal Ontario Museum in Toronto when the exhibition was held there.

"Japanese Narrative Handscroll Painting," at the annual dinner of the Smithsonian Institution's Regents.

"Popular Painting of Tokugawa Japan," at the Andrew Dickson White Museum of Art, Cornell University.

Richard Ettinghausen, head curator of Near Eastern Art, engaged in exploratory research at historical and archaeological sites in Turkey during the summer of 1965, and subsequent research in libraries and museums in that country and in Europe. This work was preparatory to writing a history of Turkish art from the late 12th to the 17th centuries, the text to be published by A. Skira in Geneva under the title, *Art Treasures from Turkey.*

He continued research on early Indo-Muslim painting of the Sultanate period, and made background studies for new acquisitions by the Gallery. In addition to his previously held honorary posts, he became a member of the Advisory Board of the Near Eastern Art Research Center, Inc., New York; a member of the Sub-Committee on Finds, American Research Center in Egypt, Inc.; and a corresponding member of the Academie des Inscriptions et Belles Lettres, Paris.

During the year, he gave the following lectures:

"Prayer Rugs," for the Rug Society of Washington, D.C.

"Iranian Art in the Islamic Period: Tradition and Changes," at the Los Angeles County Museum of Art.

"Persian Miniatures and Drawings," for the Graphic Arts Council of the Los Angeles County Museum.

"God, Man and Nature in Islam," at the University of Pennsylvania.

"Art and Architecture of Islam," at Harvard University.

"Dionysiac Motives in Persian Art," at the Institute of Fine Arts of New York University, Columbia University, and at Pennsylvania State University.

"The Constant Elements in Persian Art," at the J. B. Speed Museum in Louisville, Kentucky.

"Old and New Teheran," at the Iranian Embassy for a group of students from George Washington University.

"An Introduction to Persian Art," for the International Council of Women in the United States at the Junior Museum of the Metropolitan Museum of Art.

230-457—66——23

"7,000 Years of Persian Art," at Pennsylvania State University.

"Famous Iranian Cities" and "Iranian Art," for the Peace Corps School for International Training at Brattleboro, Vermont.

"Persian Miniatures," for the Municipal Art Society of Baltimore City.

"Art Treasures from Turkey," for the Congressional Club at the National Gallery of Art.

During the year, the work of the technical laboratory, under Rutherford J. Gettens, was largely devoted to the study of Chinese ceremonial bronzes in preparation for the forthcoming publication on that subject. This was the culmination of many years of research in this field. All the scientific techniques available have been used: microscopy, metalography, spectrographic and wet-chemical analysis, analysis by X-ray diffraction, plus the study of the objects by ultraviolet light and, in some cases, by radiography. The purpose of this research has been to find out everything possible about the physical and chemical properties of the alloys and about the methods by which the vessels were made.

Head curator Gettens also continued his studies on corrosion products of ancient metal objects and his study of Japanese pigments, particularly a modern type—a form of glass matrix in which pigment particles are embedded; this latter project will aid in the identification of Japanese forgeries. With the issuance of volume 5, number 4, of *IIC Abstracts* Gettens relinquished editorship of this publication, which hereafter will be edited at the new office of the Conservation Center of the Institute of Fine Arts, New York University.

During the year, he gave the following lectures:

"Joining Methods in the Fabrication of Ancient Chinese Bronze Ceremonial Vessels," at the William Young Symposium held by the Boston Museum of Fine Arts, at Asia House for the Chinese Art Society of New York, and at the Fourth National (International) Sculpture Casting Conference, University of Kansas.

"Some Observations of the Techniques Employed in the Fabrication of Ancient Chinese Bronze Ceremonial Vessels," at the conference last named above.

"Microscopy at the Freer Gallery of Art," at the New York Microscopical Society at the American Museum of Natural History.

Associate curator of Chinese art William B. Trousdale continued research on his studies of Chinese jade and archaic bronze weapons. In March, he joined with the University of Michigan's archaeological excavations and survey of sites in Syria and Afghanistan, a project that is expected to keep him in the field for a period of approximately five months.

Publications

"James McNeill Whistler, A Biographical Outline Illustrated from the Collections of the Freer Gallery of Art," by the late Burns A. Stubbs (*Freer Gallery of Art Occasional Papers*, vol. 1, no. 4, July 9, 1965), was revised and reprinted. Considerable time was given to the preparation of volume 6 of *Ars Orientalis* and to the first two volumes of the *Catalogue of Chinese Ceremonial Bronzes*, now in publication; the latter supersedes and enlarges upon the Freer Gallery "*Descriptive and Illustrative Catalogue of Chinese Bronzes Acquired During the Administration of John Ellerton Lodge*," by J. E. Lodge, A. G. Wenley, and J. A. Pope (1946).

Publications by staff members were as follows:

ETTINGHAUSEN, RICHARD. "In Honor of Rudolf Berliner, April 14th, 1966, on the Occasion of His Eightieth Birthday," in *Rudolf Berliner: Bibliographie*. Munich, 1966, pp. 11–14.

———. "The Islamic Period," in *Art Treasures of Turkey, Circulated by the Smithsonian Institution, 1966–1968*. Washington: Smithsonian Institution, 1966, pp. 47–66.

TROUSDALE, WILLIAM. [Review of] *Fouilles d'Amri*, by Jean-Marie Casal (Publications de la Commission des Fouilles Archèologiques, Fouilles de Pakistan), *American Journal of Archaeology*, vol. 70, 1966, p. 75.

Public Services

The total number of visitors to the Gallery, which was open to the public from 9:00 to 4:30 every day except Christmas Day, was 222,322, an increase of more than 11,000 over that of the previous year. The highest monthly attendance, in August, was 38,235. Of the total, 2,853 came to see staff members, to submit objects for examination, to study in the library, or to see objects in storage. In all, 8,152 objects and 2,362 photographs were examined, and 655 Oriental language inscriptions were translated for outside individuals and institutions. Docent service in the exhibition galleries was given by staff members, to 35 groups totaling 628 persons, and in the storage rooms to 7 groups totaling 73 persons; in addition, 457 individuals were also shown objects in storage. Among the visitors were 224 distinguished foreign scholars or persons holding official positions in their own countries, who came here to study museum administration and practices in this country.

On September 15, 1965, ceremonies were held for the presentation of the Charles Lang Freer Medal to Professor Yukio Yashiro, "for distinguished contribution to the knowledge and understanding of

Oriental civilizations as reflected in their arts." The presentation was made by Secretary Ripley, and Dr. Pope spoke on the career of Professor Yashiro, one of the world's outstanding specialists in the arts of the Far East and also an authority on the Italian painter Sandro Botticelli and his school. The recipient in his speech of acceptance commented on Mr. Freer and American pioneer collectors in the field of Oriental art. In particular, he stressed Mr. Freer's early association with Japan. Professor Yashiro's address was followed by a reception.

The series of illustrated lectures was continued as follows:

"Dionysiac Motives in Iranian Art," Dr. Richard Ettinghausen Freer Gallery of Art (October 12, 1965).

"Chinese Painting and Abstract Art," Professor Martie W. Young, Cornell University (November 9, 1965).

"Portraiture in Japan," Professor John Rosenfield, Harvard University (January 11, 1966).

"Decoration and Monumentality in the Momoyama," Father Harrie A. Vanderstappen, University of Chicago (February 8, 1966).

"Taoist Wall Painting and the Chinese Tradition," Laurence Sickman, William Rockhill Nelson Gallery of Art (March 22, 1966).

"Art and Archaeology in South Arabia," Dr. Gus W. Van Beek, Smithsonian Institution, Division of Cultural Anthropology (April 19, 1966).

The auditorium was used by 13 outside organizations for 30 meetings, with a total attendance of 4,187.

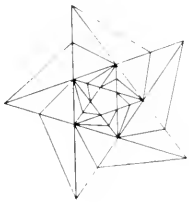
The photographic laboratory made a total of 15,164 items during year, including negatives, photographs, color slides, color sheet films, and polaroid prints; these included both Freer Gallery objects and objects submitted from other sources.

At the sales desk, 110,768 items were sold, comprising 5,821 publications and 104,947 reproductions (including postcards, slides, photographs, reproductions in the round, etc.).

These figures indicate an increase of approximately 50 percent in the work of both the photographic laboratory and the sales desk over that of previous years.

National Collection of Fine Arts

DAVID W. SCOTT, *Director*



SIGNIFICANT PROGRESS TOWARD fulfillment of its goals and mission has been made during the year by the National Collection of Fine Arts. These were formulated in the legislation of May 17, 1938, that instructed the NCFA "to encourage the development of contemporary art and to effect the widest distribution and cultivation in the matters of such art" and in the subsequent architectural program that advised the bureau "to consider its province to be the cultural life of the community all over the United States and . . . its obligation to be the encouragement of a high standard of quality among artists in the fields of both the fine and practical arts."

As the move into new quarters in the renovated Patent Office building approaches, accelerated growth toward a full-scale museum operation becomes imperative. Among the activities toward this end, made possible by an increased budget, are intensive review and refinement of plans for the new quarters; enlargement of the collections and their documentation and restoration; expansion and specialization of library services; improvement in the quality and diversity of exhibitions; and a great increase in public services offered, in the form of seminars, lectures, films, and publications.

Most gratifying has been the success of exhibitions and other national services in meeting recognized needs and achieving the highest professional standards. Public appreciation and awareness of the Collec-

tion's goals and purposes have been evidenced not only by widespread interest but also by increased donations of works of art, contributions of funds for purchases of art works and developmental activity, and offers of support for the program generally.

The dynamic growth of the National Collection of Fine Arts has prompted requests for the bureau to undertake further projects. In addition to the task of creating in the Fine Arts and Portrait Galleries (the old Patent Office building) a representative survey of American art, a second gallery project is being developed as the NCFA formulates a program for the old Court of Claims building (the original Corcoran Gallery) now assigned to the Smithsonian Institution and conceived as a gallery of art and design. The Patent Office and Court of Claims planning involves both architectural and operational considerations. Other program proposals are being developed, including assistance for the Cooper Union Museum, and art exhibits for the John F. Kennedy Center for the Performing Arts. Community and educational exhibit proposals inaugurated early in the fiscal year unfortunately were interrupted by the resignation of curator of education George V. Gallenkamp in April 1966.

Other events of the year included the transfer of the Smithsonian Institution Traveling Exhibition Service to the U.S. National Museum and the retirement of Thomas M. Beggs, former NCFA director and recently special assistant to the Secretary for fine arts.

Increased selectivity in the planning of the year's program of 11 exhibitions was demonstrated not only by the high quality of objects exhibited but by the balance in choice of subject matter: six exhibitions (five of major dimension) were drawn from American art—two from the most immediately contemporary art of our country and four historically oriented: and five presented the arts of other nations—again, of both past and present periods. Of all these, five were created by NCFA staff members.

Elsewhere, the NCFA enjoyed the felicitous cooperation of other segments of the art world. The Knoedler Galleries in New York City held a mid-winter benefit exhibition for the NCFA of the work of American artist Mary Cassatt, and for the first time in many years substantial private support was received, which will allow for the purchase of works of art and for other developmental activity. The IBM Gallery, next door to Knoedler's, presented an exhibition of miniatures in the collection, and generously donated leaflets on the NCFA and its miniatures.

Staff Changes

In November 1965, the staff was augmented by the "detail" to the NCFA of the International Art Section of the USIA, under the supervision of Miss Lois Bingham. The NCFA assumed responsibility for U.S. representation in the international art exhibits at São Paulo and Venice with the conviction that it must demonstrate our country's concern for cultural values and its continuing major achievements in the arts.

Other additions to the staff included Farnham Blair, museum technician; Susan Bratley, museum curator; Ruth Carlson, librarian (cataloging); John Latham, assistant for special services; and Lynne Kolarsey, assistant to the registrar.

Smithsonian Art Commission

A special meeting of the Executive Committee of the Smithsonian Art Commission was held on November 10, 1965, to review works offered since the 42nd annual meeting in December 1964, and the 43rd annual meeting of the Commission was held in Washington on Tuesday, December 7, 1965.

Recommendations were made for the reappointment of Wilmarth S. Lewis, Henry P. McIlhenny, Paul Mellon and Ogden M. Pleissner for the usual 4-year term. The following officers were re-elected: Edgar P. Richardson, Chairman; Gilmore D. Clarke, Vice-Chairman; and S. Dillon Ripley, Secretary. The following were re-elected to the Executive Committee: David E. Finley, Chairman, Mr. Clarke, Mr. Pleissner, Mr. McIlhenny, Mr. Richardson (ex officio) and Mr. Ripley (ex officio).

Commission members reviewed works submitted and recommended the acceptance or rejection of those works as part of the Collection. These items are reported under Accessions.

A special meeting of the Executive Committee was called on January 20, 1966, to consider recommendations concerning NCFA needs, and it was the sense of the Committee that an ad hoc committee should be set up to help meet these needs.

The death of Paul Manship on January 30, 1966, ended this great artist's long and fruitful association with the National Collection and the Smithsonian. Mr. Manship had been a member of the Smithsonian Art Commission since 1931, serving as Chairman from 1944 to 1964. To this service, he brought great warmth and goodwill and he donated to the Collection many excellent examples of his work. By the terms of

his will, the approximately 500 pieces of sculpture and drawings that remained in his studios were to be divided between the National Collection and the St. Paul Art Center. These institutions are presently planning a memorial exhibition to be held during the later summer and fall of 1966.

The Collections

Among the important gifts to the Collection during the year were 43 pieces of sculpture by Paul Manship given by the artist shortly before his death. In addition, the Collection was enriched by his magnificant bequest of 102 pieces of sculpture, 200 drawings and sketches, and 1 painting. Excluding the Manship objects, which will be reported in the next annual report, 390 works were received into the collections. Most noteworthy was the group of 105 works (paintings, watercolors, drawings, and graphics) executed under the Works Progress Administration during the 1930's, transferred from the National Park Service, U. S. Department of the Interior. Among this group are studies for murals by Reginald Marsh and William Gropper, and paintings by Millard Sheets, Peter Blume, and Eugene Higgins.

Important individual works received included a painting, *Cotopaxi*, dated 1855, by the Hudson River painter Frederic Edwin Church, given by Mrs. Frank R. McCoy; *The Hills*, by Preston Dickinson, given by Mrs. Robert F. Shawan; *Phenomena Off From Shore*, by Paul Jenkins, given by the artist; and a watercolor, *Outdoor Cafe*, by Maurice Prendergast, given by Dr. R. A. Kling.

Purchases included an oil study for a large work, never executed, entitled *The Vision*, by the Hudson River painter Thomas Cole; *Mountain Lake, Near Piedmont, Maryland*, by the mid-19th century painter William E. Sonntag, and a small *Landscape* by the Japanese-born American artist Yasuo Kuniyoshi.

A total of 1,900 works were loaned to the NCFA by 117 lenders. These included 543 weather vane molds loaned by Mrs. Edith Halpert, and 170 20th-century paintings and drawings loaned by Mr. Olin Dows. Of the 1,900 works, 1,030 were for lending programs, including items for display in the White House.

The NCFA lent to museums and educational institutions throughout the United States 360 paintings from its collections. An exhibition of 158 of its most important miniatures was held at the International Business Machines Corporation in New York City. The Wadsworth Atheneum exhibited 111 Catlin paintings in a George Catlin exhibition in Hartford. And 510 works were lent to offices of the Federal Govern-

ment, including 144 within the Smithsonian Institution and 127 to the White House.

Sixty-five paintings belonging to the National Collection were transferred to the National Portrait Gallery. The 24th Street staging area was organized to accommodate approximately 2,000 objects in the NCFA collections for storage, repair, and study prior to their removal to the new quarters in the old Patent Office building; and 67 paintings and 2 works of sculpture were restored. In connection with the NCFA's concern for government-owned art and for gathering archival material, a survey was initiated on the study and documentation of public sculpture existing in the District of Columbia. Washington sculptor Bruce Moore served as consultant.

Additions to the library, a facility which in the new building will be shared with the National Portrait Gallery, have come by the exchange distribution of catalogs issued by the NCFA and by gifts. Of the many received since July 1965, only a few of the donors can be mentioned here: Mr. Richard Dannenberg, Director of the American Contemporary Art Gallery, New York; Mrs. Daphne Foskett, Edinburgh, Scotland; Mr. David C. Huntington, of Olana Preservation, Inc., New York; Mr. Alexander Ince, New York; the Freer Gallery Library; Mr. Andrew Oliver, New York; the Embassy of the Rumanian People's Republic, Washington, D.C.; Mrs. John Sloan and Mr. Charles Nagel, Washington, D.C.

Important collections of books and papers were also received from the American Federation of Arts, New York; the Bollingen Foundation, New York; the Corcoran Gallery, Washington; Mrs. Anthony de Francisci, New York; Mrs. Edith Halpert, New York; the Martha Jackson Gallery, New York; Mrs. Haven Parker, Boston; the Tate Gallery, London; and others. The NCFA is grateful for this very necessary support of the library collections.

Exhibitions

During the past year, the number of exhibitions was reduced (11 against 19 of the previous year), and their size and duration extended. Greatly increased effort was put into selection and presentation in order to provide exhibitions of national and international significance.

George Catlin's Indian Gallery (July 19 through September 19, 1965). The Smithsonian Institution's collection of Catlin's paintings of the American Indian is unique and world-famous. This exhibition was the first occasion in over 50 years that the entire collection of more than 400 paintings and prints was on public view, exhibition mounted

in a setting and manner approximating Catlin's own gallery of the mid-19th century.

Treasures From the Plantin-Moretus Museum (July 24 through August 15, 1965). This small exhibition of fine 16th- and 17th-century printing and printing equipment from the Plantin-Moretus press of Amsterdam was circulated by the Smithsonian Institution Traveling Exhibition Service.

American Prints of the Sixties (September 4 through September 26, 1965). In a less comprehensive form, this was initially organized by NCFA for a special July 4th showing at the Department of State.

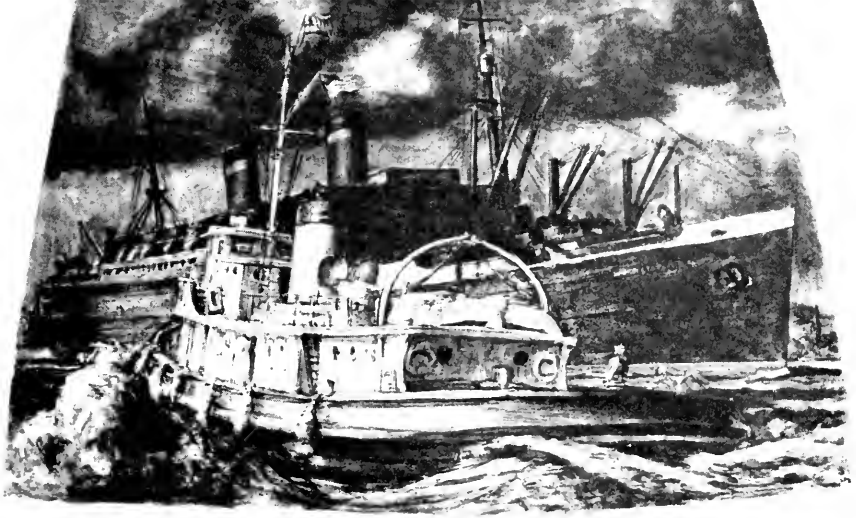
The Preservation of Abu Simbel (September 11 through October 17, 1965). Comprised of photographs and a model showing the ancient monuments to be disastrously affected by Egypt's High Aswan Dam project.

Romanian Tapestries (October 14 through November 14, 1965). The exhibition was presented by NCFA in cooperation with the U.S. Department of State cultural exchange program; 51 tapestries and 14 ceramics, all contemporary, were shown. It was the first showing in the U.S. of Romania's recently revitalized art of tapestry.

Roots of Abstract Art in America: 1910–1930 (December 2, 1965 through January 9, 1966). Paintings and sculpture by 41 artists were assembled to give a broad view of the formative period of contemporary abstract art in this country.

United States Exhibition, VIII São Paulo Bienal (January 27 through March 6, 1966). The work of seven of our most progressive artists represented the U.S. in the eighth biennial exhibit held in São Paulo, Brazil, one of the two great international forums of contemporary art. Reassembly of this exhibit at the Smithsonian marked the first home presentation within recent years of the American section. In conjunction with this exhibition lectures were given by Henry Geldzahler, associate curator of American painting and sculpture, Metropolitan Museum of Art, on "Current Abstraction and its Sources," and by Lawrence Alloway, curator of the Guggenheim Museum, on "Barnett Newman."

Frederic Edwin Church (February 10 through March 13, 1966). Frederic Church is one of those 19th century American artists who is included in textbooks but otherwise generally ignored. This exhibition, which included almost all of his major paintings and a large number of sketches, provided the first thorough survey of his work and the perspective from which to evaluate it. Organized by the NCFA, the exhibition was subsequently shown at the Albany Institute of

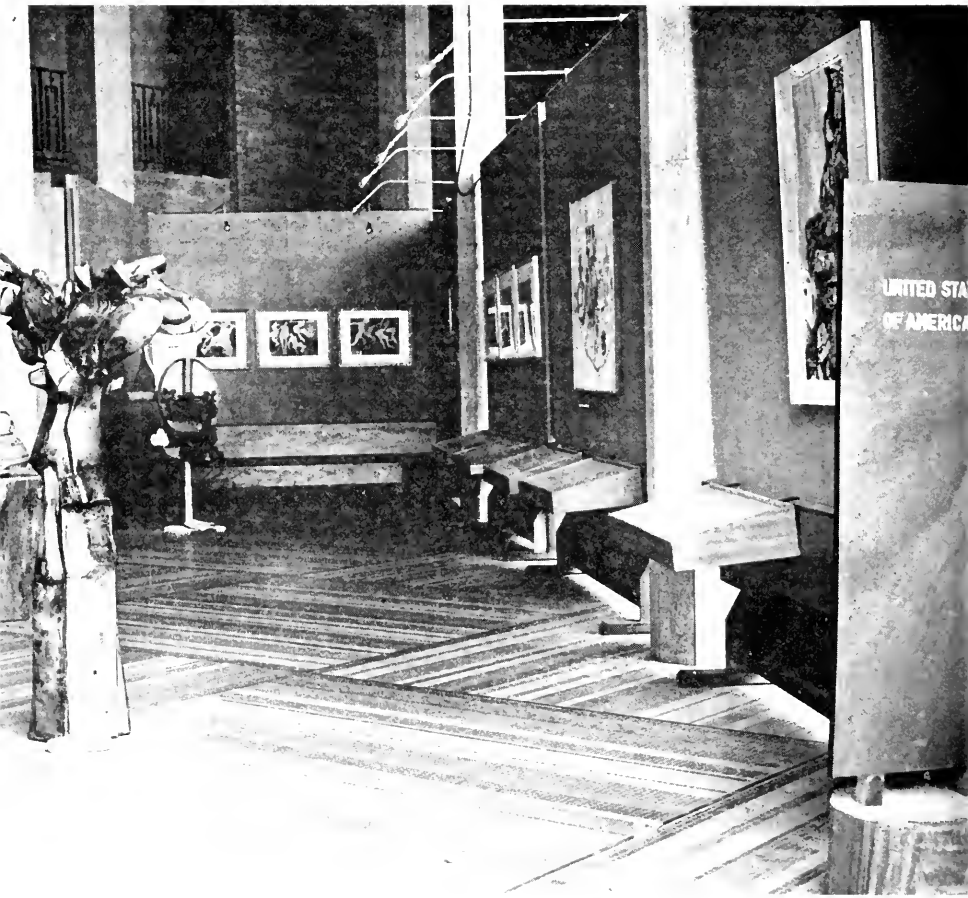


Atlantic Liner in Harbor with Tug (study for mural), by Reginald Marsh (American 1898–1954). Tempera on masonite, 18 × 23 inches. Transfer from National Park Service. 1965.8.102 NCFA.

Entrance to Church exhibition in Foyer Gallery. Draperies and bronze sculptures were brought from Church's home "Olana," and the arch is a near duplication of the entrance to its great hall.

Cotopaxi, by Frederic Edwin Church (American 1826-1900). Oil on canvas, 28⅛ × 42⅛ inches. Gift of Mrs. Frank R. McCoy. 1965. 12 NCFA.

"Roots of Abstract Art in America: 1910–1930," Special loan exhibition in main gallery of paintings and sculpture from the formative period of abstract art in this country.



United States exhibition of contemporary American Negro artists, organized by International Art Program of NCFA for the First World Festival of Negro Arts at the Palais de Justice, Dakar, Senegal.

History and Art and at M. Knoedler and Company in New York City.

American Landscape: A Changing Frontier (April 28 through June 19, 1966). Organized by NCFA in commemoration of the fiftieth anniversary of the U.S. National Park Service, this exhibition showed the pursuit of unspoiled nature by our artists from the 18th through the 20th centuries.

In connection with this exhibition, a series of six lectures on U. S. parks was given by officials of the National Park Service.

Ancient Art From Afghanistan—Treasures of the Kabul Museum (June 30 through August 23, 1966). Opportunity to exhibit antiquities of high aesthetic quality and from a little known culture is rare. The NCFA was fortunate to be one of the three museums permitted to offer this exceptional artistic event in America. In conjunction with the exhibition, M. Karim Barakzai of the Kabul Museum spent several weeks in Washington as guest curator.

Rugs of Afghanistan (June 30 through July 31, 1966). This exhibition of 34 examples of weaving by the nomadic tribes of Afghanistan presented as a complement to the showing of the ancient treasures of that country, was arranged through the courtesy of Mr. H. McCoy Jones.

In addition to the special exhibitions in New York City mentioned above, the NCFA presented or assisted with the following special exhibitions in the Washington, D.C., area: *OP and the Abstract*, print show, in the East Wing of the White House; *The Image*, contemporary American prints, in the East Wing of the White House; *Indiana Artists of Today*, the first exhibition in the Senate Caucus Room; *Modern American Painting*, an Art-in-the-Embassies exhibit at the National Collection; *Oil Reportage by J. S. Churchill*, in the National Collection; and *Georgia Artists*, the first art exhibition in the House of Representatives Caucus Room.

International Art Program

The International Art Program, formerly a part of the United States Information Agency, joined the National Collection of Fine Arts in November 1965. Under the NCFA, the mission of the International Art Program (IAP) has remained the same—to plan, assemble, and send overseas exhibits of American art, and it continues to work with the overseas posts of the USIA in setting up itineraries for its exhibits.

The biggest and most important project during the reporting period was the organizing of the American representation at the XXXIII Venice Biennale. After the works were selected by U.S. Commissioner Henry

Geldzahler, the IAP coordinated the assembling, packing and shipping of the works and the production of the catalog. NCFA staff members oversaw the installation in Venice and participated in the multifarious activities of the opening week.

Another large exhibition, that of contemporary American Negro artists, was prepared for the First World Festival of Negro Art in Dakar, Senegal. Ten artists were represented and one of them, William Majors, won first prize in graphics. The President of the Republic of Senegal complimented the American exhibit and was especially pleased with the catalog.

Other shows prepared and circulated by IAP during the period included seven different contemporary print exhibitions showing the various aspects of graphic arts in the U.S. today; a retrospective show of Stuart Davis' work for Paris, Berlin and London; two shows of American Indian art; four craft shows (one of contemporary textiles, one of Appalachian folk art, and two of general contemporary crafts); and a selection of 16 paintings by contemporary New York artists for showing in Latin America. These exhibits were, in most cases, sponsored overseas by the U.S. Information Service, which was responsible for local exhibition costs, such as the preparation of catalogs and internal shipping.

The USIA continued to provide financial assistance to the IAP during this period for projects begun before the transfer to the Smithsonian was effected. On July 1, 1966, the National Collection of Fine Arts is to assume full responsibility for this program.

Special Projects and Events

During the past year, at the request of and with the assistance of the Economic Development Administration, it engaged Charles Counts, a nationally recognized craftsman-designer from Georgia, as crafts consultant to evaluate specific crafts projects that had been submitted to the EDA. He also made a four months' survey and wrote a report which considered the economic and design problems of contemporary crafts, along with guidelines for the evaluation of craft project proposals. This report, "Encouraging American Handicrafts: What Role in Economic Development?" published by the EDA, provides a basis for further studies and activities in support of American handicrafts.

The Art-in-the-Embassies Program continues to grow under the supervision of Mrs. Nancy P. Kefauver, and the NCFA serves as a repository for the over 1,376 works of art involved. These works are registered and cared for in new storage facilities and shipped by the State Department to American Embassies in all parts of the world.

The White House Changing Exhibitions Program continues to grow with over 300 works of art involved, changing on a rotating basis every six to eight months. The program is a means by which the President can directly encourage American art of today. Each work of art on loan to the White House offices is accompanied by a letter with biographical information about the artist. The works of art, displayed individually or in small changing exhibits, hang in the East and West Wing halls, offices and reception areas, as well as in the Executive Office building.

The first annual White House Fellows' Seminar on American Art, a series of six informal lectures, was developed especially for the White House Fellows, members of the White House Staff, and the Cabinet. This survey of American art, with emphasis on the period since 1900, was presented by NCFA staff members and guest speakers Lloyd Goodrich, Director of the Whitney Museum of American Art, and Edgar P. Richardson, Director of the Henry Francis du Pont Winterthur Museum.

Staff Activities

Director David W. Scott represented the Smithsonian Institution and the NCFA at the Venice Biennale. He served on the Decorative Arts Committee of the American Federation of Arts, as well as on the Executive Council of the Art-in-the-Embassies Program. He also served as advisor to the Fine Arts panel of the National Council on the Arts, and on the Fine Arts Committee of the D.C. Recreation Board. He lectured to the NCFA White House Fellows' Seminar on various aspects of American Art and on the Landscape Show, and before the Art Association of Indianapolis on "The Arts in the Great Society." In Atlanta, Georgia, he juried the crafts section of the Arts Festival of Atlanta.

Richard P. Wunder, curator of painting and sculpture, represented the U.S. Government at a 5-day conference held at UNESCO headquarters in Paris concerning long-term loans between museums of different nations and the reconstitution of dismembered works of art. Also during the year he assisted in matters pertaining to the Cooper Union Museum. He served as Director of the Drawing Society, and he represented the NCFA at the openings of the Church exhibition at Albany and New York City. He also assembled an exhibition of 50 17th- and 18th-century drawings to be exhibited during the forthcoming year at the National Gallery of Art, and subsequently to be circulated by the American Federation of Arts.

230-457—66——24

Harry Lowe, curator of exhibits, served as Vice Commissioner at the United States Pavilion of the XXXIII biennial international art exhibition in Venice, Italy. He delivered two lectures and participated in the seminar discussion on exhibits and installation design at the National Trust for Historic Preservation Seminar for Historical Administrators in Williamsburg, Virginia, and he lectured at the White House Fellows' Seminar. He also served on the panel of three judges for the Third Annual Art Exhibit of the National Association of Industrial Artists, Inc. In an advisory capacity, he attended the Conference on Arts and Humanities in the Southeastern Region held at the University of Tennessee, Knoxville.

Donald McClelland, assistant to the director, lectured at the Chicago Institute of Art; at St. Alban's School and at the Taft School; for the Regents of the Smithsonian Institution; for the D.C. Chapter of the D.A.R.; for "Operation Headstart" at the D.C. Public Auditorium; at the White House Fellows' Seminar; and he presented a series of 9 lectures for the Heights School, D.C. In other activities, he juried 11 exhibitions, among which were the National Armed Forces show in Washington, the Petersburg (Virginia) Arts Festival, Fairfax County Art Association, and the Plains (Virginia) Art Exhibition.

Stefan P. Munsing, special consultant, organized a Jasper Johns drawing show (to coincide with the presentation of the Drawing Society National Exhibition in September 1966). He supervised arrangements for the presentation of several films: "The Ivory Knife" (color film on the artist Paul Jenkins, with music by Irwin Bazelon), "Henry Moore, London, 1940–42," "Five British Sculptors Work and Talk," and "Sculpture by Lipton." He also lectured at the White House Fellows' Seminar and served as advisor to the Archives of American Art 7th airlift tour to Eastern and Western Europe, recommending the itinerary of museums, gallaries, and private collections.

Special consultant Adelyn D. Breeskin sent a representative group of American contemporary prints to New Delhi for the International Exhibition held at the All India Institute of Arts and Crafts; helped choose exhibition material for the Edinburgh (Scotland) Fesitval; art for an exhibition of Old Lyme painters shown at the Institute of Contemporary Arts; and material for the Mary Cassatt exhibition at Knoedler Galleries, New York. She gave two lectures in the White House Fellows' Seminar on American Art. She lectured to the U.S. Foreign Service Officers, to members of the Jewish Educational Alliance of New York City, the National Council of Jewish Women, to the "Friends of Pakistan," to a group in Lincoln, Nebraska, to the Smithsonian Associates, and to the White House Fellows' Seminar, and she assisted in a symposium for the Washington Print Club. She

juried the Library of Congress Biennial Print Show; the Annual Art Exhibition in Birmingham, Alabama; a United Nations exhibition; the 16th Mid-America Annual Exhibit in Kansas City; and served as one-man jury for the annual exhibition in Huntington, West Virginia. She pursued her research for compiling a catalogue raisonné of the paintings, pastels, watercolors and drawings of Mary Cassatt. This took her in June to Europe, where she lectured in Munich and did research on Cassatt in several countries. Mrs. Breeskin received honorary degrees from Hood College, Frederick, Maryland, and Morgan State College, Baltimore, Maryland.

Librarian William Walker was actively engaged in a project with the Library of Congress subject cataloging division to revise the Library of Congress "N" classification schedule for books on the fine arts. Motivation for the undertaking was primarily the benefit of this library, but it is believed by the Library of Congress staff that the proposed changes and improvements submitted by Walker will, if published, be of value to all art libraries using this classification system, including the Library of Congress itself.

He was principally engaged in developing a strong library facility to serve the NCFA, while radically expanding that aspect supporting the National Portrait Gallery, which will share use of the facility in the new building. In anticipation of increased space and library use in the new quarters next year and reduced accessibility to the Smithsonian Library's main reference facilities now close by, concentration has been on acquiring necessary reference works, including multivolume sets, such as encyclopedias, library catalogs, and serial indexes.

John Latham, assistant for special services, joined the staff in October to develop public service programs and to advise the art world and the general public of the objectives, needs, and services of the NCFA. In connection with this mission, he was in charge of public information for the American Section in Venice before the opening of the Biennale on June 18.

This year an unprecedented number of university students and internes were in attendance for 10- or 12-week periods. This amounted to a great extension of the bureau's educational program. Ten students or internes were at work during the year, not including those of the 1965 summer program.

Among the conservators and consultants, in addition to those already mentioned, who assisted the program were Joseph Andrews, Thomas Carter, Sheldon Keck, Philip Vickers, Bruce Moore, and Marvin C. Ross. Continuing support was provided by Bayard Underwood, Harold Cross, Henri Courtais, Henry Heydenryk, Stewart Treviranus, Janice Hines, Ben Johnson, Istvan Pfeiffer, and H. B. Colborn.

Publications

BOLTON-SMITH, ROBIN. *Miniatures in the National Collection of Fine Arts, Smithsonian Institution.* New York: IBM Gallery, 1966.

BREESKIN, ADELYN D. [Introduction to] *Mary Cassatt.* New York: Knoedler Galleries, 1966, 56 pp., 42 illustr.

———. [Introduction to] *Roots of Abstract Art in America, 1910–1930.* Washington: Smithsonian Institution, publ. 4655, 1965, 93 pp., 47 illustr.

———. Matisse in America. *Harper's Bazaar* (December 1965), 2 pp., 1 illustr.

LOWE, HARRY. [Introduction to] *The Josephine and Phillip A. Bruno Collection.* New York: Finch College Museum of Art, 1965.

SCOTT, DAVID W. [Introduction to] *American Landscape: A Changing Frontier.* Washington: Smithsonian Institution, publ. 4671, 1966, 42 pp.

———. [Introduction to the Catalogue of the Exhibition] *XXXIII International Biennial Exhibition of Art, Venice 1966, United States of America.* October House, Inc., 1966.

———. America's Role in the Biennale. *Art Gallery* (June 1966), vol. 9, no. 9, pp. 11–14.

WUNDER, RICHARD P. In Memoriam: Michel Nicholas Benisovich (1891–1963) [includes bibliography, "The Art Historical Writings of Michel N. Benisovich"]. *Art Quarterly*, vol. 27, no. 2, 1964 (published 1965), pp. 196–199.

———. [Preface to] *Frederic Edwin Church.* Washington: Smithsonian Institution, publ. 4657, 1966.

National Portrait Gallery

CHARLES NAGEL, *Director*

DURING THESE FIRST YEARS of its existence—this is but its third annual report—the National Portrait Gallery has been in minimal temporary quarters and might almost be said to have been a museum in a filing case. The time, however, has been time well invested; the Gallery has had the opportunity to gather its forces for two activities that are of the utmost importance—to plan its future program and to attend to its housekeeping.

In order to plan, the Gallery had first to assemble the nucleus of a staff. This has now been done; the growing staff can be regarded with satisfaction and its work in planning for the future with hope and confidence.

As to housekeeping these months have made it possible to assure that each portrait in the collection is looking its best, and is in the best possible structural condition—matters too often neglected and all too often misunderstood or ignored by the public. But when the Gallery moves to its new quarters in the Fine Arts and Portrait Galleries (the old Patent Office building) the collection as a whole will have received the expert care it deserves. With the air conditioning that will be part of the equipment of the building, the work that has been done may confidently be expected to last many a year.

Renovation of the Fine Arts and Portrait Galleries building was about eighty percent completed in June 1966, and as finish materials begin to be applied, the building begins to reveal the character and dignity that stamp it as a distinguished work of architecture of its

period. The move into new quarters early in 1967 is anticipated eagerly, for it will permit the initiation, in greatly increased space, of a more complete professional program for the National Portrait Gallery, a program which will make it favorably known as the nation's repository for whatever treasures of American portraiture may be available.

The Collections

A National Portrait Gallery is not, after all, just another art museum; it is something new in America, a gallery devoted only to one thing: the likenesses in all media of those who in every walk of life have made a significant contribution to the development and culture of our country. It is a museum whose first consideration is the sitter. In short, it is the visual history museum for the Nation in terms of portraits of distinguished individual citizens.

In the course of the year the Gallery added to its still small collection 102 accessions by transfer, gift, or purchase. For the transfers the Gallery is beholden to the National Collection of Fine Arts, for the gifts, to a variety of donors—institutional and individual, and from all sections of the country. For the purchases, the Gallery is most grateful that its funds for purchase, though limited, have given it the rare privilege of selecting what seemed to be most important of the objects that have come upon the market.

Since these accessions are of the utmost importance to the Gallery, a full list is appended. A brief discussion of some will give an idea of the spread in time and the personality of the individuals represented.

Paul Wayland Bartlett (1865–1925), a portrait by Charles Sprague Pearce, came as a gift from Mrs. Armistead Peter, Jr. It shows Bartlett, a Yankee born but trained as an artist in France, in full profile and in the costume of the turn of the century. Among many other works he is responsible for the sculptured pediments of the House of Representatives. Bartlett was a handsome man and as a successful artist could not help but know it. All this is honestly shown with such faithfulness and conviction by his slightly older contemporary Charles Pearce that it is one of the most popular portraits in the collection. It is a transfer from NCFA.

Mary Baker Eddy (1821–1910) by Luella V. Serrao. This fine marble bust of the founder of the Christian Science Church was presented as a gift to the Gallery in May 1966 from Mrs. Frances Thompson Hill and Calvin C. Hill on the occasion of the hundredth anniversary of the founding of the church.

Ulysses S. Grant (1822–1885), a portrait by Samuel B. Waugh, was the gift of the International Business Machines Corporation. Another transfer from NCFA, it is a bust portrait that shows, beyond the rough force that is such a familiar aspect of Grant, a kind of sensitivity that explains the honesty and integrity with which he met gallantly the disasters of his later life.

Michael Gratz (1740–1811), by William Edward West, is an excellent, unusually large, pastel portrait of the man who with his brother Bernard did so much to support the American cause in the Revolution. It was the gift of Richard N. Tetlie.

Julia Ward Howe (1819–1910), a portrait by her son-in-law John Elliott, was the gift of Mrs. John Elliott and was a transfer from NCFA. It is of unusual interest as it shows Mrs. Howe as the young woman who was inspired to write the "Battle Hymn of the Republic" for which she received $4 from the Atlantic Monthly and the undying devotion of her fellow Americans.

John J. Pershing (1860–1948), a full length portrait by Douglas Volk of the famous leader of the American troops in France is a transfer from NCFA, and was originally presented by the National Art Committee, which was responsible for the recording of many outstanding figures both civil and military associated with World War I.

William Howard Taft (1957–1930), by Robert MacCameron, was presented by the artist's son and daughter, Robert, Jr., and Marguerite MacCameron. It is an unusually vigorous and convincing likeness, taken at the height of his powers, of the only man to have been both President and Chief Justice of the United States.

John Bartram (1699–1777), by John Wollaston, purchased by the Gallery. Bartram, the first great native American botanist, laid out a botanic garden on the Schuylkill and began the first hybridizing experiments in America. He was called by Linnaeus "the greatest natural botanist in the world."

Albert Einstein (1879–1955), by Joseph Scharl, purchased by the Gallery. This portrait of one of the most noted of modern scientists, is thoroughly contemporary in its approach. Yet, despite the abstract expressionist manner in which it is executed, it is a thoroughly recognizable likeness of Einstein by one of his close friends, and hence a remarkably fine document of our own time.

Edwin Forrest (1806–1872), by Edwin Agate, purchased in memory of Alexander Sandor Ince from the gift made by the Kathryn and Gilbert Miller Fund. This portrait of our earliest American-born actor of first rank shows him in the Indian role of "Metamora" which he made famous.

Alexander Hamilton (1755 or 57–1804) by Guiseppi Ceracchi, purchased by the Gallery. A bust in white marble, one of the famous portraits of Hamilton executed by this Italian sculptor.

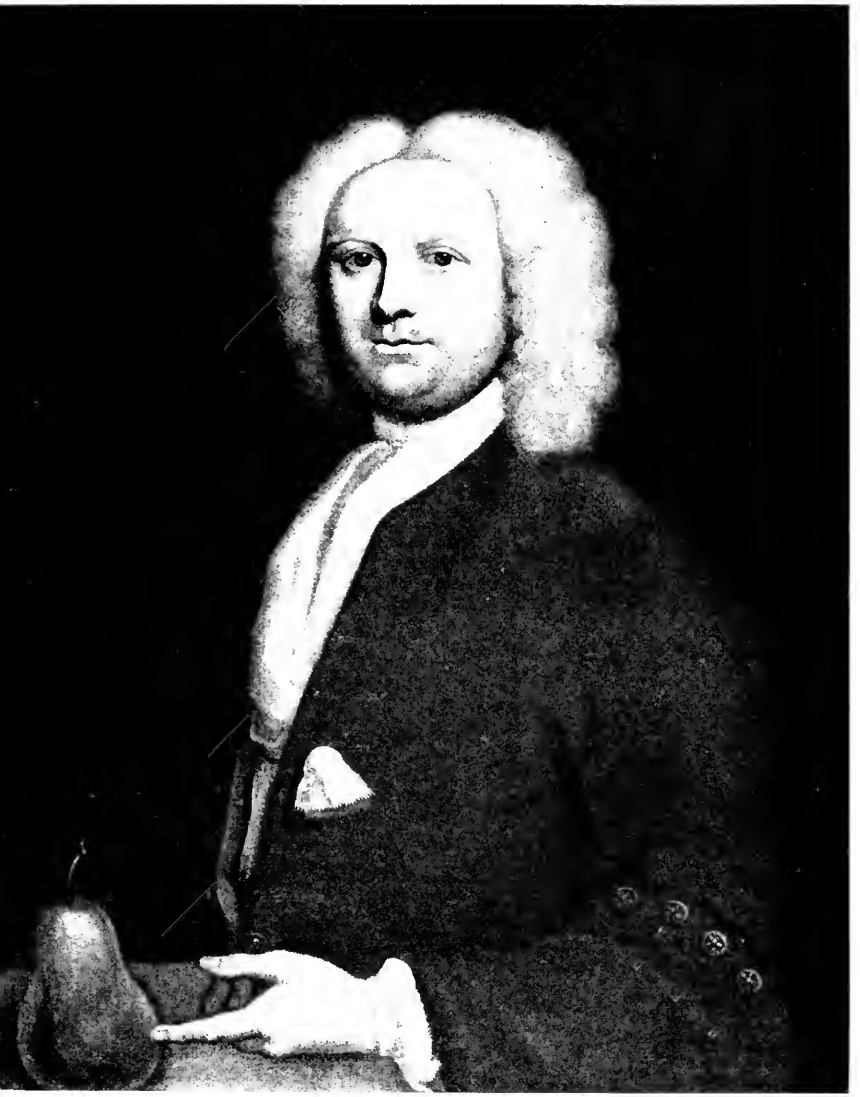
Gilbert Stuart (1755–1828), by an unknown painter, purchased by the Gallery. This small portrait of one of America's earliest native born painters is a fine likeness and a most valuable record.

In addition to the funds appropriated by the Congress for the support of the program of the National Portrait Gallery, gifts of $10,000 were received from Kathryn and Gilbert Miller Fund and $5,000 from the Kauders Foundation. A gift of two extremely handsome pieces of furniture for the Gallery executive offices was made by Victor Proetz—a tall book-case veneered in blond European elm and *en suite* a low case for oversize volumes. Each of these pieces is one of a pair, the other of which will eventually come to the Gallery. They set a standard of style and distinction for whatever additional furniture is later acquired.

In honor of Einstein week, March 14 to 21, the portrait later purchased for the collection and a drawing, both by Joseph Scharl, were placed on exhibition along with several portrait photographs. On April 9, the third anniversary of the conferring upon him of honorary United States citizenship, the portrait of Sir Winston Churchill by Douglas Chandor was put on exhibit. On April 28, a portrait of President Calvin Coolidge by Joseph Burgess was presented by the Phi Gamma Delta Fraternity and accepted for the permanent collection. On May 28th the portrait bust of Mary Baker Eddy, founder of the Christian Science Church, by Luella Varney Serrao presented by Frances Thompson Hill and the late Calvin C. Hill was placed on exhibition on the occasion of the celebration of the one-hundredth anniversary of the founding of Christian Science.

Staff Activities

Director Charles Nagel, worked with historian Daniel John Reed and curator Robert G. Stewart on planning for the future of their departments. He served as ex-officio member of the important Acquisitions Committee, addressed the New England Conference of the American Association of Museums in New Haven, and wrote articles on the Gallery for *Antiques Magazine* and *Chronique des Arts*. A most helpful outcome of his address in New Haven was an article on the gallery by Russell Lynes in the June 1966 *Harper's Magazine* entitled "Public Faces" in which some of the difficulties and opportunities of the gallery were delightfully set forth.



John Bartram (1699–1777), attributed to John Wollaston. Purchased through Museum fund.

Julia Ward Howe (1819 1910), by her son-in-law John Elliott. Gift of Mrs. John Elliott (transfer from National Collection of Fine Arts).

Mary Baker Eddy (1821–1910), by Luella V. Serrao. Gift of Mrs. Frances Thompson Hill, who stands beside the bust.

Calvin Coolidge (1872–1933), by Joseph Burgess. Gift of the Phi Gamma Delta Fraternity.

Bernard M. Baruch (1870–1965), by Douglas Chandor.
Gift of Mr. Baruch.

He also worked with the architects, Faulkner, Stenhouse, Fryer, and Faulkner and with Mr. Victor Proetz on the remodelling and furnishing of the NPG quarters in the Fine Arts and Portrait Galleries building, and represented the Smithsonian Institution at various meetings related to the International Cooperation Year.

Early in the year Daniel John Reed, formerly assistant chief of the manuscript division of the Library of Congress, assumed the duties of historian in the gallery. Since his arrival he has devoted most of his time to building up the library and the print collection and to planning and inaugurating a research and publication program. Basic to any program for the study of American portraiture is a national inventory of portraits of citizens of historical significance; this was started under his direction. In it he was assisted by John Frazer, who has continued to search the records of the Frick Art Reference Library in New York for material to be included in what is to be called the Catalog of American Portraits. Information in the catalog is being extensively indexed and will be available to scholars and other galleries and museums.

Curator Robert G. Stewart, directed a two-pronged program of conservation of the portraits in the collection and of research on their history, authenticity and authorship. He has successfully reattributed artists, has identified the artist or the subject, and, in some cases, has obtained for the collection portraits brought in for examination. In the course of this research, two portraits in the collection have been proved entirely fictitious and a number have proved to be by artists other than those to whom they had been assigned.

Mr. Stewart arranged the Gallery's first exhibition "Nucleus for a National Collection,"'opened in the Arts and Industries building for the Bicentennial of James Smithson's birth. This exhibition of 65 portraits by 52 artists in painting, engraving, drawing, sculpture, and photography, represented a cross section of the various media in the collection. A catalogue of the exhibition, *Nucleus for a National Collection* (Washington: Smithsonian Institution, publ. 4653, 1966, unpaged [30 pp.], illus.), was compiled by Mr. Stewart.

Under the direction of Mrs. Genevieve A. Kennedy a program has been instituted to photograph for the gallery's archival file all portraits on loan or brought in for study. To date 200 black and white photographs and 46 color transparencies have been made. The print collection of some 21,287 pieces has been alphabetized and biographically identified by Mrs. Kennedy, who was greatly assisted in this work by student aides Richard L. Tyner and Joyce A. Keener.

Librarian William Walker worked diligently with Dr. Reed in building up the library, which in its new quarters will serve both the

National Portrait Gallery and the National Collection of Fine Arts, and every effort has been made to avoid duplication while making the collection useful to both. Concentration has been on necessary reference works, including multi-volume sets such as encyclopedias, library catalogues and serial indexes.

Additions to the Collections

Subject	*Artist*	*Donor or Fund*
*Abbot, Charles Greely	John N. Brewer	Nicholas R. Brewer
*Agassiz, Jean Louis Rodolphe	W. Ingalls	Unknown
*Agassiz, Jean Louis Rodolphe	Louis Mayer	Unknown
*Bartlett, Paul Wayland	Charles Sprague Pearce	Mrs. Armistead Peter Jr.
Bartram, John	John Wollaston	Museum fund
Baruch, Bernard M.	Douglas Chandor	Bernard M. Baruch
Benton, Thomas Hart	Ferdinand T.L. Boyle	Museum fund
*Bliss, Tasker	John C. Johansen	Anonymous Donor
Brookings, Robert	Janet Gregg Wallace	Janet Gregg Wallace
*Bryant, William Cullan	Henry Kirke Brown	H. K. Bush-Brown
*Byrnes, James Francis	Alfred Jonniaux	Robert C. Vose Jr.
Carson, Rachel L.	Una Hanbury	Museum fund
Carver, George Washington	Betsey Graves Reyneau	The George Washington Carver Memorial Committee
*Chase, Salmon P.	James R. Lambdin	Anonymous Donor
Churchill, Winston S.	Bryant Baker	Bryant Baker
Churchill, Winston S.	Douglas Chandor	Bernard M. Baruch
*Clay, Henry	Attributed to Rembrandt Peale	International Business Machines Corporation
Clemens, Samuel L. (Mark Twain)	Eulabee Dix	Museum fund
Compton, Arthur Holly	Janet Gregg Wallace	Janet Gregg Wallace
Coolidge, Calvin	Joseph Burgess	Fraternity of Phi Gamma Delta
Corcoran, William Wilson	G. P. A. Healy	Mrs. David E. Finley & Mrs. Eustis Emmit
*Crosby, John S.	Alfonse Jongers	Unknown
Dahlgren, J. A. B.	"McC" after Joseph Cotton	Mrs. J. V. Dahlgren
*Delafield, Richard	Charles C. Curran	Albert Delafield
*Delano, Jane A.	Bjorn Egeli	Jane A. Delano Post of American Legion
*DuPont, Samuel F.	Daniel Huntington	Mrs. May DuPont Saulsbury
Eddy, Mary Baker	Luella V. Serrao	Mrs. Francis Thompson Hill, Calvin C. Hill
*Edison, Thomas	A. A. Anderson	Dr. Eleanor A. Campbell
Einstein, Albert	Josef Scharl	Museum fund

Subject	*Artist*	*Donor or Fund*
*Ericsson, John	Arvid F. Nyholm	Swedish-American Republican League of Illinois
*Ericsson, John	A. Saint-Gaudens	Georgiana Wills Sargent
*Espy, James Pollard	Thomas Sully	The Espy Family
Evans, Robley D.	August Franzen	Horatio S. Rubens
Forrest, Edwin	Edwin Agate	Kathryn and Gilbert Miller fund
Franklin, Benjamin (2 portraits)	Giovanni B. Nini	Museum fund
*Fuller, George	Edward T. Billings	Catherine Ames
*Garfield, James A.	Ole P. H. Balling	International Business Machines Corporation
Glover, Charles	John McLure Hamilton	Charles C. Glover
*Grant, Ulysses	Samuel Waugh	International Business Machines Corporation
Gratz, Michael	William West	Richard N. Tetlie
Hackett, James K.	Albert d'Andrea	The City College of New York
*Halsey, William F.	Albert K. Murry	International Business Machines Corporation
Hamilton, Alexander	Guiseppi Ceracchi	Museum fund
*Hammerstein I, Oscar	Unknown	Mrs. Oscar Hammerstein II
*Hammerstein II, Oscar	Abby Altson	Mrs. Oscar Hammerstein II
Harding, Warren Gamaliel	Margaret Lindsay Williams	Museum fund
*Hare, Robert	Alvin Clark	Unknown
Harriman, Averill	Gilbert Early	Gilbert Early
Harris, Townsend	Albert d'Andrea	City College of New York
*Henderson, John Brooks	J. J. Benjamin-Constant	Heirs of Mrs. J. B. Henderson
Henderson, Mrs. John Brooks	J. J. Benjamin-Constant	Mrs. John Brooks Henderson
*Henry, Joseph	W. Ingalls	W. Ingalls
*Hodgkins, Thomas G.	Robert G. Hardie	Unknown
*Hooper, Reverend William	After John Smibert	Transfer from United States National Museum—G. Brown Goode Collection
*Hoover, Herbert	Edmund Tarbell	National Art Committee
*Howe, Julia Ward	John Elliott	Mrs. John Elliott
*Hull, Cordell	Gregory C. Stapko	International Business Machines Corporation
*Kellogg, John Harvey	Emil Fuchs	Dr. Edward Kellogg
Kennedy, John Fitzgerald	William Draper	Museum fund
Key, Phillip	Charles Willson Peale	Charles van Ravenswaay

Subject	*Artist*	*Donor or Fund*
*King, Ernest J	Albert K. Murray	International Business Machines Corporation
*Kinkaid, Thomas C	Robert Sloan	International Business Machines Corporation
*Lane, Franklin K.	Ossip Perelma	Frank B. Noyes
*Lea, Isaac	Bernard Uhle	Mrs. Lea Hudson
Lee, Robert E.	H. G. Matthews	Museum fund
*Lockwood, Belva Ann	Nellie M. Horne	Committee on Tribute to Belva A. Lockwood
MacArthur, General Douglas	Rodolphe Kiss	Mrs. Elisha Gee Jr.
*McClellan, George B.	Julian Scott	Mrs. Georgiana L. McClellan
*McKean, Thomas	Charles Willson Peale	Mrs. Francis T. Redwood (part of the George Buchanan Coale Collection, Baltimore)
McKinley, William	Charles A. Whipple	Mrs. Mary E. Kreig
McNamara, Robert	Gilbert Early	Gilbert Early
Madison, Dolly	Unknown	Miss Eunice Chambers
*Mann, James R.	J. Gari Melchers	Mrs. James R. Mann
*Mansfield, Richard	Orlando Rouland	H. H. Flager
*Marshall, George Catlett	J. Anthony Wells	International Business Machines Corporation
*Maynard, Edward	George W. Maynard	Unknown
Meyer, George von L.	Julian Story	Donna Julia Brambilla and Mrs. Phillip O. Coffin
Morgan, John Pierpont	Adrian Lamb	H. S. Morgan
*Mitscher, Marc Andrew	Albert K. Murray	International Business Machines Corporation
*Morrill, Justin Smith	Preston Powers	Dr. Charles L. Swann
Motley, John Lothrop	H. G. Matthews	Museum fund
*Nimitz, Chester W.	Albert K. Murray	International Business Machines Corporation
*Noyes, Frank B.	Ossip Perelma	Ossip Perelma
Osceola	Lewis C. Gregg	Mrs. Lewis C. Gregg, Miss Emma Gregg
Pershing, John J.	Moses W. D. Dykaar	Estate of George Owen
*Pershing, John J.	Douglas Volk	National Art Committee
*Polk, Frank L.	John C. Johansen	Anonymous Donor
*Polk, James Knox	Max Westfield	James Knox Polk Memorial Foundation
*Ranger, Henry Ward	Alphonse Jongers	James E. Fraser
Read, Thomas Buchanan	H. A. Root	Miss Eunice Chambers
Roberts, Robert Richford	John Neagle	Museum fund
*Roosevelt, Franklin Delano	Henry S. Hubbell	Henry S. Hubbell
*Rush, Richard	Thomas W. Wood	Unknown
Salk, Jonas Edward	Edward Amateis	Edward Amateis
*Scott, Winfield	Henry Kirke Brown	H. K. Bush-Brown

Subject	*Artist*	*Donor or Fund*
*Seward, William H.	Giovanni Benzoni	Mrs. Sara Carr Upton
Sheridan, Philip	Thomas B. Read	Benjamin Bell
*Sherman, William T.	G. P. A. Healy	Tecumseh Sherman
*Signing of the Treaty of Versailles	John C. Johansen	National Art Committee
*Sims, William S.	Irving Wiles	National Art Committee
*Smithson, James	Hattie Burdette	Unknown
*Stanton, Edward McMasters	Henry Ulke	Miss Sofie Stanton
Stuart, Gilbert	Unknown	Museum fund
Taft, William Howard	Robert McCameron	Robert MacCameron Jr., Marguerite MacCameron
Torbert, Alfred T. A.	Mathew Brady	Dorothy B. Webb
Washington, George	Joseph Hiller	Unknown
*West, Benjamin	Frank Wilkins	Mrs. Mabel Wiles
*White, Henry	John C. Johansen	Anonymous Donor
*Woodrow Wilson	John C. Johansen	Anonymous Donor
Woodrow Wilson	Bryant Baker	Bryant Baker
*Woodrow Wilson	Edmund Tarbell	Anonymous Donor

*Portraits marked with an asterisk are transfers from the National Collection of fine Arts.

National Gallery of Art

JOHN WALKER, *Director*

SIR: I have the honor to submit, on behalf of the Board of Trustees, the 29th annual report of the National Gallery of Art for the fiscal year ended June 30, 1966. This report is made pursuant to the provisions of section 5(d) of Public Resolution No. 14, 75th Congress, 1st session, approved March 24, 1937 (50 Stat. 51), U.S. Code, title 20, sec. 75(d).

Organization

The National Gallery of Art, although technically established as a bureau of the Smithsonian Institution, is an autonomous and separately administered organization and is governed by its own Board of Trustees. The statutory members of such Board of Trustees are the Chief Justice of the United States, the Secretary of State, the Secretary of the Treasury, and the Secretary of the Smithsonian Institution, ex officio. The four General Trustees continuing in office during the fiscal year ended June 30, 1966, were Paul Mellon, John Hay Whitney, Dr. Franklin D. Murphy, and Lessing J. Rosenwald. On May 5, 1966, Paul Mellon was reelected by the Board of Trustees to serve as President of the Gallery, and John Hay Whitney was reelected Vice President.

The executive officers of the Gallery as of June 30, 1966, were as follows:

Chief Justice of the United States, Earl Warren, Chairman.
Paul Mellon, President.
Ernest R. Feidler, Secretary-Treasurer.

John Walker, Director.
E. James Adams, Administrator.
Ernest R. Feidler, General Counsel.
Perry B. Cott, Chief Curator.
J. Carter Brown, Assistant Director.

The three standing committees of the Board, as constituted at the annual meeting on May 5, 1966, were as follows:

EXECUTIVE COMMITTEE

Chief Justice of the United States, Earl Warren, Chairman.
Paul Mellon, Vice Chairman.
Secretary of the Smithsonian Institution, S. Dillon Ripley.
John Hay Whitney.
Dr. Franklin D. Murphy.

FINANCE COMMITTEE

Secretary of the Treasury, Henry H. Fowler, Chairman.
Paul Mellon.
Secretary of the Smithsonian Institution, S. Dillon Ripley.
John Hay Whitney.

ACQUISITIONS COMMITTEE

Paul Mellon, Chairman.
John Hay Whitney.
Lessing J. Rosenwald.
Dr. Franklin D. Murphy.
John Walker.

Personnel

At the close of fiscal year 1966, full-time Government employees on the permanent staff of the National Gallery of Art numbered 314. The United States Civil Service regulations govern the appointment of employees paid from appropriated funds.

Appropriations

For the fiscal year ended June 30, 1966, the Congress of the United States, in the regular annual appropriation, and in a supplemental appropriation required for pay increases, provided $2,531,000 to be used for salaries and expenses in the operation and upkeep of the National Gallery of Art, the protection and care of works of art acquired by the Board of Trustees, and all administrative expenses incident

thereto, as authorized by the basic statute establishing the National Gallery of Art, that is, the Public Resolution No. 14, 75th Congress, 1st session, approved March 24, 1937 (50 Stat. 51), U.S. Code, title 20, secs. 71–75.

The following obligations were incurred:

Personnel Compensation and Benefits	$2, 214, 400. 00
All other Items	315, 669. 11
Total Obligations	2, 530, 069. 11

Attendance

Visitors to the Gallery during fiscal year 1966 were 1,577,108, an increase of 324,006 over the 1965 attendance. From July 1 through Labor Day, 1965, and April 1 through June 30, 1966, the Gallery was open to the public from 10 a.m. to 10 p.m. on weekdays and from noon to 10 p.m. on Sundays. For the remainder of the year the Gallery was open to the public every day save Christmas and New Year's Day on a schedule of 10 a.m. to 5 p.m. on weekdays and 2 to 10 p.m. on Sundays. Visitors during the additional hours in the summer of 1965 and the spring of 1966 numbered 154,911. The average daily attendance for year was 4,345.

Accessions

There were 2,835 accessions by the National Gallery of Art as gifts, loans, or deposits during the fiscal year. This represents an increase of 1,113 accessions over those of fiscal 1965.

Gifts

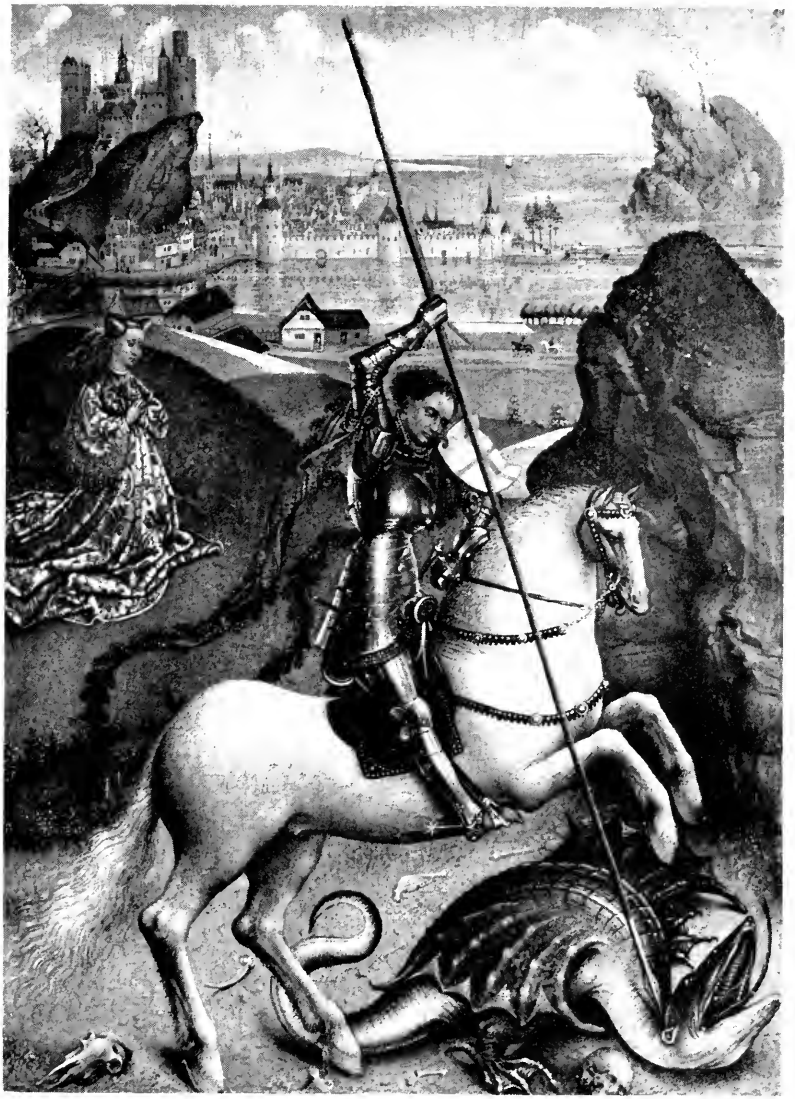
Three hundred and fifty-one paintings by George Catlin were received as a gift from Paul Mellon. In addition, the following works of art were received as gifts or bequests accepted by the Board of Trustees or were purchased pursuant to action by the Board of Trustees from funds given or bequeathed:

PAINTINGS

Donor	*Artist*	*Title*
Avalon Foundation, New York, N.Y.	Church	Morning in the Tropics
"	Copley	Eleazer Tyng

PAINTINGS—continued

Donor	*Artist*	*Title*
Charles Ulrick and Josephine Bay Foundation	Vigée-Lebrun	The Marquise de Pezé and the Marquise de Rouget with Her Two Children
Mrs. Julia Feininger	Feininger	Zirchow VII
Colonel and Mrs. Edgar W. Garbisch, New York, N.Y.	Earl	Dr. David Rogers
"	"	Martha Tennent Rogers and Her Daughter
"	Field	Deacon Harlow A. Pease
"	"	Mrs. Harlow A. Pease
"	Attributed to Jeremiah Theus	Staunch Gentleman
"	"	Devout Lady
"	Sheffield	Connecticut Sea Captain
"	"	Wife of Connecticut Sea Captain
"	Unknown	Dennison Hill, Southbridge, Massachusetts
Harry Waldron Havemeyer and Horace Havemeyer, Jr.	Vermeer	A Lady Writing
National Gallery of Art, Ailsa Mellon Bruce Fund	Corneille de Lyon	Portrait of a Man
"	Ercole Roberti	The Wife of Hasdrubal and Her Children
"	Rubens	Daniel in the Lions' Den
"	Rogier van der Weyden	Saint George and the Dragon
National Gallery of Art, Adolph Caspar Miller Fund	La Farge	Afterglow, Tautira River, Tahiti



Saint George and the Dragon, by Rogier van der Weyden (Flemish, 1399/1400–1464). Wood, 6 × 4⅝ inches. Ailsa Mellon Bruce Fund. National Gallery of Art.

The Wife of Hasdrubal and Her Children, by Ercole Roberti (Ferrarese, c. 1456–1496). Wood, 18½ × 12 inches. Ailsa Mellon Bruce Fund. National Gallery of Art.

Portrait of a Man, by Corneille de Lyon (French, active 1534–1574). Wood, $6\frac{1}{2} \times 5\frac{5}{8}$ inches. Ailsa Mellon Bruce Fund. National Gallery of Art.

Daniel in the Lions' Den, by Peter Paul Rubens (Flemish, 1577–1640). Canvas, $88\frac{1}{4} \times 130\frac{1}{8}$ inches. Ailsa Mellon Bruce Fund. National Gallery of Art.

Saskia Lying in Bed, by Rembrandt van Ryn (Dutch, 1606–1669). Pen and brush drawing, about 1638. Ailsa Mellon Bruce Fund. National Gallery of Art.

GRAPHIC ARTS

Donor	*Artist*	*Title*
William Benton, New York, N.Y.	Reginald Marsh	Merry-Go-Round
Chester Dale	Bellows	Three Pencil Sketches
"	Lurçat	Maud Dale
"	Drian	Maud Dale
"	Léger	Hands and Foot
Mrs. Snowden A. Fahnestock, Washimgton, D.C.	Fragonard	La Voile des Armours
National Gallery of Art, Ailsa Mellon Bruce Fund	Master of 1515	Satyrs with a Bacchante
"	Rembrandt	Saskia Lying in Bed

WORKS OF ART ON LOAN

The following works of art were received on loan, or were continued on loan, by the Gallery:

Donor	*Artist*	*Title*
The Fuller Foundation, Boston, Mass.	Rembrandt	Portrait of a Man in a Fur-lined Coat
Jerome Hill, New York, N.Y.	Delacroix	The Arab Tax
"	"	Lion Devouring a Goat
Mr. and Mrs. Paul Mellon, Upperville, Virginia	Degas	14 Wax Sculptures
"	Stubbs	Lion Attacking a Deer
"	"	Lion Attacking a Horse
"	Various French Artists	68 Paintings
Private Collection	Raphael	The Madonna of Loreto
"	Veronese	Self-Portrait
The Norton Simon Foundation, Los Angeles, Calif.	Rembrandt	Portrait of the Artist's Son Titus

WORKS OF ART ON LOAN RETURNED

The following works of art on loan were returned during the fiscal year:

To	*Artist*	*Title*
The Fuller Foundation, Boston, Mass.	Rembrandt	Portrait of a Man in a Fur-lined Coat
Colonel and Mrs. Edgar W. Garbisch, New York, N.Y.	S. J. Johnson	Picking Grapes in an Orchard
"	Landis	Adam and Eve
"	Pelton	Jephthah Regrets His Vow
"	Prior	Little Girl Holding Apple
"	Unknown	Adeline Howard
"	"	Woman with Butterfly Tie
"	"	Woman with Jagged Collar
"	"	Fruit in Bowl
"	"	Man with Blue Eyes
"	"	Lady with Brown Eyes
"	"	Birds
"	"	Pigeons
"	Willson	The Prodigal Son Taking Leave of His Father
"	"	The Prodigal Son Wasted His Substance
"	"	The Prodigal Son in Misery
"	"	The Prodigal Son Reclaimed
National Collection of Fine Arts, Smithsonian Institution	Homer	High Cliffs, Coast of Maine
Private Collection	Raphael	The Madonna of Loreto
"	Veronese	Self-Portrait
The Putnam Foundation, San Diego, Calif.	Bruegel	Parable of the Sower
"	Christus	The Death of the Virgin

WORKS OF ART ON LOAN RETURNED—continued

To	*Artist*	*Title*
The Putnam Foundation, San Diego, Calif.	Corot	View of Volterra
"	Murillo	Christ on the Cross
"	Rembrandt	St. Bartholomew
"	Veronese	Virgin and Child
The Norton Simon Foundation, Los Angeles, Calif.	Rembrandt	Portrait of the Artist's Son Titus
J. H. Whittemore Company, Naugatuck, Conn.	Whistler	The Dancer—Green and Blue
"	Manet	Portrait of an Actor-Buffoon of Philip IV

WORKS OF ART LENT

The following loans were made during the fiscal year:

To	*Artist*	*Title*
Connecticut Historical Society, Hartford, Conn.	Phillips	Joseph Slade
"	"	Alice Slade
Museum of Early American Folk Art, New York, N.Y.	Field	"He Turned Their Waters Into Blood"
Metropolitan Museum of Art, New York, N.Y., and Museum of Fine Arts, Boston, Mass.	Copley	Eleazer Tyng
"	"	Sir Robert Graham
"	"	The Red Cross Knight
"	"	Jane Browne
"	"	The Death of the Earl of Chatham
"	"	Epes Sargent
"	"	The Copley Family
"	"	Watson and the Shark
Gallery of Modern Art, New York, N.Y.	Hassam	Allies Day, May 1917
Munson-Williams Proctor Institute, Utica, N.Y.	Quidor	The Return of Rip Van Winkle

WORKS OF ART LENT—continued

To	*Artist*	*Title*
National Collection of Fine Arts, Smithsonian Institution	Church	Morning in the Tropics
Old Salem Museum, Winston-Salem, N.C.	Stuart	George Washington (Vaughan-Sinclair)
Smithsonian Institution, Museum of History and Technology, Presidential Reception Room	Jarvis	Commodore John Rodgers
"	"	DeWitt Clinton
"	Healy	Daniel Webster
"	Peale	Robert Coleman
"	Sully	Major Thomas Biddle
University of Nebraska Art Galleries	Henri	Young Woman in White
University Art Museum, Austin, Texas	Inness	The Lackawanna Valley

Other Gifts

In the fiscal year 1966 gifts of money were made by the Avalon Foundation, Frelinghuysen Foundation, J. I. Foundation, Samuel H. Kress Foundation, Old Dominion Foundation, Eugene and Agnes E. Meyer Foundation, Lila Acheson Wallace Fund, Inc., and Mr. Paul Mellon.

Mrs. Ailsa Mellon Bruce contributed additional money and securities for the purchase of works of art for the National Gallery of Art and for educational purposes related to works of art.

Exhibitions

The following exhibitions were held at the National Gallery of Art during the fiscal year 1966:

The Chester Dale Bequest. Continued from previous year.

Graphic Arts from the Chester Dale Collection. Continued from the previous year through August 18, 1965.

Exhibition Illustrating Richard Bales' Index of American Design Suite No. 4. Continued from previous year through August 6, 1965.

Rembrandt's Portrait of the Artist's Son Titus, on loan from the Norton Simon Foundation. Continued from previous year through December 5, 1965.

Sketches by Constable from the Victoria and Albert Museum. Continued from the preceding year through July 5, 1965.

White House Festival of Arts Exhibition. Continued from previous year through July 11, 1965.

19th and 20th Century European Drawings. July 11 through August 29, 1965.

19th and 20th Century Prints. August 6 through November 4, 1965.

British Mezzotints from the 18th and Early 19th Centuries. September 18 through October 31, 1965.

John Singleton Copley: A Retrospective Exhibition. September 19 through October 31, 1965.

Treasures of Peruvian Gold. October 14 through November 28, 1965.

Christmas Prints. November 5, 1965 through January 12, 1966.

Dürer and His Time. November 14 through December 12, 1965.

Modern French Prints from the Rosenwald Collection. December 11, 1965 through March 9, 1966.

Fifteenth-Century Woodcuts and Metalcuts from the Collection of the National Gallery of Art. December 19, 1965 through January 30, 1966.

Bruegel Prints from the Rosenwald Collection. January 13 through March 8, 1966.

French 18th Century Prints from the Widener Collection. March 9 through July 1, 1966.

Etchings by Rembrandt in the Collection of the National Gallery of Art. March 11 until after July 1, 1966.

Drawings from the Collection of the National Gallery of Art. February 5 through April 17, 1966.

French Paintings from the Collections of Mr. and Mrs. Paul Mellon and Mrs. Mellon Bruce. March 17 through May 1, 1966.

Twenty-five Years of National Gallery Publications. March 17 through May 1, 1966.

Art Treasures of Turkey, June 5 through July 17, 1966.

Exhibitions of recent accessions: *The Wife of Hasdrubal and Her Children* by Ercole Roberti, *Elizabeth Throckmorton* by Largilliere, and *Portrait of a Man* by Corneille de Lyon from August 10, 1965, through October 25, 1965; *The Marquise de Pezé and the Marquise de Rouget with Her Two Children* by Vigée-Lebrun from November 9, 1965, through January 12, 1966; *Daniel in the Lions' Den* by Rubens from January 12, 1966; *St. George and the Dragon* by Rogier van der Weyden from May 6, 1966; and *A Lady Writing* by Vermeer from May 20, 1966.

Graphic Arts

Graphic Arts from the National Gallery of Art collections were included in 8 traveling exhibitions, and special loans were made to 32 museums, universities, schools, and art centers in the United States and abroad. There were 235 visitors to the Graphic Arts Study Room.

The material in the Index of American Design was used during the year by 304 persons. Their interests included securing slides and exhibits, doing special research and designing, and gathering illustrations for publications.

Curatorial Activities

Under the direction of chief curator Perry B. Cott, the curatorial department accessioned 377 gifts to the Gallery during the fiscal year 1966. Advice was given with respect to 1,669 works of art brought to the Gallery for expert opinion, and 36 visits to collections were made by members of the staff in connection with offers of gifts. The registrar's office issued 220 permits to copy and 118 permits to photograph works of art in the Gallery's collections, About 6,771 inquiries, many of them requiring research, were answered verbally and by letter.

Assistant chief curator William P. Campbell served as a member of the Special Fine Arts Committee of the Department of State and as judge of a YWCA exhibition of the work of Washington artists.

Curator of painting H. Lester Cooke continued as consultant to NASA with duties of organizing and supervising artists doing paintings relating to the Space Program. He also acted as judge for exhibitons of the Atlanta Southern States, 1965; Peoria, Illinois, Mid-West Area, 1966; Richmond, Virginia Area; and for four local exhibitions.

Museum curator Michael Mahoney acted as judge for the Internal Revenue Service Art Exhibition, September 1965.

Assistant registrar Diane Russell taught a course on North European medieval art at The American University in the 1966 spring term.

The Richter Archives received and catalogued 621 photographs on exchange from museums here and abroad; 902 photographs were purchased and about 200 reproductions have been added to the Richter Archives. Five hundred photographs have been added to the Iconographic Index.

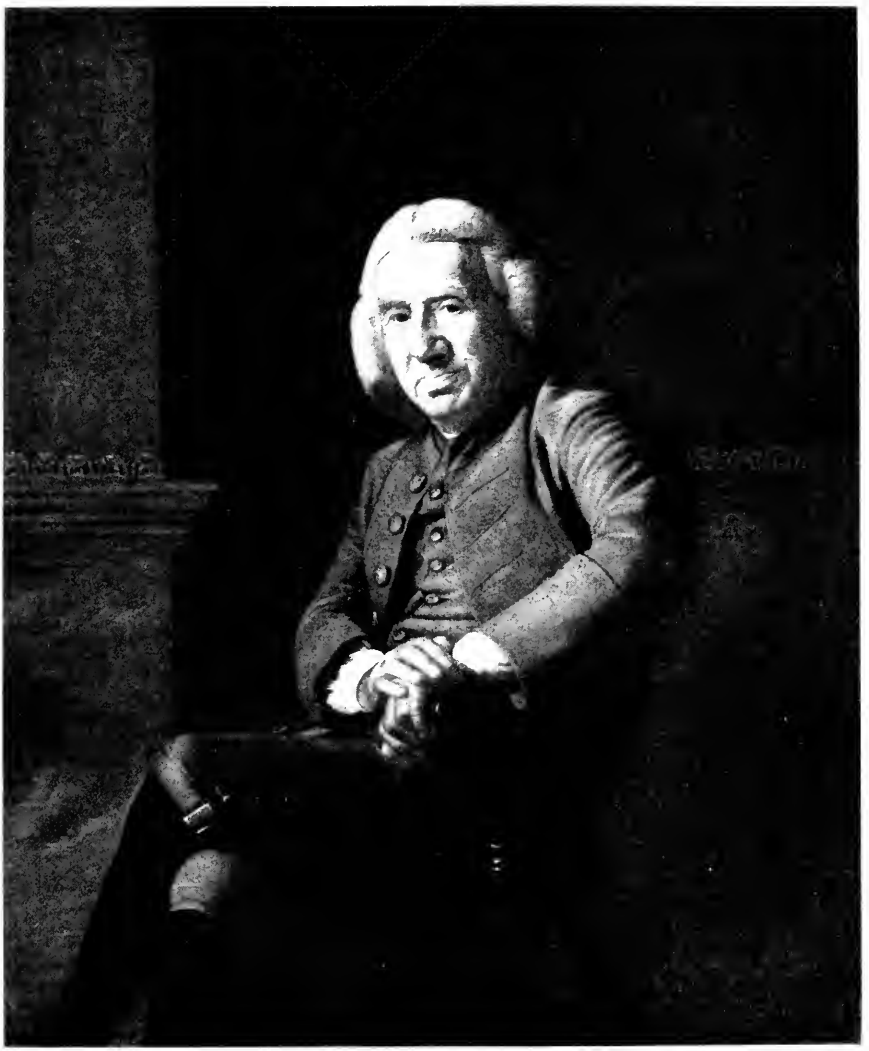
Restoration

Francis Sullivan, resident restorer of the Gallery, made regular and systematic inspection of all National Gallery of Art works of art in Washington. He relined, cleaned, and restored 9 paintings and gave

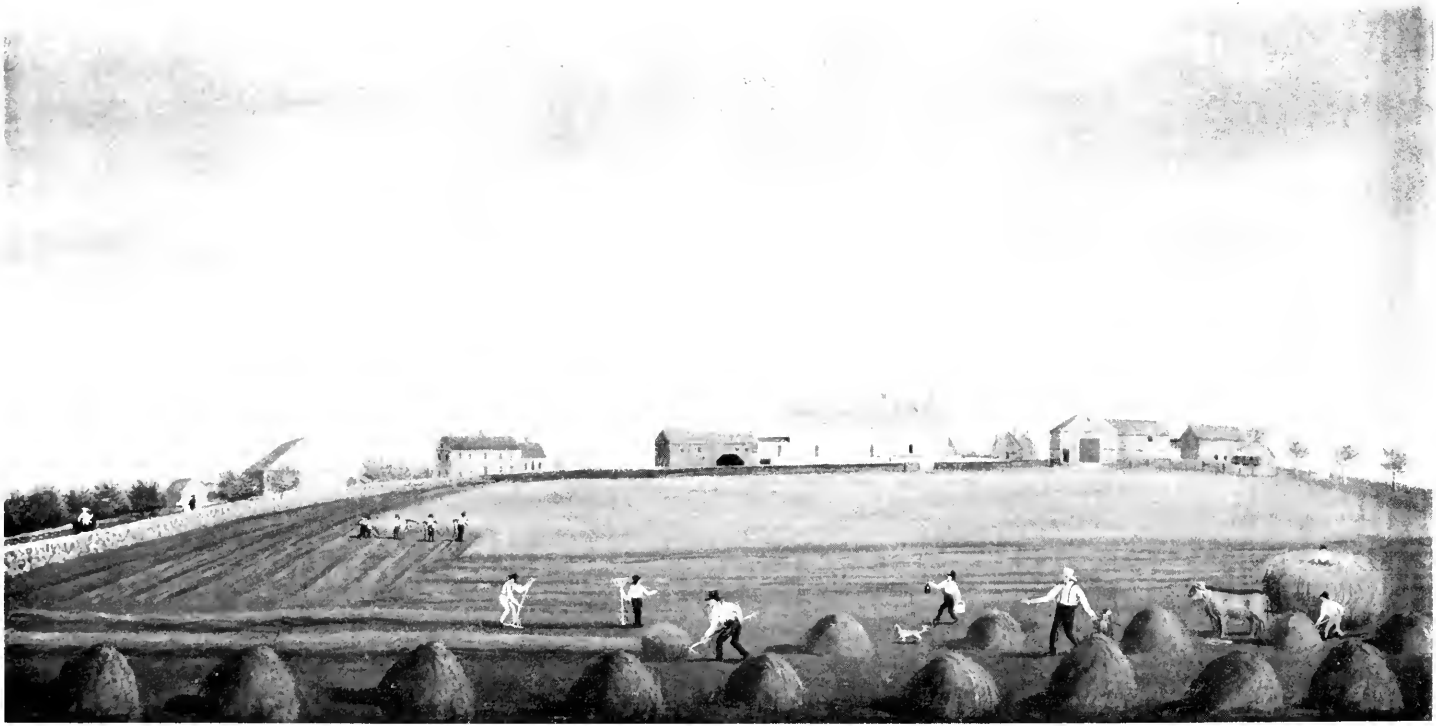
A Lady Writing, by Jan Vermeer (Dutch, 1632–1675). Canvas, 17¾ × 15¾ inches. Gift of Harry Waldron Havemeyer and Horace Havemeyer, Jr., in memory of their father Horace Havemeyer. National Gallery of Art.

230 457—66— —26

The Marquise de Pezé and the Marquise de Rouget with Her Two Children, by Elisabeth Vigée-Lebrun (French, 1755–1842). Canvas, 48⅝ × 61⅜ inches. Gift of the Bay Foundation in memory of Josephine Bay Paul and Ambassador Charles Ulrick Bay. National Gallery of Art.



Eleazer Tyng, by John Singleton Copley (American, 1738–1815). Canvas, 49¾ × 40⅛ inches. Gift of the Avalon Foundation. National Gallery of Art.



Dennison Hill, Southbridge, Massachusetts, by an unknown American artist about 1825. Canvas, 27 × 48⅛ inches. Gift of Edgar William and Bernice Chrysler Garbisch. National Gallery of Art.

special treatment to 32. Twenty-three paintings were X-rayed as an aid in research. He continued experiments with synthetic materials as suggested by the National Gallery of Art Fellowship at the Mellon Institute of Industrial Research, Pittsburgh, Pa. Technical advice was given in response to 220 telephone inquiries. Special treatment was given to works of art belonging to Government agencies, including the Capitol, Treasury Department, the White House, the Coast Guard Academy, and the Freer Gallery of Art.

Publications

La Galeria Nacional de Washington by H. Lester Cooke was published by the Aquilar Press, Madrid. Mr. Campbell wrote an introduction to a new edition of Dunlap's *History of the Rise and Progress of the Arts of Design in the United States.* Miss Katharine Shepard wrote two reviews for the American Journal of Archaeology. An article written by Michael Mahoney entitled "Salvator Rosa Provenance Studies: Prince Livio Odescalchi and Queen Christina" was published in *Master Drawings*, III, 4, 1966.

The catalogue *Fifteenth-Century Woodcuts and Metalcuts from the Collection of the National Gallery of Art* was prepared by Richard S. Field. This will constitute part of the definitive catalogue of the Gallery's collections.

The curatorial staff prepared for publication the *Summary Catalogue of European Paintings and Sculpture.*

Publications Service

During the fiscal year 1966, the Publications Service, under the supervision of Mrs. Ruth Dundas, placed on sale seven new publications: *La Galeria Nacional de Washington* (in Spanish) by H. Lester Cooke; *National Gallery of Art Summary Catalogue of European Paintings and Sculpture; A Pageant of Painting from the National Gallery of Art*, edited by Huntington Cairns and John Walker; *Dutch Landscape Painting of the 17th Century* by Wolfgang Stechow; *John Singleton Copley* by Jules D. Prown; *Renaissance Bronzes* by John Pope-Hennessy; and *The Smithsonian Institution* by Walter Karp.

Over 300 new subjects in 2″ x 2″ original color slides were added to the items sold to the public, and a slide catalogue, listing 427 subjects, was published.

For the first time black and white gravure prints, 11″x14″ size, were made from the Gallery's graphic arts collection. Eight subjects were produced in this form. Six new subjects in 11″x14″ color

reproductions were published to make a total of 284 now available to the public, and 15 new subjects were published in color postcards for a total of 239. Twelve new large color reproductions were published with Gallery assistance.

Educational Program

From June through December 1965 the program of the educational department was carried out under the direction of Dr. Raymond S. Stites, curator in charge, and his staff. On January 1, 1966, Dr. Stites became Assistant to the Director for Educational Services, and Dr. Margaret Bouton, formerly associate curator, became curator in charge of educational work. In addition to these changes, four employees were transferred from the publications office to the educational department when the latter department took over responsibility for the reception desks in the lobbies.

The educational department continued its series of lectures, conducted tours, and special talks on the works of art in the Gallery's collection. Attendance for the 741 general tours was 20,144. This is an increase of 1,239 over last year. Attendance for all regularly scheduled general tours, tours of the week, and picture of the week talks amounted to 40,123—an increase over last year of 3,280.

Special tours, lectures, and conferences (a total of 610) were arranged to serve 20,888 persons. This is an increase of 4,578 over last year. These included special appointments made for other government agencies and bureaus such as the Department of State, Foreign Service Institute, Foreign Students Service Council, and the Armed Forces. Tours, lectures, and conferences were also arranged for many club and study groups, members of the United States Congress, educators (both American and foreign), museum officials, representatives from hospitals (with patients), members of national and local chapters of women's organizations, and groups of professional men and women attending conventions in Washington. These special services were also given to school groups coming from all areas of the country.

The program of training volunteer docents was continued, and the department gave special instruction to 159 women from the Junior League of Washington, D.C., and from the American Association of University Women. By arrangement with the public and private schools in the District of Columbia and surrounding counties of Maryland and Virginia, these two organizations conducted 2,814 classes from the metropolitan area of Washington on tours, totaling 80,623 children. This is an increase of 160 classes and 4,689 children over last year when 2,654 classes visited the Gallery. The volunteers also

guided 744 Safety Patrol girls from Atlanta, Georgia, on tours of the Gallery.

Fifty lectures were given in the auditorium on Sundays with slides or films. The attendance at these lectures was 14,975 persons, representing an increase over last year of 2,406. Twenty-nine of these lectures were given by guest lecturers. The A. W. Mellon Lectures in the Fine Arts, given in 1966 by Lord David Cecil of Cambridge University, constituted a series of six and bore the title "Dreamer or Visionary—A Study of English Romantic Painting." Fifteen lectures were given by members of the staff of the educational department.

The slide library of the educational department has a total of 49,648 slides in its permanent and lending collections. During the year 697 slides were added, and 2,308 slides were recatalogued. A total of 8,922 slides was lent to 292 persons, and it is estimated that these were seen by 16,990 viewers.

Members of the staff participated in outside activities which included lecturing to various club and school groups, and to other government agencies. One staff member was responsible for the LecTour recordings, which included the processing of 92 tapes.

Staff members prepared and recorded 30 ten-minute radio talks which were broadcast over radio station WGMS in Washington, D.C. They also participated in the Widening Horizons Program, which is designed by various government agencies to introduce area high school students to the career opportunities offered in Washington. In this program staff members prepared and delivered eight briefing lectures and gave six special tours for volunteers. These lectures were attended by 130 persons.

A printed calendar of the programs and events of the Gallery was prepared for monthly distribution to a mailing list of approximately 9,600 names, an estimated increase of 2,100.

Total public response to the educational program, excluding slide viewers, was 166,209, which is an increase of 17,053 over last year.

Extension Services

The Office of Extension Services, under the direction of Dr. Grose Evans, circulated to the public, traveling exhibitions, films, slide lectures with texts, film strips, and other educational materials.

Traveling exhibitions are lent free of charge except for shipping expenses. The total number of exhibits was 149, and these were circulated in 1,122 bookings. This represents an increase over last year of 278 bookings.

In addition there are 12 exhibits on loan to two organizations which

are circulating them. A large panel exhibition *Color and Light in Painting* was completed and will be circulated by the Smithsonian Institution Traveling Exhibition Service.

Fifty prints of three films on the National Gallery of Art and its collections were circulated in 417 bookings; an increase in bookings over last year of 101.

A total of 2,160 slide lecture sets was circulated in 6,872 bookings, an increase of 1,155 bookings over last year. Ten slide sets are now being circulated with records, and Dr. Evans prepared a new slide lecture "Painting in Georgian England" based on paintings in the collection of Mr. and Mrs. Paul Mellon. Two hundred copies will be circulated by the Extension Services.

Based on the conservative average estimates per booking used in the past, the audience served by the traveling exhibitions circulated by the National Gallery was approximately 561,000 viewers; for the special exhibitions being circulated by two other organizations, 72,014 viewers, for the three films the estimated audience was 125,100 and for the slide lectures and film strips, the audience was estimated to be 412,320. It is estimated, therefore, that the Extension Services reached approximately 1,170,434 people—an increase of 199,371 over last year.

A new system of direct reporting of audience size by borrowing institutions has led to a revision of audience accounting methods in the interest of greater accuracy. The improved method, which is still under study, indicates a decrease in the estimated audience in one category and varying increases in the other two. Calculated on the new basis, the total number of people recorded in fiscal 1965 is estimated to have been 1,418,684.

In an effort to increase the circulation of the Extension Services materials and to keep abreast of new developments in the audio-visual field, Dr. Evans and his assistants traveled to various states attending 12 meetings and conventions, at which examples of the Extension Services materials were exhibited.

Dr. Evans also assisted in the organization of a pilot research teachers training program to be conducted at the National Gallery of Art by the George Washington University. Forty teachers chosen by the University from applications received form all parts of the country will be given a 6-week program from July 5 to August 12, 1966.

Library

During the year the library accessioned 3,355 publications by gift, exchange with other institutions, or by purchase. A total of 1,600 publications was processed; 5,551 cards were filed in the main catalogue

and the shelflist. Library of Congress cards were used for 390 titles; original cataloging was done for 365 titles.

There were 3,136 periodicals recorded, received by gift, purchase, or exchange. A total of 7,552 periodicals was circulated, and 4,145 books were charged to the staff. There were 6,524 books shelved in regular routine.

During the year the library distributed 1,625 National Gallery of Art publications under its exchange program and in response to individual requests.

In this fiscal year the library borrowed 1,015 books, 946 of them from the Library of Congress.

The library is the depository for black and white photographs of works of art in the Gallery's collection. These are maintained for use in research by the staff, for exchange with other institutions, for reproduction in approved publications, and for sale to the public. Approximately 6,581 photographs were added to the stock in the library during the year, and 1,571 orders for 7,890 photographs were filled. There were 472 permits for reproduction of 1,283 subjects processed in the library.

Index of American Design

Under the supervision of Dr. Grose Evans, the Index of American Design, circulated 31 traveling exhibitions for 65 showings in 21 states and one foreign country. The Index also circulated 135 sets of color slides throughout the United States, and 432 photographs of Index subjects were used for exhibits, study, and publication. The photographic file was increased by 102 negatives and 328 prints; 14 permits were issued to persons wishing to reproduce 254 subjects. The Index material was used by 304 persons, for the purpose of securing slides, exhibits, doing special research and design, and gathering illustrations for publications.

A number of special exhibitions of Index materials were arranged for showing in museums devoted to folk art; and an exhibition honoring the Christmas stamp issued by the Post Office Department in 1965 and based on an Index subject was assembled and circulated throughout the year.

Operation, Maintenance, Activities, and Protection

The Gallery building, mechanical equipment and grounds were maintained throughtout the year at the established standards.

Renovation of the skylight on the east wing of the building last

summer completes the entire resealing of the more than two and one-half acres of roof area.

The Gallery greenhouse continued to produce flowering and foliage plants in quantities sufficient for all decorative needs of special openings and day to day requirements of the Garden Courts.

Ultrasonic protection was installed in seven exhibition cases of Renaissance jewelry and other decorative art objects. Also, the same type of security system was installed in a vitrine in which the recently acquired *Saint George and the Dragon* is exhibited.

LecTour

During the fiscal year 1966 LecTour, the Gallery's electronic guide system, was used by 71,811 visitors—an increase of 13,690 users over fiscal year 1965.

Music Program

Under the supervision of Richard H. Bales, assistant to the director in charge of music, the program continued and forty concerts were given during the fiscal year in the East Garden Court. Thirty-nine of these concerts were played on Sunday evenings and one on Thursday evening. The latter was played during the 25th Anniversary celebration of the National Gallery of Art. Thirty-two of these Sunday concerts were made possible by funds bequeathed to the National Gallery of Art by Mr. William Nelson Cromwell; the 23rd American Music Festival of seven concerts between May 1 and June 12, 1966, was sponsored by the J. I. Foundation. The Gallery orchestra, conducted by Mr. Bales, played 12 concerts. Two of these orchestra programs were supported in part by a grant from the Music Performance Trust Fund of the American Recording Industry.

All concerts, except the 25th Anniversary Concert, were broadcast by WGMS–AM and FM. Music critics of the Washington papers continued their regular coverage of the concerts.

Intermission talks during the Sunday evening broadcasts featured members of the staff of the educational department speaking on various art topics, and there were occasional interviews with guest lecturers. Mr. Bales gave program notes during the intermissions of these broadcasts.

Mr. Bales was in residence at the University of Rochester during July and early August 1965, and conducted concerts and lectured on conducting at the Eastman School of Music. He received the first Distinguished Service Award from the Sons of Confederate Veterans in recognition of his work in Civil War music.

Two one-hour television programs by the National Gallery orchestra with Mr. Bales conducting were taped by WTOP–TV, and these with a previously taped program were telecast during the fiscal year. Paintings from the National Gallery of Art collection were shown during these concerts. In September 1965 a previous telecast by the National Gallery of Art orchestra won a local "Emmy" award.

Mr. Bales appeared several times as a guest conductor and lecturer; a number of his compositions and arrangements were performed by other orchestras.

During May the National Gallery concerts and Mr. Bales received their fourth award from the American Association of University Women for a cultural contribution to the community through their television concerts.

During April 1966 Mr. Bales served as Chairman of the Instrumental Music Panel of the Arts Advisory Committee of the District of Columbia Recreation Board.

Other Activities

In commemoration of the Twenty-fifth Anniversary of the National Gallery of Art, twenty-five medals were struck and awarded "For Distinguished Service to Education in Art." The recepients were flown to Washington for the Twenty-fifth Anniversary celebrations and were awarded the medals by Mrs. Johnson in the East Room of the White House on March 17. The obverse of the medal was designed by the sculptor and graphic artist, Leonard Baskin, and the reverse by the calligrapher and stone-carver, John Everett Benson. The recepients of the medals also received a cash honorarium.

Director John Walker, served as chairman of the committee to make arrangements for the visit to Washington of more than 500 directors curators from sixty nations who had come to America for the first meeting outside Europe of the International Council of Museums. Bus tours and hospitality for ICOM delegates were made possible through a donation to the Gallery by the Samuel H. Kress Foundation. On Saturday, September 18, a luncheon for visiting art museum representatives was given before the opening of the John Singleton Copley exhibition.

The Gallery provided facilities for the ceremony held by the Post Office Department on September 17, 1965, in honor of the first day issue of a stamp in the Fine Arts Series. The stamp is based on a detail from *The Copley Family*, by John Singleton Copley, in the National Gallery's collection.

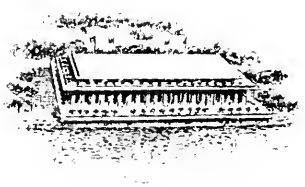
Henry Beville, head of the photographic laboratory, and his assistants processed 61,037 items which included negatives, prints, slides, color transparencies, and color slides.

Audit of Private Funds of the Gallery

An audit of the private funds of the Gallery will be made for the fiscal year ended June 30, 1966, by Price Waterhouse and Co., public accountants. A report of the audit will be forwarded to the Gallery.

John F. Kennedy Center for the Performing Arts

ROGER L. STEVENS
Chairman, Board of Trustees



THIS YEAR OF EFFORT AND ACCOMPLISHMENT saw the start of construction on the John F. Kennedy Center for the Performing Arts. Property rights to the site were cleared. The Watergate Inn, a restaurant on the original site, is being preserved as a headquarters for the builders and as an exhibition area for the Center during construction. But all other buildings were removed and excavation is nearly finished. Relocation of the Rock Creek Potomac Parkway will be completed late this fall. Invitations to bid on the general contract were issued in June. The doors of the Center should open in 1969.

The Metropolitan Opera National Company, co-sponsored by the Center and the Metropolitan Opera Association, completed its inaugural tour of 70 North American cities. Congress granted the Center distribution rights to the United States Information Agency film, *John F. Kennedy: Years of Lightning—Day of Drums,* and it was seen by 150,000 people to date. It will begin its regular run throughout the country in fall. The Friends of the Kennedy Center was formed as a volunteer organization to promote nationwide interest in the Center and its operations. Leonard Bernstein, music director of the New York Philharmonic Orchestra, agreed to compose a major work for the Center's opening in 1969. Activity, interest, and progress in all aspects of the Center should increase in the next 12 months.

Organization

Three Presidents have played a direct, personal role in the John F. Kennedy Center for the Performing Arts. The Center was authorized originally as the National Cultural Center by an Act of Congress signed into law by President Eisenhower in September 1958. The law specified that money for the Center's construction was to be raised within 5 years by voluntary contribution. Congress authorized a nationwide fund-raising campaign for this purpose. The Act was extended 3 more years during the Kennedy administration.

Following the death of President Kennedy, a spontaneous movement developed to make the Cultural Center, in which he had taken such a close personal interest, his sole official memorial in the Nation's capital. President Johnson incorporated this sentiment in an Administration request to Congress in December 1963. The measure was passed with bipartisan support and signed into law by the President on January 23, 1964 (Public Law 88–260). At the same time, Congress authorized a grant of $15.5 million to match private contributions toward the cost of construction. The matching funds were subscribed or in the bank prior to the statutory deadline of June 30, 1965, insuring that the Center would become a reality.

Board of Trustees

Pursuant to the John F. Kennedy Center Act, the Board of Trustees of the Center is made up to 15 members who serve ex officio, and 30 "general trustees." As of June 30, 1966, the Trustees of the Center were as follows:

Appointed by the President of the United States

Richard Adler
Howard F. Ahmanson
Floyd D. Akers
Robert O. Anderson
Ralph E. Becker
K. LeMoyne Billings
Mrs. Thomas W. Braden
Edgar M. Bronfman
Mrs. George R. Brown
Ralph J. Bunche
Mr. Justice Fortas
Mrs. George A. Garrett
Leonard H. Goldenson
Senator Robert F. Kennedy
Mrs. Albert D. Lasker
Erich Leinsdorf
Sol Myron Linowitz
George Meany
Edwin W. Pauley
Arthur Penn
Richard S. Reynolds, Jr.
Frank H. Ricketson, Jr.
Richard Rodgers
Arthur Schlesinger, Jr.
Mrs. Jouett Shouse
Mrs. Stephen E. Smith
Roger L. Stevens
Edwin L. Weisl, Sr.
Robert W. Woodruff

President Johnson reluctantly accepted the resignation of Mr. Ernest R. Breech as Trustee on March 17, 1966.

Appointed by the President of the United States Senate

Senator Joseph S. Clark
Senator J. William Fulbright
Senator Leverett Saltonstall

Appointed by the Speaker of the House of Representatives

Representative Charlotte T. Reid
Representative Frank H. Thompson, Jr.
Representative James C. Wright, Jr.

Members Ex Officio Designated by Act of Congress

Charles Frankel
S. Dillon Ripley
George B. Hartzog, Jr.
Walter N. Tobriner
Harold Howe, II
William Walton
John William Gardner
William H. Waters, Jr.
L. Quincy Mumford

Mrs. Lyndon B. Johnson, Mrs. John F. Kennedy, and Mrs. Dwight D. Eisenhower continue to serve as honorary co-chairmen of the Center.

The Trustees met on February 7, 1966, and elected the officers of the Center. They are as follows:

Roger L. Stevens, Chairman
Kenneth J. Birgfeld, Assistant Treasurer
Robert O. Anderson, Vice Chairman
Sol M. Linowitz, Vice Chairman
Paul J. Bisset, Assistant Treasurer
Ralph E. Becker, General Counsel
Herbert D. Lawson, Assistant Treasurer
Daniel W. Bell, Treasurer
K. LeMoyne Billings, Secretary
L. Corrin Strong, Chairman Emeritus
Philip J. Mullin, Administrative Officer and Assistant Secretary

Site and Construction Progress

Immediately after the announcement of the completion of General Accounting Office auditing of the certification of funds for matching purposes, another flurry of opposition to the location of the Center arose. For several weeks the Chairman, the General Counsel, and other officers were occupied in answering criticisms of the Potomac River site. The officers of the Center were strongly supported by the Senatorial and Congressional members of the Board of Trustees.

The closing of streets and alleys in the Center site occasioned another outbreak of opposition. Objections lodged by Watergate Development to the closing of streets in the Center site were withdrawn after meetings of persons concerned were arranged by the General Counsel. The Board of Commissioners of the District of Columbia ordered the closing after extensive public hearings, at which the Center was represented by

its General Counsel. An opinion by the Solicitor of the Department of the Interior, concurred in by the Attorney General, supported the Center's stand that land, including closed streets and alleys, outside the statutory site could be used for park setting purposes.

In the meantime, the Department of Justice reached an agreement with the Watergate Inn on a condemnation price of $650,000 for the restaurant and land. This marked the end of more than 2 years of negotiations and completed the acquisition of private property for the Center. An opinion is now being awaited from the Attorney General that all land in the Center site is property of the United States. Plans are underway for the transfer of jurisdiction over the various parcels among the governmental agencies concerned. The last legal requirement imposed by the John F. Kennedy Center Act was met when the Regents of the Smithsonian Institution found formally that the Center had sufficient funds for construction.

The Comptroller General of the United States authorized General Services Administration to solicit bids for the general construction contract on a selective basis, following a determination by the Administrator of GSA and the Chairman of the Board of Trustees of the Center that advertised competitive bidding was not practicable. Nine firms, selected on the basis of such considerations as reliability and experience with similar projects, were invited to submit bids in June. They were: George Hyman Construction Company and Charles H. Tompkins Company, of Washington, D.C.; McCloskey and Company and John McShain, Inc., of Philadelphia; J. W. Bateson Company of Dallas; Turner Company, George A. Fuller Construction Company, and Paul Tishman Company, of New York; and Pashen-Kiewit of Chicago and Omaha.

The Board of Trustees passed a resolution opposing the erection of Watergate Development Building No. 1 to any height not substantially lower than the Center. To protect its interests, the Center has been represented at hearings before the Board of Zoning Appeals on matters raised by Watergate.

Contracts were awarded for demolition of the buildings on the Center's site, for excavation, and for the relocation of the Rock Creek Potomac Parkway. A fence was constructed around the site and signs erected. Electric display panels describing the Center are being prepared.

During the last month of the fiscal year, Colonel William F. Powers (U.S. Army, retired) was retained as Executive Director of Engineering. Colonel Powers, who served 28 years in the Corps of Engineers, will

join the Center's staff on completion of his duties as Vice President of Engineering for the Lincoln Center. In his New York assignment he supervised the construction of all the buildings in the new performing arts center.

The insurance requirements of the Center were almost unique. In a major administrative action, unusual specifications were planned to permit adequate insurance coverage during the construction phase and beyond.

JFK Center-GSA Liaison Committee

The General Services Administration is the Center's agent for design and construction and will continue in this capacity through the construction phase. A special liaison committee, made up of five Trustees and representatives of GSA and the architect will be responsible for the final plans and specifications on all phases of construction. The Trustee members of this committee are Chairman Stevens, Mrs. Jouett Shouse, S. Dillon Ripley, George B. Hartzog, Jr., and Ralph E. Becker. The Director of Engineering will join the Administrative Officer as an ex officio member of the committee.

Several architectural changes in the Center's interior were recommended by the JFK-GSA Liaison Committee in accordance with suggestions by the Program Committee. The following changes were then approved by the Liaison Committee, the Executive Committee, and the Board of Trustees: elimination of a special "public reception center" (including a small cinema, reception room, and mezzanine), the addition of access doors to the stages of the Opera and the Theater, additional dressing facilities, addition of a director's suite, reduction of the opera stage apron, provision for hidden television camera locations, reservation of unallotted space for possible extra rehearsal areas and office space, alterations in the roof terrace restaurant facilities, and an increase in the window area on the roof terrace. These changes were incorporated in the final plans sent out for bids.

As a result of studies and recommendations by the Liaison Committee, an arrangement was made with Potomac Electric Power Company for equipping the Center as an all-electric building. All the energy needs, including heating and air conditioning, will embody concepts developed by the architect in close coordination with PEPCO engineers. The arrangement with PEPCO will result in substantial savings in construction costs.

230-457—66——27

Program Committee

The Program Committee, under the chairmanship of Arthur Schlesinger, Jr., has held seven meetings in the past year. The members of this committee include:

Mrs. Thomas W. Braden
Harold E. Clurman
Mr. Justice Fortas
Richard N. Goodwin
August Heckscher
Mrs. John F. Kennedy
Goddard Lieberson
Sol M. Linowitz
S. Dillon Ripley
Oliver Smith
George Stevens, Jr.
Roger L. Stevens (ex officio)

The committee consulted with outstanding professionals in the performing arts to study the most effective use of the Center's facilities. On the basis of the original Congressional mandate, the committee has studied theories and formats of artistic management, possible establishment of resident companies, the potential for the use of private and public television to extend the Center's range of activity, and various educational opportunities. The committee recommended that priority be given to the selection of the artistic management staff and that the final statement of program policy be deferred in order to permit the artistic director and his staff to praticipate in establishing the policy.

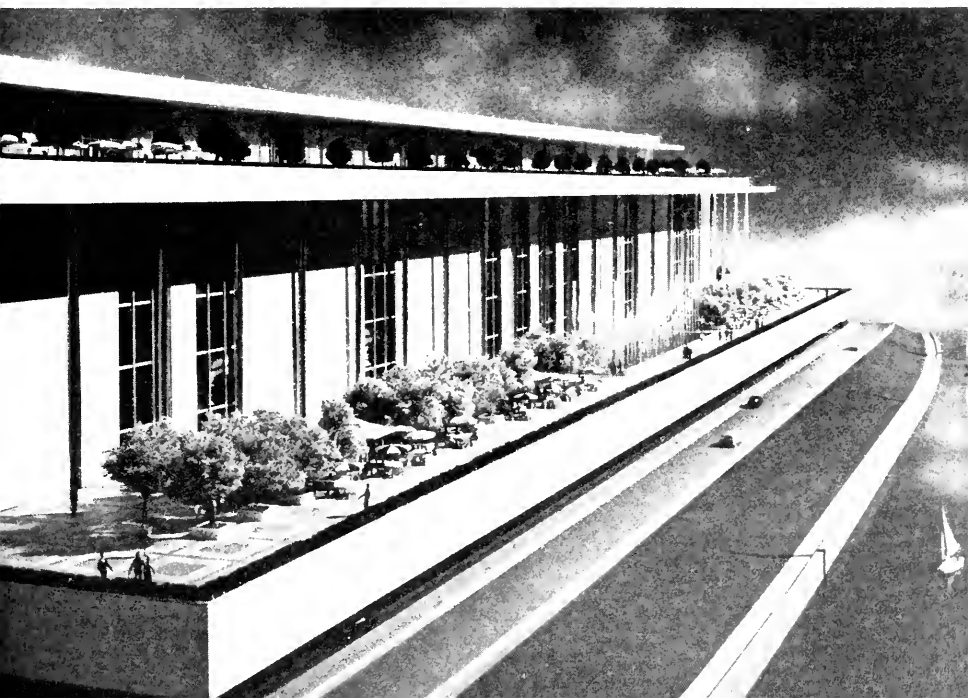
Because of the substantially increasing interest and activity in the performing arts throughout the country since the original concept of the Center was formed a decade ago, several changes were recommended in the interior plans. The changes were intended to make the facilities of the Center more flexible and to extend the educational possibilities within the Center.

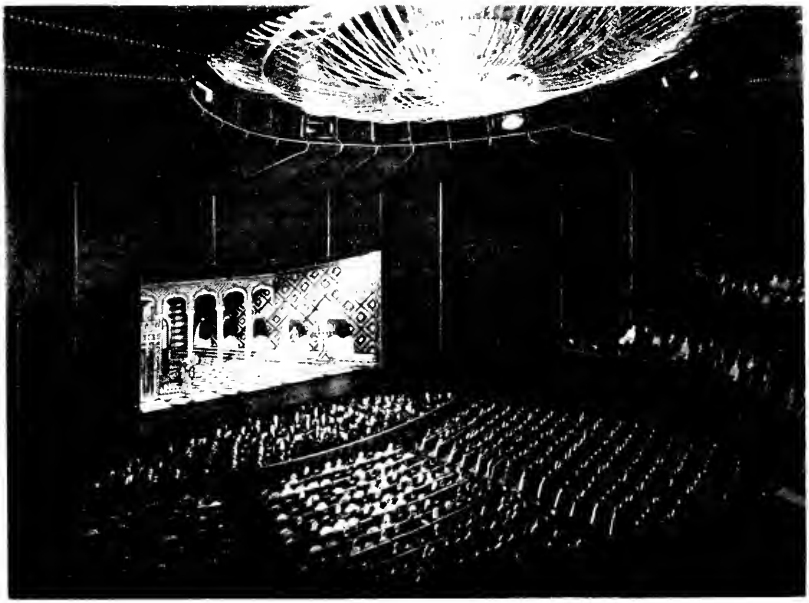
On June 23, it was announced that Leonard Bernstein, the eminent and versatile composer and music director of the New York Philharmonic Orchestra, had agreed to compose a major dramatic work for the Center's opening. Mr. Bernstein, in accepting the commission, recognized the national significance of the Center and expressed deep appreciation of the cultural interests of President Kennedy.

Memorial Committee

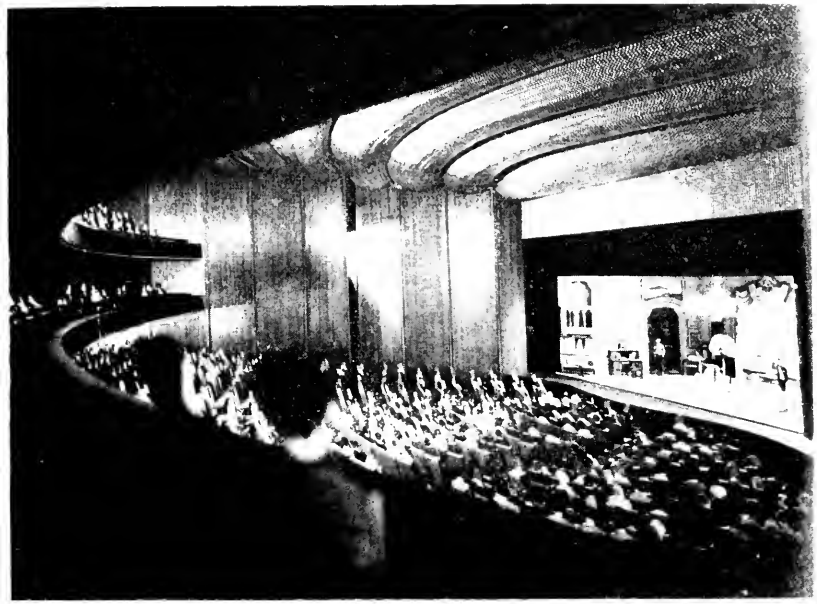
The River Terrace of the Center, overlooking the expanse of the Potomac, is being considered as a site for a special memorial to President Kennedy. The committee and Edward Durell Stone, the Center's architect, have reviewed several ideas and expect to make their recommendation in the coming year, subject to approval by the Center's Trustees, the Regents of the Smithsonian Institution, and Congress.

New model of the John F. Kennedy Center for the Performing Arts soon to be put on display at the visitors' center (formerly the Watergate Inn) on the site. Above: Entrance. Below: River terrace above Rock Creek Parkway, overlooking Potomac River.

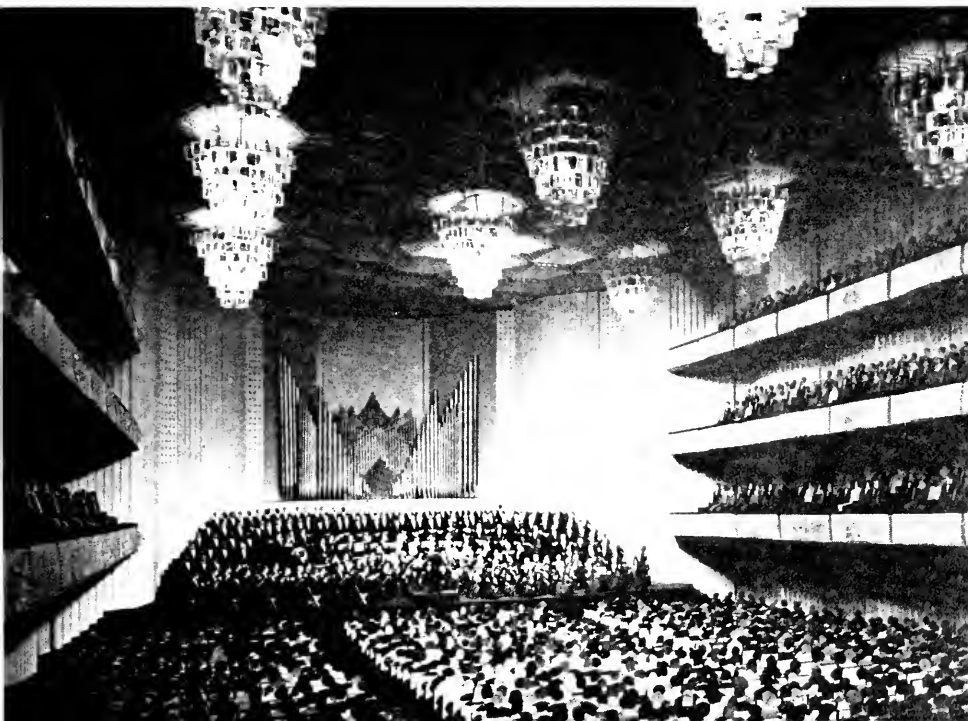


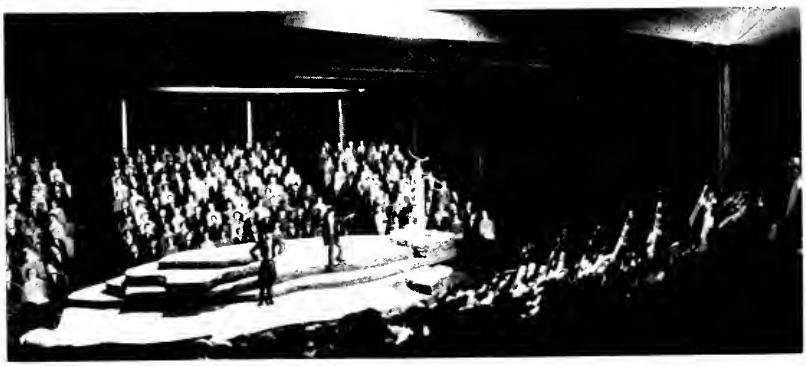


The Opera, central hall of the Center, will seat 2,200. The stage will be 60 feet wide, 100 feet deep.

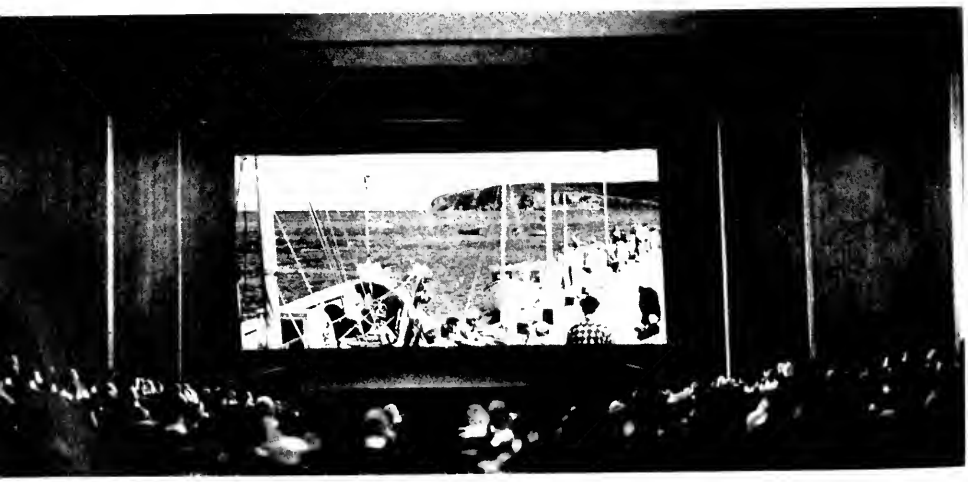


The Theater (above) will seat 1,100 and the Concert Hall (below) will seat 2,700, both are on the main level, flanking the Opera.





The Studio Playhouse, above the Theater on the roof-terrace level, can be used as a conventional theater, or with a thrust stage (top), for theater-in-the-round (center), or as a film theater (below).



Friends of the Kennedy Center

Early this year the Trustees passed a resolution creating the Friends of the Kennedy Center, a self-supporting volunteer organization, to aid the Center in establishing its national scope. The first meeting of the National Council of the Friends of the Kennedy Center was held on June 27, and the following officers were elected:

Mrs. Frank G. Wisner, Chairman
Mrs. Polk Guest, Vice Chairman
George Stevens, Jr., Vice Chairman
Mrs. David Ginsburg, Secretary
Murray Preston, Treasurer
Mrs. Llewellyn E. Thompson, Member-at-Large

Representing the Center's Board of Trustees on the National Council are the officers and Mrs. George Garrett, Mrs. Albert Lasker, and Mrs. Jouett Shouse.

Mrs. Thomas W. Braden of California and Douglas Dillon of New Jersey were named co-chairman of the National Membership Drive, currently under way.

The purpose of the National Committee of the Friends of the Kennedy Center is to develop activities and programs to bring attention to the Center, its purposes and plans; and to enlist the active support of the Center by members of the National Committee. Specific objectives of the National Committee will be developed by the National Council from time to time, subject at all times to approval of the Trustees of the Center.

Fund-Raising and Gifts

Active fund-raising efforts for the Center were curtailed after the $15.5 million Federal grant was matched, as required by law, by June 30, 1965. The Development Committee, however, under the chairmanship of Robert O. Anderson will continue to assess the immediate and future needs and to solicit foundations and individuals for additional major contributions. Fortunately, with the addition of several small contributions the interest income substantially exceeded the operating expenses for the year.

Since the above statutory deadline, several months have been lost because of procedural delays, plan reviews, and revisions. There has been some increase in wage scales and in materials and other costs. It is hoped, nevertheless, that the building can be completed at a cost close to present estimates and without the need for changes, deletions, or more funds.

Models of the sculptured bronze panels given by the German Government for the two main entrances to the Center were unveiled at a

ceremony at the German Embassy in January. Designed by the distinguished young German sculptor, Jurgen Weber, each panel will measure 40 feet long and 8 feet high. The panel leading into the Hall of States will have a theme based on the ideals of President Kennedy. The theme of the panel over the entrance to the Hall of Nations will deal with the performing arts as contributants to peace.

The weaving of the Opera House curtain, a gift from the Government of Japan and the America-Japan Society of Tokyo, is under way The Japanese are making a 16-mm. film of this unique gift as the craftsmen progress. The Center's architect has been working with the designers of the Norwegian gift of crystal chandeliers and the Danish gift of furniture. Sketches of the Waterford crystal chandelier, a gift of the people of Ireland, have been submitted to Mr. Stone for approval.

Contracts have been signed for the quarrying and cutting of the marble donated to the Center by the Italian Government. The three companies chosen by the architect after extensive testing and sampling are Bufalini, Henraux, and Montecatini. All the marble is being quarried in the vicinity of Carrara, some of it coming from the same quarry used by Michelangelo for many of his statues. These contracts were drafted to assure that sufficient marble will be available for construction when needed. Special insurance coverage was planned. Shipments of marble will be coming from the port of Leghorn in late fall, and will be transported without charge to Baltimore as a gift from the American Export-Isbrandtsen Lines.

Many other foreign nations have expressed an interest in presenting a gift to the Center and negotiations are being carried on with them.

The Fine Arts Accessions Committee held meetings to consider various gifts offered to the Center. Gifts recently accepted include a Japanese Byobu two-panel screen, from a group of Japanese ladies, and a Salt Glaze Planter executed by Kenneth Ferguson, from the Kiln Club of Washington. The Planter received a Kiln Club award at the Tenth Annual Exhibition of Ceramic Art held at the Smithsonian Institution last fall.

The John Philip Sousa Memorial Committee, appointed by the American Bandmasters Association, has continued its campaign for a $100,000 endowment to provide the stage and acoustical sound reflectors in the Concert Hall. The committee reported that 71 percent of the goal has been reached and that it anticipates 100 percent success during the school term beginning in September. The stage will be named in honor of Mr. Sousa.

Consultants

Final plans for the Center, on which construction bids were received, required expert assistance in many areas. In addition to the resources of Edward Durell Stone, architect and his associates, the following were engineering consultants to the architect: Syska & Hennessy, Inc., mechanical and electrical engineers; Meuser, Rutledge, Wentworth and Johnston, foundation engineers; Donald Oenslager, Mr. Stone's stage-design consultant; Abe Feder, lighting consultant; Ben Schlanger, seating consultant; and Olaf Soot, stage machinery consultant. Dr. Cyril Harris, acoustics consultant, designed the Center's acoustical systems. Edward D. Stone, Jr., is landscape architect and Sasaki, Walker, and Associates serve as landscape consultants.

Numerous members of the staff of the Public Buildings Service of the General Services Administration have participated in the design development of the John F. Kennedy Center. Among them special recognition is appropriate for Karel Yasko, Assistant Commissioner for Design; L. Anthony Ziernicki, Assistant Commissioner for Construction; J. Rowland Snyder, Director, Architectural Division; Robert R. Jones, Director, Mechanical and Electrical Division; Arthur Westrich, Director, Structural Division; James Francis, Director, Specifications Division; James H. Jones, Project Coordinator; Ray Whitley, Chief, Elevator Branch; Harry Kay, Estimator, Estimates Division; Edward Kearney, Chief, Electrical Estimates Branch. Dr. Vern O. Knudsen reviewed the Center's acoustical design.

Special Projects

The Metropolitan Opera National Company, co-sponsored by the Center and the Metropolitan Opera Association, completed its inaugural tour on June 12. The tour began at Clowes Memorial Hall in Indianapolis, Indiana, last September 20. When the tour ended in Guadalajara, Mexico, the company had performed in 71 cities on the North American continent. The four operas presented were Bizet's *Carmen* (in French and English), Puccini's *Madama Butterfly* (in Italian and English), Carlisle Floyd's *Susannah*, and Rossini's *Cinderella* (in English).

During the tour auditions were held in various regions of the country. New singers, including two from Washington, D.C., were signed for next year's tour.

The company's second tour will begin on September 15, in Indianapolis, where it opened last year. Many new cities have been added to the itinerary. The repertory for the second season will be Puccini's *La Boheme*, Verdi's *La Traviata*, Mozart's *Marriage of Figaro* and Benjamin Britten's *Rape of Lucretia*. Because of the nature of the Center's agreement with the Metropolitan Opera Association in establishing the National Company, all financial obligations of the Center were discharged in the first season, and there are no continuing financial obligations.

Ordinarily films produced by the United States Information Agency can be shown only in foreign countries. By special legislation, however, Congress authorized the Center to distribute domestically the USIA film *John F. Kennedy: Years of Lightning—Day of Drums*, believing that this particular film should be available to all Americans.

A Congressional resolution approved on October 7, provided for the purchase of the film by the Center from the USIA for $122,000. The resolution directed that the proceeds from all commercial showings of the film would accrue to the Center. Congress also made clear its intent that there should be no showing of the film which would serve a partisan political purpose, and that when the film was made available to educational and other nonprofit groups, it would be at no profit to the Center.

On January 3, the Trustees entered into a contract with Embassy Pictures Corporation for the commercial theatrical distribution of the film. Embassy Pictures Corporation agreed to waive all distribution fees. Negotiations have been initiated for eventual release of the film to nonprofit organizations as agreed with Embassy Films. An agreement was also reached with Capitol Records to permit the marketing of the film's soundtrack as an LP record from which royalties will be paid to the Center. The Center received an advance of royalities of $50,000 from Capitol Records.

John F. Kennedy: Years of Lightning—Day of Drums opened at the Lincoln Art Theatre in New York City on April 10. The film was shown on a continuous performance basis through mid-June. Because of public demand it was shown also at the Cinema I Theater in New York City and had a successful 9-week run there. The film has subsequently been shown in Boston and Chicago and is scheduled this fall for showing in commercial theaters in all 50 states.

The Tom Sawyer Project involves a wooden fence surrounding the construction site. The fence, erected last spring, has 250 panels, each 8 feet by 8 feet. These inspired a local organization to conceive the idea of having boys and girls decorate the panels with murals. Plans were made to have children in the District of Columbia's Widening Horizons

project paint 17 of the panels, after first receiving basic instruction from Roger Selby, curator of education at the Corcoran Gallery of Art. Plans are also under way by the Friends of the Kennedy Center to expand the project.

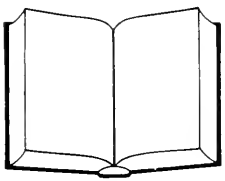
The Year Ahead

The construction of the building will be well advanced during the coming 12 months. As construction proceeds and problems relating to it are met and solved, the attention of the Trustees will be turned to the artistic management of the Center and to the development of artistic concepts and programs in greater detail. As the policies of the Center in this sphere are developed, so will be developed promotional and financial programs to implement these policies. While the stone, steel, and mortar give physical shape to the Center, the Trustees will be pressing ahead to shape its intellectual and cultural dimensions for the realization of the bright future that the John F. Kennedy Center holds for the nation.

Other Smithsonian Activities

Smithsonian Institution Libraries

MARY A. HUFFER, *Acting Director*



THE SMITHSONIAN INSTITUTION LIBRARIES continue to develop under the enthusiastic revitalizing encouragement of the Secretary and the unstinting support of the scientists and historians of the Institution.

The Office of the Director of Smithsonian Institution Libraries was established in December 1965. Library service within the Institution is rendered through a complex network of bureau, branch, departmental, and divisional libraries. Acquisitions and cataloging of all materials for the various units are performed by the central library. Most special subject collections are located in the immediate vicinity of the object collection to which they pertain, but general reference and bibliographic tools, together with extensive interdisciplinary, peripheral, and less immediately needed materials, are kept in the Central Library collection.

Central Library

An extension of library service for Smithsonian staff was carried out by the Smithsonian liaison librarian at the Library of Congress.

Material for translation amounting to 4,342 pages was submitted during fiscal year 1966 on the Special Foreign Currency Information Program and 5,077 pages were prepared for submittal in fiscal 1967. All of these represent Russian literature to be translated into English in Israel under sponsorship of the National Science Foundation. Progress continues on translation of the Russian Academy of Sciences *Flora USSR*, with 6 volumes of the 30 volume set in process or completed. Four more volumes of the multivolume *Keys to the Fauna USSR* and

2 more of the *Fauna USSR* were submitted. Greater emphasis has been put on translation of material on the history of science and technology, with 6 volumes now slated for translation.

In the acquisitions section, the advent of automation and a sharp increase in gifts and exchanges mark the fiscal year just ended.

Electronic data processing is an innovation that will have a significant long-range impact on operation of the library. Late in June 1965, an IBM-29 key punch was installed in the acquisitions section, and during fiscal 1966 all purchase orders were printed on the computer in the Smithsonian's data processing unit. The ADP program now provides computer-printed purchase orders, bi-weekly reports on the status of various accounts, receiving cards, book labels, Library of Congress card order slips, and temporary catalog cards.

Cataloging the large collection of materials transferred from the Patent Office was completed during the year. The number of volumes cataloged during the year has not quite kept abreast of incoming volumes for the year: 10,097 cataloged to 11,201 received, therefore leaving the backlog untouched. This is even more serious than it seems, because material requiring original cataloging has been relegated to the backlog while more easily handled literature (i.e., for which Library of Congress cards exist) has been done as received or pulled from the reserve supply in "control" (or backlog) in order to get a greater number of volumes moving through the department. Publications not already cataloged by the Library of Congress are probably not owned by them or any other large research library; postponing their cataloging, therefore, is a dubious expediency, but space problems alone preclude deferment and consequent accumulation of large amounts of material while catalogers spend extra time on original work.

Simplified and reduced forms for statistics have been prepared for use during the coming fiscal year. In October, Miss Clarice M. Barker, who had been acting chief of the catalog section since December 1964 and serials cataloger for the library since July 1960, retired.

Because this year's contractor for binding had difficulties in meeting contract specifications, and major portions of most shipments had to be reworked, the library's binding program suffered a serious setback. The binding unit moved into new, larger and brighter quarters on the ground floor of the West Range of the Natural History building in August.

Branch Libraries

As adequate space and equipment becomes available the library is continuing to consolidate and reorganize many of the special and

departmental collections. This year the Museum of Natural History branch library, with the help of the botany department staff, completely reorganized the botany library. Materials formerly housed in six different locations are now shelved in the botany library on the fourth floor of the west wing of the Natural History building. A temporary card catalog was made by copying cards from the shelflist in the central library. Review and weeding of the collection is now in process. In April 1966, Dr. John A. Stevenson presented his mycological library to the Institution.

Preliminary work on reorganizing the paleobiology collections has begun. A small reference collection was established and housed in the Cooper reading room in the department, and all other materials were transferred into the main natural history collection.

Mrs. Gloria A. Mauney returned to the library after a year's absence to take charge of the entomology library. A systematic review of all serials in this collection is underway.

In fall 1965 new stacks were installed in the anthropology library quarters on the third floor of the east wing of the Natural History building. This equipment allowed for the transfer of the former Bureau of American Ethnology library to the new location, thus bringing into one facility all the anthropological collections. This transfer involved moving approximately 35,000 items from the Smithsonian building. Prior to this move the library collections of the various divisions of the former department of anthropology were combined and moved to the new location.

The card catalog was completely revised in the Museum of History and Technology branch library: both the old and the new catalogs were separated into author-title catalogs with separate subject catalogs. The old shelflist was split to separate the trade literature shelflist from the old shelflist for Dewey-classed books. These changes have made the catalog considerably easier to use.

During the past year, efforts have continued to develop a strong facility to serve the National Collection of Fine Arts, while radically expanding that aspect of the work supporting the National Portrait Gallery, in anticipation of the move to the Fine Arts and Portrait Galleries building (the renovated Old Patent Office building) next year. William Walker, the branch librarian, is engaged in a project with the Library of Congress subject cataloging division, to revise the Library of Congress "N" classification schedule for books on fine arts. In January Miss Ruth Carlson joined the staff as senior cataloger for fine arts.

230-457—66——28

In the National Air and Space Museum branch library work continued on the preliminary sorting of the large bulk of materials accumulated over the years and stored at the Silver Hill facility. A member of the Museum staff spent one-half day a week in the catalog section for training in library cataloging procedures and to assist in expediting the processing of materials for that library.

Staff Activities

At the December meeting of the Society of Systematic Zoology in Berkeley, California, an informal paper "Data Processing, the Natural History Library and the Future," by Mary A. Huffer and Jean Chandler Smith was presented by Mrs. Huffer.

On April 27th the Federal Library Committee invited the Smithsonian to fill a vacancy in its membership for an unexpired term of two years ending June 1967. The Acting Director of Smithsonian Institution Libraries was designated to represent the Institution on the Committee. Mrs. Huffer also continued to work with the Federal Library Committee Task Force on Acquisitions of Library Materials and Correlation of Federal Library Procedures.

Informal lectures and tours of the Smithsonian Libraries were given several times during the year for groups of foreign visitors and library graduate students. Various library staff members took an active part in training enrollees of the Neighborhood Youth Corps as library assistants and aides throughout the year.

Jean Chandler Smith continued work on the *Bibliography on the Chemical Composition and Nutrition of Endoparasites* at the request of the American Society of Parasitologists.

The following papers by a library staff member appeared in various journals:

Goodwin, Jack S. Current bibliography in the history of technology (1964). *Technology and Culture* (Spring 1966), vol. 7, pp. 268–300.

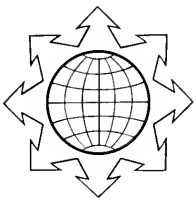
———. [Review of] Bibliography of the history of medicine in the United States and Canada, 1939–1960 (Baltimore: Johns Hopkins Press, 1964). *Technology and Culture* (Fall 1965), vol. 6, pp. 690–691.

———. [Review of] Sources of business information, by Edwin T. Coman (Berkeley: Univ. of California Press, 1964). *Technology and Culture* (Winter 1966), vol. 7, pp. 123–124.

———. [Review of] Merchants and scholars, edit. John Parker (Minneapolis: Univ. of Minnesota Press, 1966). Society for the History of Discoveries, *Newsletter* (May 1966), p. 9.

International Exchange Service

J. A. COLLINS, *Director*



THE INTERNATIONAL EXCHANGE SERVICE moved to new quarters in the Arts and Industries building during the fiscal year. The new work area provides better facilities for the processing of publications received for transmission. The total weight of publications processed during the past year was the largest ever handled. Publications were received from approximately 400 different organizations, institutions, Government bureaus, Congressional committees, agricultural experiment stations, and individuals for transmission to more than 100 different countries. Ocean freight rates were increased approximately ten percent during the year, and the cost of materials and supplies increased. A strike by the Maritime unions against some of the steamship lines delayed the forwarding of publications to many countries during the months of July, August, and September.

Official United States publications were transmitted to 105 libraries in other countries. Full sets were received by 59 libraries and partial sets by 46. The only change during the year in the recipients of the official publications was the addition of the Haile Sellassie I University, Addis Ababa, Ethiopia, to receive a partial set. Daily issues of the Congressional Record and the Federal Register were mailed to 134 foreign depository libraries.

President Johnson in his address at the Smithsonian Bicentennial stated that, "we must embark on a new and a noble adventure: First

PACKAGES RECEIVED FOR TRANSMISSION FROM FOREIGN AND DOMESTIC SOURCES, FISCAL YEAR 1966

Classification	*For transmission abroad by the Smithsonian*		*Received by the Smithsonian for distribution in the United States*	
	Number of packages	*Weight in pounds*	*Number of packages*	*Weight in pounds*
U.S. parliamentary documents received for transmission abroad	920,015	354,295	—	—
Publications received from foreign sources for U.S. parliamentary addressees	—	—	10,246	12,664
U.S. departmental documents received for transmission abroad	310,488	326,704	—	—
Publications received from foreign sources for U.S. departmental addressees	—	—	7,060	18,356
Miscellaneous scientific and literary publications received for transmission abroad	157,819	237,343	—	—
Miscellaneous scientific and literary publications received from abroad for distribution in the United States	—	—	56,092	92,130
Total	1,388,322	918,342	73,398	123,150
Total packages received	1,461,720	—	—	—
Total pounds received	—	—	—	1,041,492

to assist the education effort of the developing nations and the developing regions."

During the past year over one hundred schools, colleges, and universities in the United States transmitted publications through the International Exchange Service to libraries in other countries. Medical and dental textbooks and journals were transmitted for a number of medical and dental organizations to libraries and schools in other countries, and textbooks were forwarded to schools in which Peace Corps Volunteers were teaching.

The Smithsonian Institution through the work of the International Exchange Service has been able to carry out in a substantial way, the request of the President. It also serves as a means of developing and executing in part the broad and comprehensive objective, "the diffusion of knowledge."

Administrative Support Services

A number of administrative divisions, operating behind the scenes, serve the Smithsonian Institution by providing the technical assistance and resources and other support that enable the bureaus and other program activities to work productively and efficiently. In carrying out this responsibility, these divisions directly share in the Institution's accomplishments in research, exhibits, education, and public service. The following brief statements highlight some of their activities and note the more significant staff changes during this past year.

An Office of Programming and Budget was established under the Assistant Secretary to work closely with the Institution's museums and scientific bureaus in studying their objectives, analyzing their programs, and translating their essential requirements into sound budgets. In April 1966, Edward H. Kohn, formerly executive officer of the Smithsonian's Science Information Exchange, was appointed director of this new office.

The supply division continued its efforts in the market place to procure the supplies, materials, and services needed in the many and varied Smithsonian activities. Over 6,000 purchase orders were issued for such diverse items as dehydrated fire-fly tails, lifesize mannequins, hardwood sawdust, and a newsboy's bag to be used by a scientist to carry traps while in Africa.

The Smithsonian benefitted from the highly effective property utilization program of the General Services Administration. By means of this program, material and equipment are transferred from Government agencies where they are no longer required to other agencies where they can be put to productive use, and thus additional purchases are avoided. One million dollars worth of this property was acquired by the Institution this year. It included $100,000 worth of office furniture and equipment, and, for the the collections, a prototype Hawk missile launcher and the 29-foot, 6-ton U.S. Navy experimental hydrofoil craft *Sea Legs*, which will be placed on exhibit.

In December 1965, after 47 years of service to the Institution, Anthony W. Wilding retired as chief of the supply division and in March 1966, Fred G. Barwick was appointed chief. Mr. Barwick had previously been a contract specialist with the Bureau of Ships, Department of the Navy.

To meet the workload imposed by the payroll and other accounts of the Institution, the fiscal division made increased use of automatic data processing equipment, with its capability of fast and accurate computations.

As is evident by the preceding pages of this report, much of the Institution's work is conducted overseas, so that foreign exchange rates and overseas accounts add an international dimension as well as challenging problems to the staff of the fiscal division. In this aspect of the work, they were assisted greatly by the U.S. Treasury Department and private banking concerns in Washington, D.C.

The personnel division, in addition to processing over 3,200 personnel actions, conducted an active Incentive Awards Program, under which 58 employees received cash awards totaling $5,230. Of particular significance was the suggestion to establish the Smithson Medal for Scientific and Curatorial Excellence. Also, during this period the Secretary approved the design for the new Henry Medal, to be used by the Board of Regents to recognize distinguished service or achievement. With the cooperation of its various bureaus, the Institution provided practical training opportunities for disadvantaged youth in the Metropolitan Area under the President's Youth Opportunity Program. Much of the credit for successful staffing and training programs can be given to the efforts and assistance of the Civil Service Commission.

With the general increase in exhibits, research, education, and public services throughout the Smithsonian, the workload of the photographic services division increased substantially. Approximately 184,000 black and white prints, color slides and other color photography items, an increase of 45,000 over the previous year, were produced, as well as 21,000 feet of motion picture film. A particularly important job performed by the photographers was the coverage of the colorful Smithson Bicentennial. The resulting photographs, slides, and motion pictures, which received wide distribution, provided an exceptionally complete documentary of this significant and historic occasion.

Plans for constructing a photographic laboratory to service the Oceanographic Sorting Center were approved, and this facility is expected to be in operation during the coming fiscal year.

The tasks assigned to the Smithsonian's buildings management department are both large and particularly significant to the successful meeting of the Smithsonian's goals. To this department is assigned the broad responsibility of maintaining, operating, and improving the buildings and associated equipment and other facilities, and of protecting these buildings, their irreplaceable contents, and the visiting

public. Much of this work is on an around-the-clock basis. An indication of its scope is provided by a few statistics: six monumental buildings on the Mall and other significant properties in and around Washington to be repaired, improved, and kept presentable; some 60 million objects of natural history, art, and scientific, technological, and cultural significance to be protected; and over 13 million visitors this year to be safeguarded and assisted.

The department also participated in the installation of exhibits; repaired and refurbished furniture, equipment, and museum objects; it provided necessary supporting services for the curatorial, research, and public service activities; and it conducted safety programs.

Automatic data processing equipment holds a tremendous potential for assisting in the curatorial and scientific areas as well as in certain administrative areas. The full value of the information documenting the collections cannot be realized until it can be captured, correlated, and retrieved by means other than traditional manual methods. An information systems division was established this year to design and program the systems to meet these needs effectively and efficiently. Nicholas J. Suszynski, Jr., who was appointed in November 1966 to head this new division, brings to it ten years of ADP experience in a variety of business management and scientific assignments.

Other staff activities in the Office of the Secretary provided valuable advisory and management assistance: The office of the general counsel, the contracts office, the organization and methods division and the internal audit office. The last named was established this year to support the Smithsonian's continuing efforts to assure sound financial management in all its aspects, and in March 1966 Douglas Martin was appointed to implement this program by means of on-site reviews and other techniques of fiscal analysis.

Appendix

1.

Report of the Executive Committee of the Board of Regents of the Smithsonian Institution

For the Year Ended June 30, 1966

To the Board of Regents of the Smithsonian Institution:

Your executive committee respectfully submits the following report in relation to the funds of the Smithsonian Institution, together with a statement of the appropriations by Congress for the Government bureaus in the administrative charge of the Institution.

Parent Fund

The original bequest of James Smithson was £104,960 8s 6d ($508,318.46). Refunds of money expended in prosecution of the claim, freight, insurance, and other incidental expenses, together with payment into the fund of the sum of £5,015, which had been withheld during the lifetime of Madame de la Batut, brought the fund to the amount of $550,000.

The gift of James Smithson was "lent to the United States Treasury, at 6 per centum per annum interest" (20 U.S.C. 54) and by the Act of March 12, 1894 (20 U.S.C. 55) the Secretary of the Treasury was "authorized to receive into the Treasury, on the same terms as the original bequest of James Smithson, such sums as the Regents may, from time to time see fit to deposit, not exceeding, with the original bequest the sum of $1,000,000."

The maximum of $1,000,000 which the Smithsonian Institution was authorized to deposit in the Treasury of the United States was reached on January 11, 1917, by the deposit of $2,000.

Under the above authority the amounts shown on the following page are deposited in the United States Treasury and draw 6 percent interest.

In addition to the $1,000,000 deposited in the Treasury of the United States there has been accumulated from income and bequests the sum of $7,314,088.20 which has been invested. Of this sum, $6,232,813.25 is carried on the books of the Institution as the Consolidated Fund, a policy approved by the Regents at their meeting on December 14, 1916. The balance is made up of several small funds.

Sources: Smithsonian Fund Deposited in U.S. Treasury

Donor	*Unrestricted funds*		*Income 1966*
James Smithson	$727,640		$43,658
Avery	14,000		840
Habel	500		30
Hamilton	2,500		150
Hodgkins (General)	116,000		6,960
Poore	26,670		1,600
Rhees	590		35
Sanford	1,100		66
	Restricted funds	$889,000	$53,340
Hodgkins (Specific)	$100,000		6,000
Reid	11,000		660
		111,000	6,660
		$1,000,000	$60,000

Consolidated Fund

[Income for the unrestricted use of the Institution]

Fund	*Investment 1966*	*Income 1966*
Abbott, W. L., Special	$24,792	$1,449
*Avery, Robert S., and Lydia	65,715	3,777
Forrest, Robert Lee	1,857,275	78,521
Gifts, royalties, gain on sale of securities	459,354	26,385
Goddard, Robert, Memorial Fund	15,035	137
Hachenberg, George P., and Caroline	6,602	41
*Hamilton, James	672	41
Hart, Gustavus E.	810	46
Henry, Caroline	2,012	118
Henry, Joseph and Harriet A.	81,560	4,708
Higbee, Harry, Memorial Fund	19,459	937
*Hodgkins, Thomas G. (General)	50,397	2,897
Morrow, Dwight W.	128,656	7,413
Olmsted, Helen A.	1,333	76
*Poore, Lucy T. and George W.	270,832	15,802
Porter, Henry Kirke	476,465	27,368
*Rhees, William Jones	787	45
*Sanford, George H.	1,481	85
*Smithson, James	34,611	2,379
Taggart, Gansen	598	43
Witherspoon, Thomas A.	214,697	12,331
Total	$3,713,143	$184,599

*In addition to funds deposited in the United States Treasury.

Consolidated Fund

[Income restricted to specific use]

Fund	*Investment 1966*	*Income 1966*
Abbott, William L., for investigations in biology	$173,441	$9,962
Armstrong, Edwin James, for use of Department of Invertebrate Paleontology when principal amounts to $5,000.00	2,518	122
Arthur, James, for investigations and study of the sun and annual lecture on same	66,537	3,825
Bacon, Virginia Purdy, for traveling scholarship to investigate fauna of countries other than the United States	83,352	4,790
Baird, Lucy H., for creating a memorial to Secretary Baird	60,975	3,419
Barney, Alice Pike, for collection of paintings and pastels and for encouragement of American artistic endeavors	47,716	2,741
Barstow, Frederick D., for purchase of animals for Zoological Park	1,663	96
Brown, Roland W., endowment fund—study, care, and improvement of the Smithsonian paleobotanical collections	54,063	2,614
Canfield collection, for increase and care of the Canfield collection of minerals	63,774	4,214
Casey, Thomas L., for maintenance of the Casey collection and promotion of researches relating to Coleoptera	20,853	1,199
Chamberlain, Francis Lea, for increase and promotion of Isaac Lea Collection of gems and mollusks	46,850	2,691
Division of Mammals Curators Fund, for support of scientific purposes	3,308	31
Dykes, Charles, for support in financial research	71,627	4,113
Eickemeyer, Florence Brevoort, for preservation and exhibition of the photographic collection of Rudolph Eickemeyer, Jr	18,083	1,038
Guggenheim, David and Florence, Foundation for a commemorative Guggenheim Exhibit, an annual Daniel Guggenheim Lecture, and annual Guggenheim Fellowships for graduate students for research at the National Air Museum	50,539	1,121
Hanson, Martin Gustav and Caroline Runice, for some scientific work of the Institution, preferably in chemistry or medicine	14,790	850
Higbee, Harry, income for general use of the Smithsonian Institution after June 11, 1967	977	20
Hillyer, Virgil, for increase and care of Virgil Hillyer collection of lighting objects	10,934	628
Hitchcock, Albert S., for care of the Hitchcock Agrostological Library	2,626	153

Consolidated Fund—Continued

Fund	*Investment 1966*	*Income 1966*
Hrdlička, Ales and Marie, to further researches in physical anthropology and publication in connection therewith	$100,812	$4,812
Hughes, Bruce, to found Hughes alcove	31,845	1,831
Johnson, E. R. Fenimore, research in underwater photography	13,927	629
Loeb, Morris, for furtherance of knowledge in the exact sciences	145,031	8,475
Long, Annette and Edith C., for upkeep and preservation of Long collection of embroideries, laces, and textiles	904	54
Maxwell, Mary E., for care and exhibition of Maxwell collection	32,632	1,876
Myer, Catherine Walden, for purchase of first-class works of art for use and benefit of the National Collection of Fine Arts	33,605	1,930
Nelson, Edward W., for support of biological studies	39,559	2,125
Noyes, Frank B., for use in connection with the collection of dolls placed in the U.S. National Museum through the interest of and Mr. Mrs. Noyes	1,600	97
Pell, Cornelia Livingston, for maintenance of Alfred Duane Pell collection	12,333	713
Petrocelli, Joseph, for the care of the Petrocelli collection of photographic prints and for the enlargement and development of the section of photography of the U.S. National Museum	12,334	711
Rathbun, Richard, for use of division of U.S. National Museum containing Crustacea	17,696	1,022
*Reid, Addison T., for founding chair in biology, in memory of Asher Tunis	29,592	1,699
Roebling Collection, for care, improvement, and increase of Roebling collection of minerals	200,785	11,532
Roebling Solar Research	41,668	2,197
Rollins, Miriam and William, for investigations in physics and chemistry	259,965	13,811
Smithsonian employees' retirement	5,525	208
Smithsonian Institution and THF	7,623	309
Sprague Fund for the advancement of the physical sciences	1,780,760	16,195
Springer, Frank, for care and increase of the Springer collection and library	29,834	1,713
Stevenson, John A., Mycological Library Fund, for care, maintenance, and additions to the library	10,002	7
Strong, Julia D., for benefit of the National Collection of Fine Arts	16,635	960
Walcott, Charles D. and Mary Vaux, for development of geological and paleontological studies and publishing results of same	932,217	52,589

CONSOLIDATFE FUND—Continued

Fund	*Investment 1966*	*Income 1966*
Walcott, Mary Vaux, for publication in botany	$96, 251	$5, 335
Zerbee, Francis Brincklé, for endowment of aquaria	1, 578	91
Total	$4, 649, 339	$174, 548

*In addition to funds deposited in the United States Treasury.

FREER GALLERY OF ART FUND

Early in 1906, by deed of gift, Charles L. Freer, of Detroit, gave to the Institution his collection of Chinese and other Oriental objects of art, as well as paintings, etchings, and other works of art by Whistler, Thayer, Dewing, and other artists. Later he also gave funds for construction of a building to house the collection, and finally in his will, probated November 6, 1919, he provided stocks and securities to the estimated value of $1,958,591 as an endowment fund for the operation of the Gallery. The fund now amounts to $11,605,036.

SUMMARY OF ENDOWMENTS

Invested endowment for general purposes	$5, 879, 442
Invested endowment for specific purposes other than Freer endowment	5, 100, 950
Total invested endowment other than Freer	10, 980, 392
Freer invested endowment for specific purposes	11, 605, 036
Total invested endowment for all purposes	$22, 585, 428

CLASSIFICATION OF INVESTMENTS

Deposited in the U.S. Treasury at 6 percent per annum, as authorized in the U.S. Revised Statutes, sec. 5591		$1, 000, 000
Investments other than Freer endowment (cost or market value at date acquired):		
Bonds	$3, 570, 000	
Stocks	4, 517, 280	
Real estate and mortgages	1, 614, 588	
Uninvested capital	278, 524	9, 980, 392
Total investments other than Freer endowment		10, 980, 392

Investments of Freer endowment (cost or market value at date acquired):		
Bonds	$6,720,045	
Stocks	4,884,784	
Uninvested capital	207	$11,605,036
Total investments		$22,585,428

Gifts, Grants, and Bequests

The Smithsonian institution gratefully acknowledges gifts, grants, and bequests from the following:

American Heritage Publishing Co., Inc.: Grant to create and publish a series of books under the overall title of the Smithsonian Library.

American Petroleum Institute: Grant for research entitled *The Crustose Corallines of the North Atlantic.*

Anonymous donor: Gift for the American Association of Physical Anthropologists Conference at Berkeley, California.

Anonymous donor: Gift for the department of botany.

Archbold Foundation: Grant for the support of research entitled *Biological Survey of Dominica Project.*

Atomic Energy Commission: Additional grant for research entitled *A Study of the Biochemical Effects of Ionizing and Nonionizing Radiation of Plant Metabolism During Development.*

Charles and Rosanna Batchelor Memorial Inc.: Gift for the purpose of improving the Emma E. Batchelor stamp collection.

Buffalo Bill Memorial Association: Gift to help support the Smithsonian Institution-National Park Service-Whitney Gallery excavations at Mummy Cave, Wyoming.

Hardy Jefferson Bowen: Grant entitled *Bowen Andros Expedition.*

Bredin Foundation: Grant for the support of research entitled *Biological Survey of Dominica Project.*

Mr. and Mrs. Joseph Campbell: Gift to the Zoo Animal Fund.

Coca-Cola Company: Gift to the division of medical sciences.

Conservation Foundation: Grant to support Conference on Avifauna of Northern Latin America.

Joanne T. Cummings: Gift for the purpose of acquiring ceramics and glass.

Charles Darwin Foundation: Gift for the support of research and conservation in the Galápagos Islands.

Department of the Air Force: Grant for research entitled *Chemical Analysis of Chrondrite Meteorites.*

Additional grant for studies directed toward the development of a technique for measuring wind speed and direction at heights using ionized paths generated by meteors.

Additional grants for the support of research entitled *Researches—Molecular Collisions.*

Additional grant for research directed toward the study of stellar scintillation.

Additional grant for the study of *Atmospheric Entry and Impact of High Velocity Meteorites.*

Additional grant for research directed toward the studies of rate of accretion of interplanetary matter by the earth.

Additional grant for research directed toward providing a program for determination of satellite density data.

DEPARTMENT OF ARMY: Grants for the support of research entitled *Potential Vectors and Reservoirs of Disease in Greece and Central and South Africa; Gold Flash;* and *Ecology and Distribution of Mammalian Ectoparasites, Arboviruses, and Their Hosts in Venezuela.*

Additional grants for the support of research entitled *Studies of the Mosquitoes of Southeast Asia* and *Potential Vectors and Reservoirs of Disease in Strategic Overseas Area;* also for support of research on the analysis of bird migration in the Pacific area and the study of the ecology of birds and mammals on one or more Pacific Islands.

DEPARTMENT OF COMMERCE: Grant to identify and develop economic opportunities and employment potential in craft industries.

DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE: Grant for planning experimental museum exhibits for the blind. Grant for study of parasites of Philippine fishes.

DEPARTMENT OF THE INTERIOR: Grants for support of research entitled *Indexing Vocabulary for Publication by the Office of Water Resources Research* and *Sorting of Plankton Samples from Geronimo;* and to provide services to sub-sample plankton samples from the International Indian Ocean Expedition.

Additional grants for the support of research entitled *Tropical Fishes* and *Continuation of a Review of the General and American Species of the Shrimp Family Penaeidae;* also for the purpose in the preparation of camera-ready copy of research data suitable for photocopying and printing as a current Water Resources Research Catalog.

DEPARTMENT OF STATE: Grant for Mr. Joseph F. K. Acquaye, assistant curator of the Ghana National Science Museum.

FORD FOUNDATION: Grant to purchase land on the Chesapeake Bay known as Ivy Neck.

FORD MOTOR COMPANY: Gift in support of the model foundry for the iron and steel hall.

GENERAL PRECISION, INC.: Gift to the Link Prolonged and Deep Submergence Study Program Fund.

JULIUS W. GILBERT: Gift to the Joanne Toor Cummings Fund.

C. M. GOETHE: Gift to the Barro Colorado Island Fund.

MAYER AND RUTH GREENBERG FOUNDATION: Gift to the division of ceramics and glass.

DANIEL AND FLORENCE GUGGENHEIM FOUNDATION: Addition to the grant for the establishment of a Commemorative Guggenheim Exhibit, an Annual Guggenheim Lecture, and Annual Guggenheim Fellowships for graduate students, for research at the National Air Museum.

HARVARD UNIVERSITY: Grants for the engineering services to Harvard University and for the support to Harvard University for the transportation of an 84-foot radiotelescope.

HUMBLE COMPANIES CHARITABLE TRUST: Gift for reconstructing the fluid catalytic cracking unit model for the hall of petroleum.

INTERNATIONAL BUSINESS MACHINES CORP.: Gift to cover expenses on Smithsonian Film.

FELIX AND HELEN JUDA FOUNDATION: Gift to the Freer Gallery of Art for the purchase of collections.

OTTO KALLIR: Gift for the purchase of the lithograph *Seeds for Sowing May Not be Milled.*

KAUDUS CHARITABLE TRUST: Gift to further the work of the National Portrait Gallery.

KEVORKIAN FOUNDATION: Gifts to the Freer Gallery of Art Library; to the Freer Gallery of Art for the publication of Ganhara frieze in the form of a picture book; and to the Freer Gallery of Art Library for purchasing books dealing with Near Eastern art.

ELSIE AND WILLIAM KNIGHT FOUNDATION: Grant to the Stazione Zoologica.

DOROTHY V. LEE: Gift for the support of research and conservation in the Galapagos Islands.

LINK FOUNDATION: Gift for the 1966 Edwin A. Link Lecture.

MARILYN C. LINK: Grant to support the publication of a biographical booklet on James Smithson.

EUGENE AND AGNES E. MEYER FOUNDATION: Gift toward the costs of the program to provide for greater use of Smithsonian museum exhibits in the District schools.

NATIONAL ACADEMY OF SCIENCES: Gift to defray travel expenses to Monks Wood, England.

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION: Grants for the support of research projects entitled: *Symposium on Meteoritic Orbits and Dusts; Exobiology and Origin of Life; Photoelectric Techniques for Measurement of Earthshine; Data Analyses in Connection with the National Geodetic Satellite Program; A Survey of the Influx Rates of the Major Meteor Streams;* and *High-Energy Gamma-Ray Astronomy Experiment for High-Altitude Balloons.*

Additional grants for the support of research entitled *Optical and Radar Investigation of Simulated and Natural Meteors; Textures of Meteorites;* and *Optical Satellite Tracking Program;* also for research of the systematic recovery of meteorites and the photography of meteorites in flight; for an investigation and collection of meteorites, tektites, and related materials; and for the scientific and engineering study for instrumenting and orbiting telescope.

NATIONAL FOUNDATION ON THE ARTS AND HUMANITIES: Grant for organizing and to present a major display representative of contemporary American painting.

NATIONAL GEOGRAPHIC SOCIETY: Grants for support of research entitled *Bermuda Underwater Archeological Expedition;* also for the study of Mollusks on Polynesia and Melanesia and for the Seabird Colonies project. Gift to Freer Gallery of Art for publications.

NATIONAL SCIENCE FOUNDATION: Additional grants for the support of research projects entitled: *Early Tertiary Mammals of North America; Mammals of the Southeastern United States; Botanical Exploration on Southern Brazil; Revisionary Study of Blattoidea; Morphology and Paleoecology of Permian Brachiopods of the Glass Mountain, Texas; South Asian Microlepidoptera, particularly the Philippine Series; Taxonomy of Bamboos; Lower Cretaceous Ostracoda of Israel; Marine Mollusks of Polynesia; Tertiary Echiniods of the Eastern United States and the Caribbean; Zoogeography of Southern Ocean Sclearactinian Coral Faunas; The American Commensal Crabs of the Family Pinnotheridae; Indo-Australian Vespidae sens. lat. and Specidae; Revision of Genera of Paleozoic Bryozoa; Monographic Studies of the Tingidae of the World; Study of Type Specimens of Ferns in European Herbaria; Polychaetous Annelids of New England; The Phanerogams of Colombia; Revision of Scarab Beetles of the Genus* Ataenius; *Geographic Variation in the Interspecific Relations among certain Andean Passeriformes; Systemic Studies of the Archidaceae, Subtribe Epidendrinae; A Monograph of the Stomatopod Crustaceans of the Western Atlantic; Recording of Data for Specimens Collected during the U.S. Antarctic Program; Distribution*

of North America Calanoid and Harpacticoid Copepoda; Collection of Meteorites and Tektites in Australia; Installation of Power Line to Barro Colorado from Mainland; Upper Cretaceous Inoceraminae in North America and Western Europe; Environment of Permo-Triassic Reptiles of the Order Therapsida in South Africa; Taxonomic and Biological Studies of Neotropical Water Beetles; Evolution and Distribution of Parmelia *in Eastern Asia and Pacific; Taconomic Studies of the Family Stenomidae in Neotropical Region; Pre-Industrial System of Water Management in Arid Region; Revisionary Stiudies in the Chilopoda; Photographic Investigation of Comets; Purchase of the Hood Collection of Thrips, Archaeological Survey of Southwestern Kansas; Science Information Exchange; Taxonomic and Biological Studies on Central American Caddisflies; Identification Guide to Antarctic Birds; Ostracoda of the Indian Ocean; Sorting of Collection from the U.S. Antarctic Research Program; Sorting of Collections from the International Indian Ocean Expedition; Systematic; of the Antarctic and Sub-Antarctic Gemmaridean Amphipods; Eltanin Cruise Participations; Stellar Atmospheres; Comparative Study of Molluscan Faunas of Tertiary Stages; The Mammals of Panama; Systematics of Stomiatoid Fishes; Cooperative Systematics Studies in Antarctic Biology; Undergraduate Research Participation Program; Purchase of the Carl Bosch Research Collection of Minerals and Meteorites;* and *Bibliography of Termites.*

OFFICE OF NAVAL RESEARCH: Additional grants for the support of research entitled: *Information of Shark Distribution and Distribution of Shark Attack All Over the World; Conduct Research on the Medusae and Related Organisms From the Indian Ocean Collection; Studies of the Ecology, Distribution and Classification of South American Birds; Distribution of Formaminifera in the Eastern Tropical Atlantic;* and *The Formation of Spectrum Lines.* Also, to provide expert consultants to advise the Navy Advisory Committee, and to perform psychological research studies.

MARJORIE MERRIWEATHER POST: Gift to defray travel expenses of Marvin Ross.

ROSSER REEVES, TED BATES AND COMPANY: Gift for the purchase of insurance for the Rosser Reeves Ruby.

DOROTHY B. ROTHSCHILD: Gift to the Joanne Toor Cummings Fund.

SHIRLEY LATTER SCHLESINGER: Contribution to the National Collection of Fine Arts to be entitled "Cassatt Research Fund."

ANSEL SCHOENEMAN: Gift for the purchase of an 18th-century, earthenware, English figure of the Duke of Cumberland.

ST. PETERSBURG SHELL COMPANY: Grant for the St. Petersburg Shell Company Fund.

SOCIETY FOR A MORE BEAUTIFUL NATIONAL CAPITAL INC.: Gift for landscaping the entrance to the National Zoo.

SPRAQUE FUND: Bequest of the late Joseph White Spraque to establish a fund for the advancement of the physical sciences.

E. R. SQUIBB AND SONS: Gift to the division of medical sciences.

JOHN A. STEVENSON: Gift of the John A. Stevenson Mycological Library and a gift for care and maintenance and making additions thereto.

SYDNEY PRINTING AND PUBLISHING COMPANY: Grant for the purchase of U.S. coins.

UNITED STATES INFORMATION AGENCY: Grant to undertake complete responsibility of the Agency's Fine Arts exhibits activity.

UNITED STATES STEEL CORP.: Grant to defray the cost of a model of an integrated steel plant.

UNIVERSITY OF MICHIGAN: Gift to Freer Gallery of Art for the *Ars Orientalis* Fund.

G. UNGER VETLESEN FOUNDATION: Grant to assist in studying flora and other terrestial and marine fauna in Australia.

LILA ACHESON WALLACE: Contribution for expenses in connection with Symposiums for Department of Civil History.

WASHINGTON BIOLOGISTS' FIELD CLUB: Grant for the purpose of defraying the costs of the publication of the work *Trapnesting Wasps and Bees.*

WASHINGTON FASHION GROUP: Gift to the Historic Dresses Fund.

ELLEN BAYARD WEEDON FOUNDATION: Gift to the Freer Gallery of Art for the Library Fund.

WENONAH DEVELOPMENT COMPANY: Contribution to the Kathryn and Gilbert Miller Fund.

WOODS HOLE OCEANOGRAPHIC INSTITUTION: Grant for participation of five Smithsonian staff members in cruises of the *Anton Bruun* in the Eastern Pacific Ocean.

CHARLES M. WORMSER: Gift to the Moritz Wormser Memorial Collection.

The Smithsonian Institution gratefully acknowledges gifts, for the special purposes indicated, from the following:

For the Carl Bosch Collection Fund:

Gem Lapidary and Mineral Society of Montgomery County.
Mineralogical Society of the District of Columbia.
Yale University
Franklin Ogdensburg Mineralogical Society
Xerox Fund
Standard Oil Company of New Jersey
American Metal Climax Foundation Incorporated
Foundation of Litton Industries
Consolidation Coal Company
Lockheed Aircraft Corporation

For the Division of Mammals Curators Fund:

David H. Johnson
Remington Kellogg
Gerrit S. Miller, Jr.

For the purpose of the S. D. Heron Memorial Fund:

Anonymous donor
A. E. Felt
Harold S. Morehouse
J. H. Stern

For the purpose of the Smithsonian Bicentennial Ceremony:

Burlington Industries Foundation
W. R. Burgess
Austin B. Chinn
Ben Gray
Wilmarth S. Lewis
Martha I. Love
Charles Nagel
Marjorie Merriweather Post

For the purpose of the Smithson Bicentennial Celebration:

Anonymous
Bethlehem Steel Corp.
Bibb Manufacturing Co.
Burrough Corp.
Carrier Corp.
Certain-teed Products Corp.
Connecticut Printer
John Deere Foundation
R. R. Donnelly and Sons Co.
Douglas Aircraft
Dumbarton Oaks
Eastern Airlines, Inc.
Eastman Kodak Co.
The Equitable Life Assurance Society
Evening Star
Electro-Optical Systems
Ex-Cell-O-Corporation
Fisher Scientific Co.
General Aniline and Film Corp.
General Dynamics Corp.
General Precision Equipment Corp.
Goodwill Ambassador

Grumman Aircraft Engineering Corp.
I. B. M. Corp.
William W. Johnson
C. O. Kienbusch
Kresge Foundation
Link Foundation
Lockheed Aircraft Corp.
David McKay
Martin Co.
The Magnavox Co.
The Maytag Co.
Majorie Merriweather Post
The Merck Company Foundation
Philadelphia Inquirer
Reader's Digest
Revell, Inc.
Scholastic Magazine, Inc.
Southern Railway System
Alfred P. Sloan
Time, Inc.
United Aircraft Corp.
United States Steel Foundation, Inc.
Washington Post
Westinghouse Electric Corp.

For the purpose of the Venice Biennale Fund:

Mrs. Dean Acheson
Mrs. Philip Barry
Mr. Harvey Baskin
Mrs. and Mrs. John Begg
Mr. and Mrs. Melvin Belman
Dr. and Mrs. Edgar F. Berman
Mr. Leo M. Bernstein
Mr. and Mrs. Norman Bernstein
Mr. William McCormick Blair
Mr. Jacob Blaustein
Mr. and Mrs. Huntington Block
Mr. and Mrs. Richard Borwick
Mrs. Edith Bralove
Mr. and Mrs. Abner Brenner
Dr. Iving Brotman
Mr. J. Carter Brown
Mr. John Bucknell
Mrs. Douglas Burden
Mr. and Mrs. S. Carter Burden
Mr. William A. M. Burene
Mrs. Morris Cafritz
Mrs. Calvert Carey
Mr. Aldus Chapin
Mr. and Mrs. Gilbert Chapman
Mr. and Mrs. Marcus Cohn
The Honorable and Mrs. John T. Connor
Miss Edith Newman Cook
Mr. Gardner Cowles
Crown-Zellerbach Foundation
Mrs. Gertrude d'Amecourt
The Honorable and Mrs. C. Douglas Dillon
Miss Barbara Donald
Mr. and Mrs. Robert B. Eichholz
Mr. Milton Elsberg
Dr. and Mrs. Richard Ettinghausen
Mr. and Mrs. David E. Finley
Mr. and Mrs. Lawrence A. Fleischman
The Honorable and Mrs. Clifford Folger
Forage Foundation, Inc.
Mrs. Elizabeth J. Foy
Mr. and Mrs. Carl M. Freeman
The Honorable and Mrs. Peter H. B. Frelinghuysen
Mr. and Mrs. B. H. Friedman
Mrs. J. William Fullbright
Mr. Richard E. Fuller
Mr. Wreathan E. Gathright
Mr. and Mrs. Joseph Geldzahler
Mr. Ira Gershwin
Mr. Roland Gibson
Mr. and Mrs. Mackensie Gordon
Mrs. Philip L. Graham
Miss Jacqueline Greber
Mr. and Mrs. Gilbert Hahn, Jr.
Mrs. W. Averill Harriman
Mr. E. David Harrison
Mr. and Mrs. John Hechinger
Mr. Henry H. Hecht, Jr.
Mr. Ernest Hillman, Jr.
Mr. Barnet Hodes
Mrs. Arthur U. Hooper
Mr. and Mrs. David Jay Hyman
Dr. and Mrs. John M. Ide
I. F. A. Galleries, Inc.
Industrial Union Department
AFL–CIO
Dr. H. W. Janson
Mr. and Mrs. Maxey Jarman
The Honorable Jacob K. Javits
Mrs. J. Lee Johnson, III
Captain and Mrs. Francois C. B. Jordan
Mr. Garfield I. Kass
Mrs. Estes Kefauver

Mrs. Fenwick Keyser
Mrs. Robert Kintner
Mrs. GraemeKorff
Mr. and Mrs. David Lloyd Kreeger
Mr. Sigmund Junstadter
Mr. Irving Levick
Dr. and Mrs. Alec C. Levin
Mr. and Mrs. Jerome P. Lewis
Mr. and Mrs. Sidney Lewis
Mr. John L. Loeb, Jr.
Mr. and Mrs. Walter C. Louchheim, Jr.
Mr. Georg S. T. Maisel, III
Mr. Stanley Marcus
Mr. Henry A. Markus
Mr. Morton May
Mr. Robert B. Mayer
Mr. Stephen Mazoh
Mr. and Mrs. William S. McCornick
Mr. Henry P. McIlhenny
The Honorable and Mrs. Robert S. McNamara
Mr. and Mrs. Paul Mellon
Mr. and Mrs. Cord Meyer, Jr.
Mr. and Mrs. Robert E. Meyerhoff
Mrs. Paul Moore
The Honorable and Mrs. William S. Moorhead
Mr. and Mrs. Edward P. Morgan
Philip Morris International
Mr. Charles Nagel
Mrs. David Halle
Mr. and Mrs. Roy R. Neuberger
Mr. Gerson Nordlinger, Jr.
Miss Anna Belle O'Brien
Mr. and Mrs. Joseph Ottenstein
Mr. and Mrs. Maxwell Oxman
Mrs. Tompkins Parker
Mr. Robert E. Phinney, Jr.
Mr. Abe Pollin
Mrs. S. Prentice Porter
Mrs. Merriweather Post
Mr. Gustave Ring
Mr. Laurance S. Rockefeller
Samuel and David Rose Fund, Inc.
Mr. and Mrs. Arthur Ross
Mr. William M. Roth
Mrs. Seymour J. Rubin
Mrs. Henry P. Russell
Mrs. Serge Sacknoff
Mr. and Mrs. Walter Salant
Dr. and Mrs. Stanley J. Sarnoff
Rita and Taft Schreiber Foundation
Mrs. John Farr Simmons
Skidmore, Owings and Merrill
Mr. and Mrs. Albert H. Small
Mr. and Mrs. Charles E. Smith
Mr. L. M. C. Smith
Mr. and Mrs. Stephen E. Smith
Miss Laura Steinbach
Mr. and Mrs. Philip Stern
Mrs. Donald B. Straus
Mrs. Madeleine S. Sundlun
Mr. and Mrs. Carleton Byron Swift
Mrs. Fredrika M. Tandler
Walter Dorwin Teague Associates
Mr. and Mrs. Edward Russell True, Jr.
Mr. and Mrs. Bayard Underwood
Mr. and Mrs. T. Graydon Upton
Mr. and Mrs. Julius Wadsworth
Mrs. C. Law Watkins
Mr. Thomas J. Watson, Jr.
Mrs. Vanderbilt Webb
Dr. and Mrs. Paul S. Weisberg
Mr. and Mrs. Eric Wentworth
Dr. and Mrs. Sidney Werkman
Mr. and Mrs. Kurt Wiener
Mrs. J. Burke Wilkenson
Mrs. Earle Kress Williams
Mr. and Mrs. Anthony Wilson
Mr. Howard Wise
Mrs. Frank G. Wisner
The Honorable and Mrs. Stanley Woodward
Xerox Corporation
Mr. and Mrs. Jacob Zettlin
Mr. and Mrs. Sidney S. Zlotnick

Funds and Federal Appropriations

The following appropriations were made by Congress for the Government bureaus under the administrative charge of the Smithsonian Institution for the fiscal year 1966:

Salaries and Expenses	$18,921,000
National Zoological Park	$1,832,000
The appropriation made to the National Gallery of Art (which is a bureau of the Smithsonian Institution under a separate Board of Trustees) was	$2,531,000

The Institution also received appropriations to continue the 12-year capital improvement program at the National Zoological Park ($1,539,000); and for the restoration and renovation of buildings ($2,248,000).

For fiscal year 1966, the Smithsonian was granted an appropriation of $1,300,000 in foreign currencies for museum programs and related research.

In addition, funds were transferred from other Government agencies for expenditure under the direction of the Smithsonian Institution as follows:

Working funds, transferred from the National Park Service, Department of the Interior, for archeological investigations in river basins throughout the United States	$221,000

The Institution also administers a trust fund for partial support of the Canal Zone Biological Area, located on Barro Colorado Island in the Canal Zone.

Audit

The report of the audit of the Smithsonian Private Funds is attached.

Respectfully submitted:

Robert V. Fleming
Caryl P. Haskins
Clinton P. Anderson
Executive Committee.

Washington, D.C., *October 7, 1966*

PEAT, MARWICK, MITCHELL & CO.
ACCOUNTANTS AND AUDITORS
1730 M STREET, NW.
WASHINGTON, D.C. 20036

THE BOARD OF REGENTS,
SMITHSONIAN INSTITUTION,

We have examined the balance sheet of private funds of Smithsonian Institution as of June 30, 1966, and the related statements of changes in funds for the year then ended. Our examination was made in accordance with generally accepted auditing standards, and accordingly included such tests of the accounting records and such other auditing procedures as we considered necessary in the circumstances.

Except for certain real estate acquired by gift or purchased from proceeds of gifts which are valued at cost or appraised value at date of gift, land, buildings, furniture, equipment, works of art, living and other specimens and certain other similar property are not included in the accounts of the Institution; the amounts of investments in such properties are not readily determinable. Current expenditures for such properties are included among expenses. The accompanying statements do not include the National Gallery of Art, the John F. Kennedy Center for the Performing Arts nor other departments, bureaus and operations administered by the Institution under Federal Appropriations. The accounts of the Institution are maintained on the basis of cash receipts and disbursements, with the result that the accompanying statements do not reflect income earned but not collected or expenses incurred but not paid.

In our opinion, subject to the matters referred to in the preceding paragraph, the accompanying balance sheet of private funds and the related statements of changes in funds present fairly the assets and funds principal of Smithsonian Institution at June 30, 1966 and changes in fund balances resulting from cash transactions of the private funds for the year then ended, on a basis consistent with that of the preceding year.

PEAT, MARWICK, MITCHELL & CO.

October 7, 1966

In the Auditor's report, the following statement precedes schedules 1 and 2:

Accountants' Report on Supplementary Data

We have reported separately herein on the basic financial statements of private funds of Smithsonian Institution. The current year's supplementary data included in Schedules 1–2 were subjected to the same auditing procedures and, in our opinion, are stated fairly in all material respects when considered in conjunction with the basic financial statements taken as a whole.

SMITHSONIAN

BALANCE SHEET OF PRIVATE

Assets

Current funds:		
General:		
Cash:		
United States Treasury current account		$334, 369
In banks and on hand		336, 881
		671, 250
Investments—stocks and bonds (quoted market value $2,709,-440.00) (note 1)		2, 863, 780
Contract reimbursements due		556, 951
Travel and other advances		70, 777
Total general funds		4, 162, 758
Restricted:		
Cash:		
United States Treasury current account	$670, 413	
In banks	147, 007	
Due from general fund	999, 279	
Due from Freer endowment fund	2, 076	
Total restricted funds		1, 818, 775

EXHIBIT A

INSTITUTION

FUNDS, JUNE 30, 1966

	Fund Balances		
Current funds:			
General:			
Due to restricted funds			$999, 279
Unexpended funds—unrestricted (Exhibit B)			3, 163, 479
Total general funds			4, 162, 758
Restricted (Exhibit C):			
Unexpended income from endowment:			
Freer	$380, 032		
Restricted	642, 813	$1, 022, 845	
Funds for special purposes:			
Gifts	505, 550		
Grants	98, 972		
Contracts	191, 408	795, 930	
Total restricted funds			1, 818, 775

Assets—Continued

Total current funds			$5, 981, 533
Endowment funds and funds functioning as endowment:			
Freer Gallery of Art Fund:			
Cash		$207	
Stocks and bonds (quoted market value $17,009,713.00) (note 1)		11, 604, 829	
Total Freer Gallery of Art fund		11, 605, 036	
Other funds:			
Cash	$278, 524		
Stocks and bonds (quoted market value $9.139,617.00) (note 1)	8, 083, 958		
	8, 362, 482		
Loan to United States Treasury	1, 000, 000		
Other stocks and bonds (quoted market value $12,404.00) (note 1)	3, 322		
Real estate (note 2)	1, 614, 588		
Total other funds		10, 980, 392	
Total endowment funds and funds functioning as endowment			22, 585, 428
			$28, 566, 961

See accompanying notes to financial statements.

Fund Balances—Continued

Total current funds			$5, 981, 533
Endowment funds and funds functioning as endowment (Exhibit D):			
Freer Gallery of Art fund:			
Due to Freer restricted fund		$2, 076	
Principal of fund (Exhibit D)		11, 602, 960	
Total Freer Gallery of Art fund		11, 605, 036	
Other funds:			
Mortgages payable (note 2)	$222, 283		
Principal of funds (Exhibit D):			
Restricted	$4, 878, 667		
General	5, 879, 442	10, 758, 109	
Total other funds		10, 980, 392	
Total endowment funds and funds functioning as endowment			22, 585, 428
			$28, 566, 961

EXHIBIT B

SMITHSONIAN INSTITUTION: PRIVATE FUNDS

STATEMENT OF CHANGES IN CURRENT GENERAL FUND BALANCE

YEAR ENDED JUNE 30, 1966

	Balance at beginning of year	*Receipts (Schedule 1)*		*Disbursements (Schedule 2)*	*Balance at end of year*
		Transfers	*Other*		
Operations	$3,254,983	$3,274,120	$998,612	$4,364,236	$3,163,479
Gifts	.....	547,194	.....	547,194	.....
Grants	.....	5,417,677	.....	5,417,677	.....
Contracts	.....	4,708,264	.....	4,708,264	.....
	$3,254,983	$13,947,255	$998,612	$15,037,371	$3,163,479

See accompanying notes to financial statements.

EXHIBIT C

SMITHSONIAN INSTITUTION: PRIVATE FUNDS

STATEMENT OF CHANGES IN CURRENT RESTRICTED FUND BALANCE

YEAR ENDED JUNE 30, 1966

	Unexpended income	*Funds for special purposes*			
		Gifts	*Grants*	*Contracts*	*Total*
Balance at beginning of year	$1,351,544	$615,909	$613,902	($261,676)	$2,319,679
Add:					
Collection of prior years' advances	.....	.....	.....	265,498	265,498
Income from endowment:					
Freer Gallery of Art	621,202	.....	.....	.....	621,202
Other restricted funds	185,839	.....	.....	.....	185,839
Unrestricted funds	184,599	.....	.....	.....	184,599
Sale of publications	38,273	784	.....	.....	39,057
Gifts and grants	11,638	697,193	6,935,186	4,070,873	11,714,890
Traveling exhibition	.....	222,524	.....	.....	222,524
Advances from general fund at year end	.....	.....	.....	556,951	556,951
Other	264	27,747	.....	.....	28,011
	1,041,815	948,248	6,935,186	4,893,322	13,818,571
	2,393,359	1,564,157	7,549,088	4,631,646	16,138,250

EXHIBIT C—Continued

	Unexpended income	*Funds for special purposes*			*Total*
		Gifts	*Grants*	*Contracts*	
Deduct:					
Transfers to current income:					
Freer Gallery of Art	$867, 708	.....	.....	.....	$867, 708
Other restricted funds	231, 219	.....	.....	.....	231, 219
Unrestricted funds	184, 599	.....	.....	.....	184, 599
Direct costs	.....	$547, 194	$5, 417, 677	$4, 708, 264	10, 673, 135
Overhead	.....	.....	1, 251, 350	509, 154	1, 760, 504
Unexpended income	$56, 569	.....	.....	.....	56, 569
Gifts	.....	169, 944	.....	.....	169, 944
Grants	.....	.....	447	.....	447
Contracts	.....	.....	.....	3, 130	3, 130
	1, 340, 095	717, 138	6, 669, 474	5, 220, 548	13, 947, 255
Transfers, other:					
Income added to principal	20, 890	.....	.....	.....	20, 890
To unrestricted funds for investment	.....	335, 899	.....	.....	335, 899
To restricted funds for investment	.....	15, 000	.....	.....	15,000
To gifts	9, 529	(9, 529)	.....	.....	.....
To contracts	.....	.....	780, 310	(780, 310)	.....
To grants	.....	99	(99)	.....	.....
	30, 419	341, 469	780, 211	(780, 310)	371, 789

Total transfers	1, 370, 514	1, 058, 607	7, 449, 685	4, 440, 238	14, 319, 044
Refund of prior years' unexpended	.....	.....	431	.....	431
Total deductions	1, 370, 514	1, 058, 607	7, 450, 116	4, 440, 238	14, 319, 475
Balance at end of year	$1, 022, 845	$505, 550	$98, 972	$191, 408	$1, 818, 775

EXHIBIT D

SMITHSONIAN INSTITUTION

PRIVATE FUNDS

STATEMENT OF CHANGES IN PRINCIPAL OF ENDOWMENT FUNDS AND FUNDS FUNCTIONING AS ENDOWMENT YEAR ENDED JUNE 30, 1966

Balance at beginning of year	$19,659,589
Add:	
Gifts and bequests	2,009,451
Income added to principal as prescribed by donor	20,890
Transfer from gifts for investment	350,899
Net gain on investments	320,240
Balance at end of year	22,361,069
Balance at end of year consisting of:	
Freer Gallery of Art	11,602,960
Other:	
Restricted	4,878,667
General	5,879,442
	$22,361,069

SMITHSONIAN INSTITUTION

NOTES TO FINANCIAL STATEMENTS JUNE 30, 1966

(1) Investments are stated at cost or appraised value at date of gift.

(2) During the fiscal year ended June 30, 1966, the Institution acquired by gift, bequest or purchase, property subject to existing mortgages. At June 30, 1966 there were three parcels of property pledged as security for mortgages with unpaid balances totaling $222,283.

SMITHSONIAN INSTITUTION
SCHEDULE OF CURRENT FUND RECEIPTS
YEAR ENDED JUNE 30, 1966

	Operations	*Gifts*	*Grants*	*Contracts*	*Total*
Transferred from other funds:					
Endowment income:					
Freer Gallery of Art	$867, 708	.....	.....	.....	$867, 708
Other restricted funds	231, 219				231, 219
Unrestricted	184, 599				184, 599
Gifts, grants and contracts—direct cost		$547, 194	$5, 417, 677	$4, 708, 264	10, 673, 135
Overhead:					
Grants	1, 251, 350	.....	.....	.....	1, 251, 350
Contracts	509, 154	.....	.....	.....	509, 154
Unexpended income	56, 569	.....	.....	.....	56, 569
Miscellaneous:					
Gifts	169, 944				169, 944
Grants	447	.....	.....	.....	447
Contracts	3, 130	.....	.....	.....	3, 130
Total transfers	3, 274, 120	547, 194	5, 417, 677	4, 708, 264	13, 947, 255
Other receipts:					
Investment income	186, 879	.....	.....	.....	186, 879
Publications and photographs	609, 152	.....	.....	.....	609, 152
Gifts	64, 591	.....	.....	.....	64, 591
Smithsonian Institution Society of Associates	50, 642	.....	.....	.....	50, 642
Miscellaneous	87, 348	.....	.....	.....	87, 348
Total other receipts	998, 612	.....	.....	.....	998, 612
Total receipts	$4, 272, 732	$547, 194	$5, 417, 677	$4, 708, 264	$14, 945, 867

SMITHSONIAN INSTITUTION

SCHEDULE 2

SCHEDULE OF CURRENT FUND DISBURSEMENTS
YEAR ENDED JUNE 30, 1966

	Operations	*Gifts*	*Grants*	*Contracts*	*Total*
Salaries:					
Administrative	$1,798,649	.....	.....	.....	$1,798,649
Research	122,346	$124,743	$2,813,232	$1,700,939	4,761,260
Other	2,759	.....	24,223	25,307	52,289
Employee benefits	130,191	7,496	150,561	107,750	395,998
Total salaries	2,053,945	132,239	2,988,016	1,833,996	7,008,196
Purchase for collection	20,378	.....	.....	.....	20,378
Researches and exploration and related administrative expenses:					
Travel and transportation of persons	125,652	66,393	282,395	137,809	612,249
Transportation of things	5,037	43,022	131,960	22,434	202,453
Equipment and supply	639,150	29,485	365,089	65,956	1,099,680
Other supplies and materials	100,500	7,483	480,525	109,056	697,564
Publication and photographs	556,650	.....	.....	.....	556,650
Buildings, equipment and grounds:					
Buildings and installations	22,291	.....	41,909	.....	64,200
Court and grounds maintenance	2,048	.....	.....	.....	2,048
Technical laboratory	60	.....	.....	.....	60
Rents and utilities	20,369	.....	364,653	190,107	575,129

Contractual services:					
Computer	14, 319	.....	206, 476	77, 182	297, 977
Subcontracts	39	16	.....	2, 063, 953	2, 064, 008
Other services	475, 866	230, 112	266, 984	122, 309	1, 095, 271
Supplies and expenses:					
Meetings, special exhibits	357	.....	.....	.....	357
Lectures	4, 352	1, 771	.....	.....	6, 123
Printing and reproductions	168, 123	34, 174	58, 461	7, 731	268, 489
Sales desk	10, 555	.....	.....	.....	10, 555
Postage, telephone and telegraph	144, 545	2, 499	231, 209	77, 731	455, 984
Total current disbursements	$4, 364, 236	$547, 194	$5, 417, 677	$4, 708, 264	$15, 037, 371

2.

Smithsonian Foreign Currency Program Grants Awarded Fiscal Year 1966

Archeology and Related Disciplines

American Institute of Indian Studies, Philadelphia, Pa. To establish American Academy at Benares, India, an institution for research in art history and archeology.

American Research Center in Egypt, Boston, Mass. To support a program of research and excavation in Egypt: a, Excavation of the early Medieval Arab town of Fustat; b, Excavation of a fortified town in Nubia (Gebel Adda); c, Epigraphic and architectural survey at Luxor; d, Excavation of a stratified Pharonic site at Mendes in the Nile Delta; e, Field project for recording and preserving the treasures of St. Catherine's Monastery, Mt. Sinai; f, Study of ancient glass found at Fustat; g, Operation of Center facilities at Cairo; h, Survey of opportunities for restoration of monuments and sites; i, Excavation of ancient city of Hierakonpolis.

Brooklyn Museum. To support three projects: a, Construction of scale models of Egyptian monuments. b, Study of ancient Egyptian goldwork; c, Photographic survey of ancient sites.

Lawrence Radiation Laboratory, University of California, Berkeley. To test utilization of cosmic rays to "x-ray" the Egyptian pyramids in search of presently unknown chambers.

Carnegie Museum, Pittsburgh Theological Seminary. To excavate a Philistine city at Ashdod, Israel.

University of Colorado. To prepare a proposal to study prehistoric archeological and paleontologic remains in Tunisia.

Jerusalem School of Archeology of the Hebrew Union College, Cincinnati, Ohio. To excavate an archeological site at Gezer, Israel, and to conduct a Summer Institute on Near Eastern Civilizations.

Institute for Advanced Study, Princeton, New Jersey. To study and document Bronze and Iron age materials in Yugoslavia.

MUSEUM OF ANTHROPOLOGY, UNIVERSITY OF MICHIGAN. To develop a program for research and training in prehistoric archeology in Israel.

CURATORS OF THE UNIVERSITY OF MISSOURI. To investigate ancient Phoenician glass manufacturing sites in Israel.

INSTITUTE OF INTERNATIONAL STUDIES AND OVERSEAS ADMINISTRATION, UNIVERSITY OF OREGON. To conduct research into the history of ancient civilizations of Guinea.

UNIVERSITY MUSEUM, UNIVERSITY OF PENNSYLVANIA. To excavate the archeological site at Mohenjo-daro in the lower Indus Valley, Pakistan.

UNIVERSITY MUSEUM, UNIVERSITY OF PENNSYLVANIA. To study remaining stones of the Temple of Akhnaten at Luxor, Egypt.

SMITHSONIAN INSTITUTION, OFFICE OF ANTHROPOLOGY. To study ancient urban technology in Pakistan and India.

SOUTHERN METHODIST UNIVERSITY. To study prehistory of the area around Sibaiya, Egypt.

SOUTHERN METHODIST UNIVERSITY. To complete excavations near Tushka, Egypt, of an archeological site to be inundated by water rising behind the Aswan Dam.

AMERICAN MUSEUM OF NATURAL HISTORY, UNIVERSITY OF WASHINGTON, SEATTLE. To study and excavate prehistoric and early historic sites in East and West Pakistan.

PEABODY MUSEUM OF NATURAL HISTORY, YALE UNIVERSITY. To excavate the Oligocene and Miocene deposits of Egypt to enlarge knowledge of the primitive ancestors of man in Egypt.

3.

Publications of the Smithsonian Press
For the Year Ended June 30, 1966

SMITHSONIAN SPECIAL PUBLICATIONS

NATURAL HISTORY

Flora of Japan, by Jisaburo Ohwi. ix+1067 pp., 33 pls., 18 figs. Publ. 4542, September 20, 1965. ($25.)

Gems in the Smithsonian Institution, by Paul E. Desautels. 74 pp., 46 pls., 18 figs. Publ. 4608, December 14, 1965. ($1.25.)

The United States and the world ocean, by Lt. Comdr. Don Walsh, USN. 28 pp., 13 pls. Publ. 4650, December 3, 1965. (25 cents.)

The Philippine Bureau of Science Monographic Publications on Fishes: No. 1, Check-list of the species of fishes known from the Philippine Archipelago, by David Starr Jordan and Robert Earl Richardson, 78 pp. 1910. No. 23, Gobies of the Philippines and the China Sea, by Albert W. Herre, 352 pp., 1–30 pls., 6 figs., 1927. No. 24, Pomacentridae of the Philippine Islands by Heraclio R. Montalban, 117 pp., 19 pls., 1927. September 1, 1965. (TFH fund reprint: $5.50.)

SMITHSONIAN ASTROPHYSICAL OBSERVATORY

Smithsonian Astrophysical Observatory star catalog. Four volumes, unpaged. Publ. 4652, March 18, 1966. ($20.)

Lighthouse of the skies—The Smithsonian Observatory: Background and history, 1846–1955, by Bessie Zaban Jones. 399 pp., 32 pls. Publ. 4612, September 16, 1965. ($5.)

NATIONAL COLLECTION OF FINE ARTS

Roots of abstract art in America, 1910–1930; introd. by Adelyn D. Breeskin. 93 pp., illustr. Publ. 4655, 1965. ($3.65.)

Frederic Edwin Church; preface by Richard P. Wunder. 86 pp., illustr. Publ. 4657, 1966. ($3.95.)

American landscape: A changing frontier; introd. by David W. Scott. 42 pp., illustr. Publ. 4671, 1966. ($2.25.)

SMITHSONIAN TRAVELING EXHIBITION SERVICE

Early monuments and architecture of Ireland. 4 pp. Publ. 4642, 1965.

Dürer and his time. 252 pp., illustr. Publ. 4647, 1965. ($4.25.)

Rugs from the Joseph V. McMullan collection. 57 pp., illustr. Publ. 4660, 1966. ($1.50.)

Art treasures of Turkey, introductions by Rodney S. Young and Richard Ettinghausen. 217 pp., illustr. Publ. 4663, 1966. ($3.65.)

Smithsonian Institution Traveling Exhibition Service catalogue, 1966–1967. 60 pp., illustr. Publ. 4668, 1966.

New names in Latin American art, introduction by Jose Gomez-Sicre. 14 pp., illustr. Publ. 4672, 1966. (35 cents.)

HISTORY AND TECHNOLOGY

Meissen and other German porcelain in the Alfred Duane Pell collection, by Paul Vickers Gardner. 68 pp., illustr. Publ. 4256, 1966. ($2.)

American folk art from the Eleanor and Mabel Van Alstyne collection, by Peter C. Welsh. 97 pp., 65 pls. Publ. 4615, 1965. ($3.)

The trotter in America Prints from the Harry T. Peters America on stone lithography collection, Smithsonian Institution, by Peter C. Welsh. 17 pp., 14 pls. Publ. 4637, August 16, 1965. (50 cents.)

Exterior inscriptions—Museum of History and Technology. 3 pp. Publ. 4639, July 21, 1965.

The First Ladies hall, by Margaret W. Brown Klapthor. 14 pp., illustr. Publ. 4640, September 6, 1965. (50 cents.)

The Dolls' house, by Faith Bradford. 29 pp., illustr. Publ. 4641, September 28, 1965. (50 cents.)

The great design—two lectures on the Smithson bequest by John Quincy Adams, edited, with an introduction, by Wilcomb E. Washburn. 95 pp., 8 pls. Publ. 4643, September 16, 1965. ($5.)

AMERICAN HISTORICAL ASSOCIATION

Annual report of the American Historical Association for the year 1959. Vol. II, Writings on American History, 1957. xv+698 pp. July 12, 1965.

Annual report of the American Historical Association for the year 1964. Vol. I, Proceedings. xxix+83 pp. November 3, 1965.

MISCELLANEOUS

Brief guide to the museums in the Washington area. 39 pp., 31 pls. Publ. 4528, September 27, 1965. (25 cents.)

Smithsonian research opportunities—science, fine arts, history, 1966–1967. 64 pp. Publ. 4645, September 21, 1965. (50 cents.)

Smithsonian publications 1848–1965. 16 pp. Publ. 4646, September 16, 1965.

SMITHSONIAN SERIES

Smithsonian Annual Reports

Smithsonian year 1965. 439 pp., illustr. Publ. 4648, January 27, 1966.

Annual report of the Board of Regents of the Smithsonian Institution, 1964. xiii+553 pp. Publ. 4613, December 30, 1965.

The general appendix contained the following papers, which were published separately (Publ. 4618–4636), as follows:

The quest for life beyond the earth, by Carl Sagan.

The secret of Stonehenge, by Gerald S. Hawkins.

The Smithsonian's satellite-tracking program: its history and organization. Part 3, by Nelson Hayes.

How mountains are formed, by R. A. Lyttleton.

The future of oceanography, by Athelstan Spilhaus.

Search for the *Thresher*, by F. N. Spiess and A. E. Maxwell.

Recent events in relativity, by Milton A. Rothman.

The edge of science, by Sanborn C. Brown.

Anatomy of an experiment: An account of the discovery of the neutrino, by Clyde L. Cowan.

Fracture of solids, by J. E. Field.

Man-made diamonds: A progress report, by C. G. Suits.

How do microbes "fix" nitrogen from the air? by D. J. D. Nicholas.

The unity of ecology, by F. Fraser Darling.

Venomous animals and their toxins, by Findlay E. Russell.

How insects work in groups, by John Sudd.

Our native termites, by Thomas E. Snyder.

The phenomenon of predation, by Paul L. Errington.

5,000 years of stone age culture in Borneo, by Tom Harrisson.

The emergence of the Plains Indian as the symbol of the North American Indian, by John C. Ewers.

Smithsonian Contributions to Astrophysics

VOLUME 8

9. Static diffusion models of the upper atmosphere with empirical temperature profiles, by Luigi G. Jacchia. pp. 215–257, 4 figs., 2 tab. December 27, 1965.

Smithsonian Miscellaneous Collections

VOLUME 148

6. Middle and late Turonian oysters of the *Lopha lugubris* group, by Erle G. Kauffman. 92 pp., 8 pls., 18 figs. Publ. 4602, October 6, 1965.

7. An account of the Astropysical Observatory of the Smithsonian Institution, 1904–1953, by C. G. Abbot. 16 pp., 4 figs. Publ. 4656, February 24, 1966.
8. Forecasting from harmonic periods in precipitation, by C. G. Abbot. 16 pp., 8 figs. Publ. 4659, March 23, 1966.
9. New Lower Cambrian trilobite faunule from the taconic sequence of New York, by Franco Rasetti. 52 pp., 12 pls. Publ. 4662, May 23, 1966.

VOLUME 149

4. An endocranial cast of the Bridger middle Eocene primate *Smilodectes gracilis*, by C. Lewis Gazin. 14 pp., 2 pls. Publ. 4616, July 1, 1965.
5. Display patterns of tropical American "Nine-Primaried" songbirds. IV. The yellow-rumped tanager, by M. Moynihan. 34 pp., 6 figs. Publ. 4644, January 27, 1966.
6. Echinoid distribution and habits, Key Largo coral reef preserve, Florida, by Porter M. Kier and Richard E. Grant. 68 pp., 16 pls., 15 figs. Publ. 4649, October 22, 1965.
7. Silicified Ordovician brachiopods from east-central Alaska, by Reuben James Ross, Jr., and J. Thomas Dutro, Jr. 22 pp., 3 pls., 1 fig. Publ. 4654, March 4, 1966.
8. Bartolomé Bermejo's "Espiscopal Saint." A study in medieval Spanish symbolism, by Herbert Friedmann. 21 pp., 11 pls. Publ. 4658, April 4, 1966.
9. A new Pliocene stork from Nebraska, by Lester L. Short, Jr. 11 pp., 1 pl. Publ. 4661, May 26, 1966.

VOLUME 150

[Whole Volume.] The birds of the Republic of Panama. Part 1.—Tinamidae (tinamous) to Rynchopidae (skimmers), by Alexander Wetmore. 483 pp., 73 pls. Publ. 4617, December 27, 1965. ($6.)

VOLUME 151

1. *Stringocephalus* in the Devonian of Indiana, by G. Arthur Cooper and Thomas Phelan. 20 pp., 5 pls., 2 figs. Publ. 4664, May 23, 1966.
4. *Parapercis kamoharai* (family Mugiloididae), a new fish from Japan with notes on other species of the genus, by Leonard P. Schultz. 4 pp., 1 pl. Publ. 4669, May 18, 1966.

UNITED STATES NATIONAL MUSEUM BULLETINS

MUSEUM OF NATURAL HISTORY

202, vol. 3. Fishes of the Marshall and Marianas Islands, by Leonard P. Schultz and collaborators: Loren P. Woods and Ernest A. Lachner. vii+176 pp., 25 pls., 18 tab., 22 figs. March 9, 1966.

246. Catalog of living whales, by Philip Hershkovitz. 259 pp. February 28, 1966.

247, parts 1 and 2. Fossil marine mammals from the Miocene Calvert formation of Maryland and Virginia, by Remington Kellogg. 63 pp., 32 pls., 31 figs. October 15, 1965.

MUSEUM OF HISTORY AND TECHNOLOGY

229. Contributions from the Museum of History and Technology: Papers 31–33, on numismatics.
   32. Numismatics: an ancient science—a survey of its history, by Elvira Eliza Clain-Stefanelli. 102 pp., 47 figs. December 30, 1965.
   33. Italian coin engravers since 1800, by Elvira Eliza Clain-Stefanelli. 68 pp., 138 figs., December 13, 1965.

241. Contributions from the Museum of History and Technology: Papers 45–51, on cultural history.
   47. Presentation pieces in the Museum of History and Technology, by Margaret Brown Klapthor. pp. 81–108, 22 figs. September 20, 1965.
   49. Benjamin Latrobe and Dolley Madison decorate the White House, 1809–1811, by Margaret Brown Klapthor. pp. 153–164, 10 figs. November 3, 1965.
   51. Woodworking tools, 1600–1900, by Peter C. Welsh. pp. 177–227, 66 figs. June 7, 1966.

245. Cincinnati locomotive builders, 1845–1868, by John H. White. 167 pp., 56 figs. December 30, 1965.

249. Contributions from the Museum of History and Technology: Papers 52–58, on historic sites archeology.
   52. Excavations at Clay Bank in Gloucester County, Virginia, 1962–1963, by Ivor Noël Hume. pp. 1–28, 16 figs. January 18, 1966.
   53. Excavations at Tutter's Neck in James City County, Virginia, 1960–1961, by Ivor Noël Hume. pp. 29–72, 20 figs. June 3, 1966.

250. Contributions from the Museum of History and Technology: Papers 59– , on cultural history.
   61. Rembrandt's etching technique: An example, by Peter Morse. pp. 93–108, 16 figs. May 4, 1966.

BUREAU OF AMERICAN ETHNOLOGY BULLETINS

194. Hidatsa social and ceremonial organization, by Alfred W. Bowers. xii+528 pp., 12 pls., 12 figs., 5 maps, 14 charts, 4 tab. 1965.

195. The Ponca tribe, by James H. Howard. xii+191 pp., 24 pls., 8 figs., 1 map. 1965.

196. Anthropological papers, nos. 75–80. iii+470 pp., 4 pls., 14 figs., 2 maps, 26 tab. 1966.

Smithsonian Contributions to Anthropology

volume 1

[Whole volume.] Early formative period of coastal Ecuador: The Valdivia and Machalilla phases, by Betty J. Meggers, Clifford Evans, and Emilio Estrada. xxi+234 pp., 196 pls., 115 figs., 30 tables. December 20, 1965.

Contributions from the National Herbarium

volume 32

Part 5. The American species of *Ormosia* (Leguminosae), by Velva E. Rudd. pp. 279–384, 6 pls., 15 figs. September 17, 1965.

volume 37

Part 2. Mosses of the Eastern Highlands, New Guinea, from the 6th Archbold Expedition, 1959, by Edwin B. Bartram. pp. 1–66. September 21, 1965.

Proceedings of the United States National Museum

volume 116

Title page, table of contents and index. pp. v+557–586. January 13, 1966.

volume 117

3508. Microlepidoptera of Juan Fernandez Island, by J. F. Gates Clarke. pp. 1–106, 1 pl., 111 figs. July 13, 1965.

3509. Neotropical Hemerobiidae in the United States National Museum, by Waro Nakahara. pp. 107–122, 2 pls., 5 figs. July 30, 1965.

3510. *Hermatobates*, a new generic record for the Atlantic Ocean, with descriptions of new species (Hemiptera: Gerridae), by Jon L. Herring. pp. 123–130, 4 figs. July 6, 1965.

3511. Benthic polychaetous annelids from Bering, Chukchi, and Beaufort Seas, by Donald J. Reish. pp. 131–158, 1 tab., 3 figs. August 25, 1965.

3512. Haustoriidae of New England (Crustacea: Amphipoda), by E. L. Bousfield. pp. 159–240, 31 figs. August 17, 1965.

3513. Planktonic copepods from Bahía Fosforescente, Puerto Rico, and adjacent waters, by Juan C. Gonzalez and Thomas E. Bowman. pp. 241–304, 21 figs. August 24, 1965.

3514. Revision of the milliped genera *Boraria* and *Gyalostethus* (Polydesmida: Xstodesmidae), by Richard L. Hoffman. pp. 305–348, 26 figs. August 17, 1965.

3515. Revision of Diaperini of America north of Mexico with notes on extralimital species (Coleoptera: Tenebrionidae), by Charles A. Triplehorn. pp. 349–458, 7 pls., 3 figs. November 16, 1965.

3516. Marine Amphipoda of Atolls in Micronesia, by J. Laurens Barnard. pp. 459–552, 11 tab., 35 figs. December 14, 1965.

3517. Hedgehogs and shrews of Turkey, by Dale J. Osborn. pp. 553–566, 4 figs. December 3, 1965.

3518. Systematic significance of breeding tubercles in fishes of the family Percidae, by Bruce B. Collette. pp. 567–614, 3 tab., 7 figs. December 7, 1965.

3519. Land snails of the genus *Amphidromus* from Thailand (Mollusca: Pulmonata: Camaenidae), by Alan Solem. pp. 615–629, 2 pls. December 3, 1965.

3520. A review of the genus *Haimbrachia* Dyar with descriptions of new species (Lepidoptera: Crambidae), by Hahn W. Capps. pp. 629–653, 6 figs. December 13, 1965.

3521. Genus *Lexiphanes* of America north of Mexico (Coleoptera: Chrysomelidae), by Edward U. Balsbaugh, Jr. pp. 655–680, 8 figs. January 18, 1966.

VOLUME 118

3522. Marine Amphipoda of the family Ampithoidae from southern California, by J. Laurens Barnard. pp. 1–46, 28 figs. December 30, 1965.

3523. Species of Oedemeridae of the Big Bend region of Texas, by Ross H. Arnett, Jr. pp. 47–55, 6 pls., 3 figs. December 17, 1965.

3524. Copepod crustaceans parasitic on elasmobranch fishes of the Hawaiian Islands, by Alan G. Lewis. pp. 57–154, 40 figs. April 12, 1966.

3525. Revision of the Pilargidae (Annelida: Polychaeta), including descriptions of new species, and redescription of the pelagic *Podarmus ploa* Chamberlin (Polynoidae), by Marian H. Pettibone. pp. 155–208, 26 figs. March 31, 1966.

3526. Descriptions and records of West Indian Cerambycidae (Coleoptera), by John A. Chemsak. pp. 209–220. February 8, 1966.

3527. Neotropical Microlepidoptera VII, new genus *Pseudomeritastis* and its species (Lepidoptera: Tortricidae), by Nicholas S. Obraztsov. pp. 221–232, 6 pls., 2 figs. February 23, 1966.

3528. More new galerucine beetles with excised middle tibiae in the male, by Doris H. Blake. pp. 233–266, 35 figs. February 23, 1966.

3529. A review of the beetles of the genus *Neobrotica* and some closely related genera, by Doris H. Blake. pp. 267–372, 16 figs. April 14, 1966.

3530. Notes on certain nearctic Trichoptera in the Museum of Comparative Zoology, by Oliver S. Flint, Jr. pp. 373–390, 4 figs. February 23, 1966.

3531. Neotropical Microlepidoptera VIII, a review of the genus *Falculina* with descriptions of new species (Lepidoptera: Stenomidae), by W. Donald Duckworth. pp. 391–404, 1 pl., 5 figs. February 10, 1966.

3532. A revision of the genus *Furnaricola* (Mallophaga) with descriptions of new species, by M. A. Carriker, Jr. pp. 405–432, 31 figs. March 9, 1966.

4.

Members of the Smithsonian Council

June 30, 1966

RALPH E. ALSTON. Professor of Botany, University of Texas, Austin, Texas. Born 1925. B.S. College of William and Mary, Ph. D. University of Indiana, 1955. Author of *Biochemical Systematics* (1963). Research interests include plant physiology and genetics.

H. HARVARD ARNASON. Vice President for Art Administration of the Solomon R. Guggenheim Foundation, 1071 Fifth Avenue, New York City. Born 1909. B.S. and A.M. Northwestern University, M.F.A. Princeton University, 1939. Worked with O.W.I. 1942–1945 and the State Department, Office of International Information and Cultural Affairs, 1945–1946; from 1947–1961 served as professor and chairman of the Department of Art at the University of Minnesota; appointed to present position in 1961. Member of the *Art in America* editorial board as well as many professional organizations. Author of numerous articles on medieval and modern art, *Modern Sculpture* (1962), and *Conrad Marca-Relli* (1962).

WHITFIELD J. BELL, Jr. Association Librarian, American Philosophical Society, 105 South Fifth Street, Philadelphia, Pennsylvania. Born 1914. A.B. Dickinson College, Ph. D. University of Pennsylvania, 1947. Associated with Dickinson College 1937–1954; assistant and then associate editor of the Papers of Benjamin Franklin 1954–1961; and from 1961 Association Librarian of APS. Editor of *Bibliography of the History of Medicine in the U.S. and Canada* (1948–1953) and *Mr. Franklin* (with L. W. Labaree) (1956). Author of *Needs and Opportunities for Research in the History of Early American Science* (1955).

FRED R. EGGAN. Professor of Anthropology, University of Chicago, 1126 East 59th Street, Chicago, Illinois. Born 1906. Ph. B. University of Chicago, Ph. D. University of Chicago, 1933. Has been with the University of Chicago since 1934 (Chairman

of the Department of Anthropology since 1961 and Director of the Philippine Studies Program since 1953). Has served as the U.S. official delegate to the Pacific Science Congresses in Manila (1953), Bangkok (1957), and Honolulu (1961). Research centers on the Indians of western United States and the tribes of the Philippines. Author of *Social Organization of the Western Pueblos* (1959). Editor of *Social Anthropology of North American Tribes* (1937 and 1955).

DONALD S. FARNER. Chairman, Department of Zoology, University of Washington, Seattle, Washington. Born 1915. B.A. Hamline University, Ph. D. University of Wisconsin, 1941. With the Washington State University 1947–1966 (Dean of the Graduate School 1960–1966). Author of *The Birds of Crater Lake National Park* (1952) and contributor to many scientific publications, mainly on the subject of ornithology.

ANTHONY N. B. GARVAN. Chairman, Department of American Civilization, University of Pennsylvania, Philadelphia, Pennsylvania. Born 1917. B.A. and M.A. Yale University, Ph. D. Yale University, 1948. Has been with the University of Pennsylvania since 1951, except three years (1957–1960) as Head Curator of the Department of Civil History at the Smithsonian Institution (Chairman of the Department of American Civilization since 1960). Editor of the *American Quarterly* 1951–1957. Author of *Architecture and Town Planning in Colonial Connecticut* (1951), *Index of American Cultures* (1953).

G. EVELYN HUTCHINSON. Sterling Professor of Zoology, Yale University, New Haven, Connecticut. Born 1903. University of Cambridge. Has been at Yale since 1928. Author of *The Clear Mirror* (1936), *The Itinerant Ivory Tower* (1953), *A Treatise on Limnology, vol. 1* (1957), *A Preliminary List of the Writings of Rebecca West 1912–1951* (1957), *The Enchanted Voyage* (1962), *The Ecological Theater and the Evolutionary Play* (1965), and many scientific papers. Studies lie in the fields of oceanography and limnology, ecology, population biology, and biology in the development of literature and the fine arts.

CLIFFORD L. LORD. President, Hofstra University, Hempstead, Long Island, New York. Born 1912. A.B. and A.M. Amherst College, Ph. D. Columbia University, 1943. Was Director of the New York State Historical Association 1941–1946; organized the Farmers' Museum in Cooperstown, New York, in 1942; Honorary Director of Circus World Museum (Director 1955–58); Vice President of the National Railroad Museum 1956– ; Dean of the

School of General Studies and Professor of History at Columbia University 1958–1965. Member of many historical associations. Author of *History of U.S. Naval Aviation* (1949).

CHARLES D. MICHENER. Watkins Distinguished Professor of Entomology, University of Kansas, Lawrence, Kansas. Born 1918. B.S. University of California at Berkeley, Ph. D. University of California at Berkeley, 1941. Has been with the University of Kansas since 1948 (Watkins Distinguished Professor since 1959). Served as State Entomologist 1949–1961. Author of *American Social Insects* (with Mary H. Michener) (1951), *Nest Architecture of the Sweat Bees* (with S. F. Sakagami) (1962), and approximately 200 technical works, mainly on bees. Work in taxonomy reflects his interests in concepts of numerical taxonomy, behavior, and ecology.

PETER M. MILLMAN. National Research Council of Canada, Ottawa 2, Ontario, Canada. Born 1906. B.A. Toronto, Ph. D. Harvard University, 1932. President of the Royal Astronomical Council of Canada. A meteoritic specialist whose studies include those of the upper atmosphere with planetary and space research; also interested in the culture of Japan and international exchanges.

ROBERT MOTHERWELL. 173 East 94th Street, New York City. Born 1915. A.B. Stanford University, 1937. A well-known artist who has exhibited nationally and internationally and contributes to American and foreign magazines. Editor of *The Documents of Modern Art* 1944–1952.

NORMAN D. NEWELL. Chairman, Department of Fossil Invertebrates, American Museum of Natural History, New York City. Born 1909. B.S. and A.M. University of Kansas, Ph. D. Yale University, 1933. Since 1945 has been a professor at Columbia University as well as curator of invertebrate paleontology at the American Museum of Natural History. Author of *The Nature of the Fossil Record* (1959), *Organism Communities and Bottom Facies, Great Bahama Bank* (1959) and is the organizer of the pelecypod volume of the *Treatise on Paleontology*. Coeditor of the *Journal of Paleontology* (1939–1942). Has visited all parts of North America, Europe, Australia, and Asia in the study of the Permian of the world. Other major field of interest is pelecypods.

NORMAN HOLMES PEARSON. Chairman of the Department of American Studies, Yale University, New Haven, Connecticut. Born 1909. A.B. Yale University, Ph. D. Yale University, 1941. Has been with Yale University since 1941 and in his present position since 1958. Editor of *Complete Novels of Hawthorne* (1937), *The Oxford*

Anthology of American Literature (with W. R. Benet) (1938), *Walden* (1948), *Poets of the English Language* (with W. H. Auden) (1950), and *The Pathfinder* (1952).

FREDERICK SEITZ. President, National Academy of Sciences, 2101 Constitution Avenue, NW., Washington, D.C. Born 1911. A.B. Leland Stanford Jr. University, Ph. D. Princeton, 1934. Has taught physics at University of Rochester, University of Pennsylvania, Carnegie Institute of Technology, and University of Illinois (Head of Department of Physics 1957—Dean of Graduate College and Vice President for Research 1964–1965). Was Chairman of Governing Board of the American Institute of Physics 1954–1959. President, NAS since 1962. Author of *Modern Theory of Solids* (1940), *The Physics of Metals* (1943).

CYRIL STANLEY SMITH. Institute Professor, Massachusetts Institute of Technology, Cambridge, Massachusetts. Born 1903. B.S. University of Birmingham, Sc. D. Massachusetts Institute of Technology, 1926. Has been with M.I.T. since 1945 (Institute Professor since 1961). Was a member of the President's Science Advisory Committee in 1959. Coauthor of *Structure and Properties of Solid Surfaces* (1953), *Reaumur's Memoirs on Steel and Iron* (1956), *Treatise on Divers Arts by Theophilus* (1963). Author of *A History of Metallography* (1960). A primary interest is the historical interaction between science and technology, and he is a frequent consultant to the Freer Gallery of Art and the Smithsonian Office of Anthropology.

JOHN D. SPIKES. College of Letters and Science, University of Utah, Salt Lake City, Utah. Born 1918. B.S. California Institute of Technology, Ph. D. California Institute of Technology, 1948. Has been with the University of Utah since 1948 (except for a period on leave as Cell Physiologist of the Division of Biology and Medicine of the Atomic Energy Commission). Author of numerous publications in scientific journals, bulletins, etc. Major research is in biophysics, especially photobiology.

STEPHEN E. TOULMIN. Department of the History and Philosophy of Science, Brandeis University, Waltham, Massachusetts. Born 1922. B.A. King's College, Ph. D. King's College, 1948. Has taught at Oxford, University of Melbourne, University of Leeds, New York University, Stanford University, and Columbia University, and from 1960–1966 was Director of the Nuffield Foundation Unit for History of Ideas. Author of *The Place of Reason in Ethics* (1950); *The Philosophy of Science, an Introduction*

(1953); *Metaphysical Beliefs* (author of one of three essays) (1957); *The Uses of Argument* (1958); *Foresight and Understanding* (1961); "The Ancestry of Science": vol. 1 (*The Fabric of Heavens*) (1961), vol. 2 (*The Architecture of Matter*) (1962), vol. 3 (*The Discovery of Time*) (1965); *Night Sky at Rhodes* (1963).

5.

Appointments 1965–1966

Research Participation Programs

Post-Doctoral, Graduate, Undergraduate

POST-DOCTORAL RESEARCH ASSOCIATES

RALPH F. BAIERLEIN, Harvard University: General relativistic analysis of rotating astrophysical systems.

JOHN H. BEAMAN, Michigan State University: Study of the alpine flora of Mexico and Guatemala.

JAMES H. BREWER, North Carolina College (Durham): The Confederate Negro: the ambivalent rebel in Virginia.

WILLIAM A. GOSLINE, University of Hawaii: Classification and relationships of perciform fishes.

CHARLES W. HARPER, JR., University College of Swansea (G.B.): Investigation of Upper Ordovician, Silurian, and Devonian brachiopod collections in USNM.

HENRY J. KAUFFMAN, Millersville State College (Pennsylvania): Development of technology in America.

PETER B. LEAVENS, Harvard University: Mineralogy and geochemistry of the Fe–Mn phosphates and the paragenesis of secondary phosphates in pegmatites.

FRANK J. S. MATURO, University of Florida: Systematic study of the Ectoprocta collected by the Atlantic Continental Shelf and Slope Survey (Hudson Canyon to Key West).

ROBERT H. MCCORKELL, University of Manitoba: Study of extraterrestrial materials in sea sediments by means of cosmic ray produced radio-isotopes.

THORNTON L. PAGE, Wesleyan University: Evolution of galaxies.

FRANCESCO PARENTI, Universita degli studi di Milano: Effect of previous photoperiodic treatment of leaves on biosynthetic capacity of isolated chloroplasts.

LADISLAV SEHNAL, Astronomical Institute, Ondrejov, Czechoslovakia: Solar radiation pressure effects in the motion of satellites.

GRADUATE RESEARCH PARTICIPATION PROGRAMS

(*Denotes Pre-Doctoral Internship)

SUSAN E. BRATLEY, University of Michigan: Basic reorganization of the National Collection of Fine Arts/National Portrait Gallery Library morgue (separating subject material from artist and institution files, and setting up an American portrait file).

JOSEPH C. BRITTON, JR., Texas Christian University: Sorting, cataloguing, and identifying a portion of material collected in conjunction with the Indian Ocean Expedition in 1963. Collection contains some 2,400 lots of mollusks representing 9143 specimens.

*EVERETT D. CASHATT, Catholic University of America: Continuation and expansion of project on consolidation and rearrangement, according to latest revisionary study, of USNM collection of N. A. Chrysauginae. Also, distribution and taxonomy of *Oidaemathophorus balanotes* Meyrick were examined, resulting in description of two new species.

ANTHONY G. COATES, University of the West Indies: Conducted studies on Mesozoic Caribbean fossil collection, especially the coral fauna.

GEORGE T. FARMER, JR., University of Cincinnati: Continuation of studies begun in 1961, completing preparation of specimens and studying techniques to be used in the systematic part of the study, which will follow.

ROBERT D. GORDON, North Dakota State University: Revision of the niger-tenebrosus group of the genus *Hydroporus* (Coleoptera: Dytiscidae), involving putting into practice the standard procedures of systematists in the study of insect classification.

*ELIZABETH M. HARRIS, University of Reading (G. B.): Study, classification, and cataloguing of the Division of Graphic Arts' collection of prints.

SISTER MARY VICTORIA HAYDEN, St. Louis University: Survey of families of seed plants represented on Barro Colorado Island, evaluation of herbarium there and the system of filing used, study of the Rubiaceae, microscope examination of seed coats of Psychotrieae, assistance in observation of bees which frequent orchids.

HENRY L. HULL, Georgetown University: Study of the objects in the collection of Captain P. V. H. Weems U.S.N. (retired), and an attempt to gain information on the historical background of the collection's instruments on navigation in general.

*CHARLES J. LARUE, JR., University of Maryland: Variation and functional interrelations of the major components of the bird skull.

ROBERT F. MAGNUS, Columbia University Teachers College: Assisted in installing and removing various exhibits; assisted in aspects of paper work involved in exhibitions; designed signs used in several exhibitions; made up model of art hall to be used for useful visualization of future exhibits.

WALKER B. MOORE, JR., Howard University: Study of Eskimo and Aleut juvenile skulls, involving suture closure and tooth eruption, and tabulation of data on IBM processing cards.

*Eugene S. Morton, Cornell University: Ecology of avian sound; the forces of the physical and biological environments selecting for or against certain sound characteristics.

*Martin G. Naumann, University of Kansas: Investigation and observation of wasps in the field; making descriptions of nests and analyses of nest populations.

Dolores Newton, Harvard University: Assisted in research on the material culture of the Seminole Indians of Florida; tabulated and organized pictorial and photographic information to be used, and explored possibilities in categorizing design strips.

Osborn B. Nye, Jr., University of Cincinnati: Learned techniques involved in thin sectioning cyclostome bryozoans, and defining specific problems for future work.

Herbert H. Odom, Massachusetts Institute of Technology.

F. Paul Prucha, S.J., Marquette University: Study of the origin, development and use of the Indian Peace Medal in the United States.

*John R. Oppenheimer, University of Illinois: Ethology of *Cabus capucinus*.

*Carmen Perilliat, University of Mexico: Study of USNM's collection of Miocene mollusks.

Patricia E. Putnam, Emory University: Identifying fern collections from India, Mexico, Honduras, Michigan and Dominica; general herbarium work, including refiling and demounting of returned specimens, labelling and rearranging collections to conform with orders of genera in the fern herbarium.

*Gary L. Ranck, University of Utah: Study of the rodents of Libya.

*Michael H. Robinson, University College of Swansea: Research and field studies on insect antipredator behavior.

Lawrence E. Schaad, University of Illinois: Description of avian and mammalian quarantine procedures at the National Zoological Park to explain procedures of keeping accurate records on medical condition of accessions of these species from all over the world; feeding routines, exams for parasitic infestation, medication for control of observed parasites, and preparation for conditions other than those caused by parasites.

Kenneth W. Shipps, Yale University: Inquiry into the development and prevalence of political campaign music in the U.S. from earliest traces in Jefferson's campaign through 1860.

Harold K. Skramstad, Jr., George Washington University: Devising system for organizing, describing, and storing the archival and manuscript collections of the Division of Mechanical and Civil Engineering; preparing illustrated booklet on the archival collections; working out a system of archival control, which might be adaptable to future acquistions.

*Nicholas D. Smythe, University of Maryland: Reconnaissance of habitat and population density in order to establish basic data on ecology of the Agouta.

Betty I. Strauss, University of Delaware: Iconography of George Washington.

*William L. Taylor, Brown University: Traced growth and development of the port of Baltimore; analyzed evolution of the size and types of ships

employed in trade and commerce; began dissertation on the gradual domination during latter half of 19th and early 20th centuries of coastwise steamship lines along the New England coast by the railroads of New England.

JANE C. WHEELER, Cambridge University: Prehistoric hunting patterns in the Iranian paleolithic sites.

UNDERGRADUATE RESEARCH PARTICIPATION PROGRAM

DIANE H. ALEXANDER, University of Maryland: Identification by fiber content and basic weave of a large collection of fabrics collected by U.S. consulates from various countries during the late 19th and early 20th centuries, for the organization of a fabric sample file by country.

RONALD A. ANDERSON, Ferris State College: Fitting additional families into the zocae key as a supplement to D. I. Williams (1957) key, which covered approximately 13 families including all major sections of Decapoda.

ORAN W. ATKINSON, Howard University: Bibliographical research, measurement, and study of skeletal elements associated with hind limbs in different genera, specimen sorting, and classifying specimens for purposes of recording information on punch card files.

COLLES A. BAXTER, Wheaton College: Verifying information and making out reference cards, carrying out preliminary research on various collections or paintings and labeling photographs and furniture.

DENTON F. BLAIR, Yale University: Assembling, preparing, and organizing various collections and paintings for storage or exhibit, with particular attention given to the Gellatly Collection.

DANIEL C. CHURCH, Yale University: Study of the manifestations of the American romantic movement in objects of material culture in connection with the Gothic and Italianate revivals.

THEA B. COMINS, Bennington College: Helping to prepare catalogue for Turkish exhibition; cataloguing new acquisitions; augmenting previous catalogue entries.

WILLIAM D. CROSBY, JR., Yale University: Collecting parts of the story of the history of rocketry through the year 1945 and compiling an outline and analysis on the historical events. Assisted in taking inventory of the Silver Hill warehouse facilities, including the identification and cataloguing of pieces in this collection.

BARBARA B. DAVENPORT, Bennington College: Preparing specimens for exhibit; research pertaining to ceramic imports into the U.S., 1800–1825; mounting slides.

ARTHUR B. DAVIS, North Carolina State University: Work in the quantitative analysis laboratory involving standard quantitative preparations and procedures; running emission spectograph for qualitative analyses and spectrophotometer for quantitative analyses; maintenance of meteorite reference-filing system.

CAROLYN R. FAWCETT, Radcliffe College: Transcribing and translating from the notebook of Lorenzo della Volpaia, a contemporary of Cellini, da

Vinci, and Poliziano, with particular attention to the planetary clock and scientific instruments designed and executed by della Volpaia.

JACK B. FISHER, Cornell University: Field assistant in the Bredin-Archbold-Smithsonian Biological Survey of Dominica; in the Botany Herbarium, identified pressed material collected on Dominica last year and made keys to genera and species for those families identified.

MADELINE E. GERKEN, Cornell University: Work on the extraction of phytochrome from green plants.

DANIEL D. GIBSON, University of Alaska: In cooperation with the Oceanographic Sorting Center and the Bureau of Commercial Fisheries, conducted study of seabird habits based on material on hand in the Division of Birds from four Atlantic cruises, including one made by the participant.

JEROLD L. GRASHOFF, Michigan State University: Comparative anatomical study of olyroid grasses.

ROBERT K. HITCH, University of Tennessee: Typing Antarctic plankton down to genus and making up a reference sample for the Lamont Geological Laboratory.

JUDITH A. HOLLAND, Pennsylvania State University: Work on the classification of the family Scarabaeidae of North America.

RICHARD S. HOPKINS, Harvard College: Work on reclassification of the mineral study collection according to the seventh edition of Dana's "System of Mineralogy" and addition to the existing files of new x-ray standards of absolute accuracy, in large part for those same minerals that were being reclassified.

DEE ANNE F. HOUSTON, George Washington University: Analysis of living reef-associated Bivalvia and their reflection in fossil reef assemblages.

MARILYN R. JOHNSTONE, Bard College: An evaluation of the journals of Charles D. Walcott, 1870–1921.

JOYCE A. KEENER, Bennington College: Helping to organize two print collections; outlining a procedure for identifying engravings and other graphic works according to media.

RICHARD H. KESSIN, Yale University: Work on the isolation of RNA polyphosphates.

SAUL J. KROTKI, University of Utah: Engaged in x-ray crystallographic analysis of garnet.

MARY F. KUNDAHL, George Washington University: Research on the Hans Zyz Collection of 18th century Oriental and European porcelain; involved revision of the Collection Catalogue, expansion of the catalogue files, and assistance in processes necessary for displaying the collection.

RICHARD S. LAUB, Queens College, University of the City of New York: Study of morphological variations found in horizontal and vertical trending populations of the fossil coral *Turbinolia pharetra*.

BARBARA M. K. LAWRENCE, Bennington College: Compiled photofile books for exhibitions; checked photographs in former Bureau of Ethnology files against their negatives to determine if negatives could still be printed or were still extant, or properly catalogued.

JEFFREY A. LEVY, Bard College: Morphometric study of copepoda ectoparasitic on sharks.

JAMES A. MCKENNEY, University of Maryland: Participated in initiation of proposed Smithsonian catalogue of the Neotropical Squamata, confining work to literature available on lizards known to occur south of Mexico.

RUSSELL B. MERRILL, University of Kansas: Assisting in the illustration, description, and population analysis of part of the ostracode fauna of the western Indian Ocean.

SUSAN E. MINTZ, Bennington College: Learning techniques of conservation and preservation of ethnological and archeological specimens.

MARIA C. NOVOA, Mount Marty College (South Dakota): Studying evolutionary trends of asteroids.

MARTHA S. RAY, University of Connecticut: Research on distinguishing between mysids and euphausids.

CHARLOTTE RUNDLES, Duke University: Engaged in anatomical research on the freshwater mollusks of Thailand, some of which are of medical importance. Reassigned: Study of the cranial and facial measurements of Eskimo and Aleutian children.

STEPHEN L. SCHILLING, College of William and Mary: Compiling an annotated bibliography on animal-sediment relationships, writing a report on benthic animals found in marine sediments, and assisting in setting up the Division of Sedimentology.

ELIZABETH E. SCULL, Bennington College: Survey of National Collection of Fine Arts' American art paintings suitable for exhibit; initiating survey of American art course offerings in U.S.

CHRISTIANE E. SEIDENSCHNUR, Michigan State University: Study and preparation of a large collection of Virginia-Maryland plants for deposit in the National Herbarium and distribution as exchange.

PRISCILLA A. SHERWIN, Pomona College: Vascularization of aroid flowers, of which the Department has a large collection, preserved following collecting trips.

DORMAN H. SMITH, University of California: Carrying out preliminary research on instruments in the collection, then cataloguing and storing them; research and presentation of a paper to the Division staff on enharmonic keyboard instruments.

SHARI B. TAYLOR, Wheaton College (Massachusetts): Studying the Jurassic Formaninifera of the western interior of the United States. Reassigned: Study of the size of Wilson's petrel related to its geographic distribution.

6.

Staff of the Smithsonian Institution

June 30, 1966

Office of the Secretary	THEODORE W. TAYLOR, Assistant to the Secretary
	PHILIP C. RITTERBUSH, Special Assistant to the Secretary
	ROBERT W. MASON, Executive Assistant
	ROBERT N. CUNNINGHAM, Development Officer
	SAMUEL T. SURATT, Archivist
Office of the Assistant Secretary (Administration)	JOHN WHITELAW, Executive Assistant
	OTIS O. MARTIN, Financial Management Adviser
Office of the Assistant Secretary (Science)	HARRY HYMAN, Special Assistant for Science Resources Planning
	MICHAEL A. STAHL, Administrative Officer
Fine Arts Special Project	THOMAS M. BEGGS
Office of Education and Training	CHARLES BLITZER, Director
Office of International Activities	WILLIAM W. WARNER, Director
General Counsel	PETER G. POWERS
Public Information	B. RICHARD BERG, Director
Smithsonian Press	ANDERS RICHTER, Director
Smithsonian Libraries	Mrs. MARY A. HUFFER, Acting Director
	RUTH E. BLANCHARD, Library of Congress Liaison
Smithsonian Museum Service	MEREDITH JOHNSON, Acting Director
Smithsonian Associates	G. CARROLL LINDSAY, Acting Executive Secretary
	Mrs. LISA M. SUTER, Program Manager
Fiscal	Mrs. BETTY J. MORGAN, Assistant Treasurer
	ERNEST A. BERGER, Assistant Treasurer
Organization and Methods	Mrs. ANN S. CAMPBELL, Director
Programming and Budget	EDWARD H. KOHN, Director
Contracts	ELDRIDGE O. HURLBUT, Contracting Officer
Internal Audit	DOUGLAS R. MARTIN
Information Systems	NICHOLAS J. SUSZYNSKI, Director

230-457—66——32

Personnel	J. A. Kennedy, Director
Buildings Management	Andrew F. Michaels, Jr., Director
Supply	Fred G. Barwick, Chief
Photographic Services	O. H. Greeson, Chief

UNITED STATES NATIONAL MUSEUM

Director	Frank A. Taylor
Registrar	Helena M. Weiss
Office of Exhibits	John E. Anglim, Chief
Natural History Laboratory	A. Gilbert Wright, Assistant Chief Julius Tretick, Production Supervisor
History and Technology Laboratory	Benjamin W. Lawless, Chief William M. Clark, Jr., Production Supervisor
Exhibits Labels Editor	George Weiner
Conservation Research Laboratory	Charles H. Olin, Chief Mrs. Jacqueline S. Olin, Chemist
Traveling Exhibition Service	Mrs. Dorothy Van Arsdale, Chief Mrs. Nancy Curtis Padnos, Assistant Chief
Exhibits Coordinators	Frances P. Smyth, Mrs. Erika Passantino, Barboura C. Flues, Mrs. Jean Taylor, Mrs. Genie Rice

MUSEUM OF NATURAL HISTORY

Director	Richard S. Cowan
Deputy Director	Donald F. Squires
Assistant Director for Oceanography and Limnology	I. Eugene Wallen
Smithsonian Oceanographic Sorting Center	H. Adair Fehlmann
Assistant Director for Ecology	Helmut K. Buechner
Research Biologist	Lee M. Talbot
Special Assistant for Tropical Biology	F. Raymond Fosberg
Director, Chesapeake Bay Field Station	Kyle R. Barbehenn
Administrative Officer	Mrs. Mabel A. Byrd
Smithsonian Office of Anthropology	Richard B. Woodbury, Chairman T. Dale Stewart, Senior Scientist Waldo R. Wedel, Senior Scientist John C. Ewers, Senior Scientist Henry B. Collins, Senior Scientist Mrs. M. Blaker, Archivist Joseph Andrews, Exhibit Specialist
Cultural Anthropology	Saul H. Riesenberg, Curator in Charge Gordon D. Gibson, Associate Curator

	Eugene I. Knez, Associate Curator
	Clifford Evans, Jr., Curator
	William H. Crocker, Associate Curator
	Gus W. Van Beek, Associate Curator
	Kent V. Flannery, Associate Curator
	William C. Sturtevant, Associate Curator
	Robert M. Laughlin, Associate Curator
Physical Anthropology	J. Lawrence Angel, Curator in Charge
	Lucile E. Hoyme, Associate Curator
River Basin Surveys	Robert L. Stephenson, Anthropologist
Vertebrate Zoology	Philip S. Humphrey, Chairman
	Leonard P. Schultz, Senior Scientist
Fishes	Ernest A. Lachner, Curator in Charge
	Victor G. Springer, Associate Curator
	William R. Taylor, Associate Curator
	Stanley H. Weitzman, Associate Curator
	Robert H. Gibbs, Jr., Associate Curator
Reptiles and Amphibians	Doris M. Cochran, Curator in Charge
	James A. Peters, Associate Curator
Birds	George E. Watson, Curator in Charge
	Richard L. Zusi, Associate Curator
	Paul Slud, Associate Curator
Mammals	Charles O. Handley, Jr., Curator in Charge
	Henry W. Setzer, Associate Curator
	David H. Johnson, Research Curator
Invertebrate Zoology	Joseph Rosewater, Acting Chairman
	Fenner A. Chace, Jr., Senior Scientist
	Horton H. Hobbs, Jr., Senior Scientist
	Joseph Britton, Systematic Zoologist
Crustacea	Raymond B. Manning, Curator in Charge
	Thomas E. Bowman, Associate Curator
	J. Laurens Barnard, Associate Curator
	Louis S. Kornicker, Associate Curator
	Roger F. Cressey, Jr., Associate Curator
Echinoderms	David L. Pawson, Curator in Charge
	Klaus Rutzler, Associate Curator
Worms	Meredith L. Jones, Curator in Charge
	Marian H. Pettibone, Associate Curator
	W. Duane Hope, Associate Curator
	Mary E. Rice, Associate Curator
Mollusks	Joseph Rosewater, Curator in Charge
	Joseph P. E. Morrison, Associate Curator
	Harald A. Rehder, Research Curator
Entomology	Karl V. Krombein, Chairman
	J. F. Gates Clarke, Senior Scientist
Neuropteroids	Oliver S. Flint, Jr., Curator in Charge

Lepidoptera	Donald R. Davis, Curator in Charge
	W. Donald Duckworth, Associate Curator
	William D. Field, Associate Curator
Coleoptera	Oscar L. Cartwright, Curator in Charge
	Paul J. Spangler, Associate Curator
Hemiptera	Richard C. Froeschner, Curator in Charge
Myriapoda and Arachnida	Ralph E. Crabill, Jr., Curator in Charge
Botany	William L. Stern, Chairman
	Lyman B. Smith, Senior Scientist
Phanerogams	John J. Wurdack, Curator in Charge
	Wallace R. Ernst, Associate Curator
	Dan H. Nicolson, Associate Curator
	Velva E. Rudd, Associate Curator
	Stanwyn G. Shetler, Associate Curator
Ferns	Conrad V. Morton, Curator in Charge
	David B. Lellinger, Associate Curator
Grasses	Thomas R. Soderstrom, Curator in Charge
Cryptogams	Mason E. Hale, Jr., Curator in Charge
	E. Yale Dawson, Curator*
	Paul S. Conger, Associate Curator
	Harold E. Robinson, Associate Curator
Plant Anatomy	William L. Stern, Acting Curator in Charge
	Richard H. Eyde, Associate Curator
Fungi	Chester R. Benjamin, Honorary Curator
	John A. Stevenson, Honorary Curator
	John L. Cunningham, Honorary Curator
	Marie L. Farr, Honorary Curator
	Paul Lewis Lentz, Honorary Curator
	Francis A. Uecker, Honorary Curator
Paleobiology	G. Arthur Cooper, Chairman
Invertebrate Paleontology	Richard S. Boardman, Curator in Charge
	Porter M. Kier, Associate Curator
	Richard Cifelli, Associate Curator
	Erle G. Kauffman, Associate Curator
	Martin A. Buzas, Associate Curator
	Richard M. Benson, Associate Curator
	Kenneth M. Towe, Associate Curator
	Thomas R. Waller, Associate Curator
	Richard A. Robison, Associate Curator
Vertebrate Paleontology	C. Lewis Gazin, Curator in Charge
	David H. Dunkle, Associate Curator
	Nicholas Hotton III, Associate Curator
	Clayton E. Ray, Associate Curator

*Deceased June 23, 1966.

Paleobotany	FRANCIS M. HUEBER, Curator in Charge
	WALTER H. ADEY, Associate Curator
Sedimentology	JACK W. PIERCE, Curator in Charge
Mineral Sciences	GEORGE S. SWITZER, Chairman
Meteorites	KURT FREDRIKSSON, Curator in Charge
	EDWARD P. HENDERSON, Curator
	ROY S. CLARKE, JR., Chemist
Mineralogy	PAUL E. DESAUTELS, Associate Curator in Charge
Petrology	WILLIAM G. MELSON, Associate Curator in Charge

NATIONAL ZOOLOGICAL PARK

Director	T. H. REED
Assistant Director	JOHN PERRY,
Office of the Director	TRAVIS E. FAUNTLEROY, Assistant to the Director
	JOHN EISENBERG, Resident Scientist
	DONALD R. DIETLEIN, Manager of the Animal Department
	CLINTON W. GRAY, Veterinarian
	MARIAN P. MCCRANE, Zoologist
Associates in Ecology	HELMUT K. BUECHNER, LEE M. TALBOT

SMITHSONIAN TROPICAL RESEARCH INSTITUTE

Director	MARTIN H. MOYNIHAN
Biologists	ROBERT L. DRESSLER, A. STANLEY RAND, NEAL G. SMITH

RADIATION BIOLOGY LABORATORY

Director	WILLIAM H. KLEIN
Assistant Director	WALTER A. SHROPSHIRE, JR.
Biochemists	DAVID L. CORRELL, MAURICE M. MARGULIES, FRANCESCO PARENTI, ROBERT L. WEINTRAUB
Cytogeneticist	TE-HSIU MA
Geochemist	AUSTIN LONG
Physicist	BERNARD GOLDBERG
Plant Physiologists	VICTOR B. ELSTAD, BERNARD NEBEL, LEONARD PRICE
Electronic Engineer	JUNIUS H. HARRISON
Instrument Engineering Technician	DARNEL G. TALBERT

ASTROPHYSICAL OBSERVATORY

Director — Fred L. Whipple

Assistant Director (Science) — Charles A. Lundquist

Assistant Director (Management) — Carlton W. Tillinghast

Scientific Staff — Leendert Aardoom, Eugene H. Avrett, Nathaniel P. Carleton, Willard R. Chappell, Giuseppe Colombo, Matthias F. Comerford, Allan F. Cook, Robert J. Davis, James C. deFelice, Charles H. Dugan, Giovanni G. Fazio, Edward L. Fireman, Enrichetta E. Forti, Giuseppe Forti, Fred A. Franklin, Manfred P. Friedman, Edward M. Gaposchkin, Owen J. Gingerich, Antanas Girnius, Mario D. Grossi, Salah E. Hamid, Gerald S. Hawkins, Henry F. Helmken, Paul W. Hodge, William M. Irvine, Luigi G. Jacchia, Wolfgang Kalkofen, Walter J. Köhnlein, Yoshihide Kozai, Myron Lecar, Anthony R. Lee, Carlton G. Lehr, A. Edward Lilley, Brian G. Marsden, Ursula B. Marvin, Richard E. McCrosky, Jean Meffroy, Donald H. Menzel, Henri E. Mitler, Robert W. Noyes, Costas Papaliolios, Cecilia H. Payne-Gaposchkin, Douglas T. Pitman, James B. Pollack, Annette G. Posen, George B. Rybicki, Carl Sagan, Jack W. Slowey, Leonard H. Solomon, Richard B. Southworth, Stephen E. Strom, David Tilles, Sachiko Tsuruta, Chi-Yuen Wang, Charles A. Whitney, John A. Wood, Frances W. Wright, James P. Wright.

Consultants — Giorgio Fiocco, Yusuke Hagihara, David G. Hummer, William M. Kaula, Colin S. L. Keay, Czeslaw P. Kentzer, Irving Michelson, Eduardo O. Patino, A. E. Ringwood, Juan Roderer, Winfield W. Salisbury, Mario R. Schaffner, William E. Strange, Bhuwan M. Tripathy, Francis X. Tuoti, George Veis

Research Associates — Ralph F. Baierlein, Robert H. McCorkell, Thornton L. Page, Ladislav Sehnal

Central Bureau for Satellite Geodesy	JAN ROLFF, Executive Director
Central Bureau for Astronomical Telegrams	OWEN J. GINGERICH, Director

SCIENCE INFORMATION EXCHANGE

Director	MONROE E. FREEMAN
Deputy Director	DAVID F. HERSEY
Associate Directors	WILLIS R. FOSTER, Life Sciences
	FRANK J. KREYSA, Physical Sciences
	HARVEY MARRON, Operations
Executive Officer	V. P. VERFUERTH

MUSEUM OF HISTORY AND TECHNOLOGY

Director	ROBERT P. MULTHAUF
Assistant Director	SILVIO A. BEDINI
Liaison Editor	ROGER PINEAU
Administrative Officer	VIRGINIA BEETS
Science and Technology	WALTER F. CANNON, Chairman
	Mrs. DEBORAH J. WARNER, Assistant Curator
Physical Sciences	WALTER F. CANNON, Acting Curator; in charge of Sections of Astronomy, Chemistry, Meteorology, and Physics
	UTA C. MERZBACH, Associate Curator, Sections of Mathematics and Antique Instruments
Mechanical and Civil Engineering	ROBERT M. VOGEL, Associate Curator in Charge; Sections of Heavy Machinery and Civil Engineering
	EDWIN A. BATTISON, Associate Curator; Sections of Light Machinery and Horology
	MONTE A. CALVERT, Associate Curator, Section of Tools
Electricity	BERNARD S. FINN, Curator
Transportation	HOWARD I. CHAPELLE, Curator
	MELVIN H. JACKSON, Associate Curator, Section of Marine Transportation
	JOHN H. WHITE, JR., Associate Curator, Section of Land Transportation
Medical Sciences	SAMI K. HAMARNEH, Curator; in charge of Sections of Medical and Dental History and Pharmaceutical History and Health

Arts and Manufactures	Philip W. Bishop, Chairman
Manufactures and Heavy Industries	Philip W. Bishop, Acting Curator
	John N. Hoffman, Associate Curator
Agriculture and Forest Products	John T. Schlebecker, Curator
Textiles	Mrs. Grace Rogers Cooper, Curator
	Rita J. Adrosko, Associate Curator
Ceramics and Glass	Paul V. Gardner, Curator
	J. Jefferson Miller II, Associate Curator
Graphic Arts	Jacob Kainen, Curator
	Peter Morse, Associate Curator
	Eugene Ostroff, Associate Curator; Section of Photography
Civil History	Richard H. Howland, Chairman
Political History	Keith E. Melder, Associate Curator in Charge
	Mrs. Margaret B. Klapthor, Associate Curator
	Mrs. Anne W. Murray, Associate Curator
	Herbert R. Collins, Assistant Curator
	Mrs. Claudia B. Kidwell, Assistant Curator
Cultural History	C. Malcolm Watkins, Curator
	Richard E. Ahlborn, Associate Curator
	John T. Fesperman, Jr., Concert Director
	Mrs. Cynthia A. Hoover, Associate Curator
	Rodris C. Roth, Associate Curator
Philately and Postal History	Carl H. Scheele, Associate Curator in Charge
Numismatics	Vladimir Clain-Stefanelli, Curator
	Mrs. Elvira Clain-Stefanelli, Associate Curator
Armed Forces History	Mendel L. Peterson, Chairman
Military History	Edgar M. Howell, Curator
	Craddock R. Goins, Jr., Associate Curator
Naval History	Philip K. Lundeberg, Curator
American Studies	Wilcomb E. Washburn, Chairman
Growth of the United States	Peter C. Welsh, Curator
	Ann Castrodale, Assistant Curator

NATIONAL AIR AND SPACE MUSEUM

Director	S. Paul Johnston
Assistant Director (Astronautics)	Frederick G. Durant
Assistant Director (Education and Information)	Paul E. Garber
Visual Information Officer	James A. Mahoney

Flight Craft	Louis C. Casey, Curator in Charge
Flight Materiel	Kenneth E. Newland, Curator in Charge
Flight Propulsion	Robert B. Meyer, Curator in Charge
Presentation and Restoration	Walter M. Male, Facilities Manager

NATIONAL ARMED FORCES MUSEUM ADVISORY BOARD

Director	Col. John H. Magruder III
Assistant Director	James S. Hutchins
Museum Specialist	Col. Robert M. Calland
Advisory Board	John Nicholas Brown, Chairman
Members	Chief Justice of the United States, Secretary of Army, Secretary of Navy, Secretary of Air Force, David Lloyd Kreeger, Henry Bradford Washburn, Jr., William H. Perkins, Jr., James H. Cassell, Jr.
Ex Officio	Secretary of Defense, Secretary of the Smithsonian Institution

FREER GALLERY OF ART

Director	John A. Pope
Assistant Director	Harold P. Stern
Head Curator (Near Eastern Art)	Richard Ettinghausen
Associate Curator (Chinese Art)	William Trousdale
Head, Technical Laboratory	Rutherford J. Gettens

NATIONAL COLLECTION OF FINE ARTS

Director	David W. Scott
Assistant to the Director	Donald R. McClelland
Assistant for Special Services	John Latham
Special Consultants (Art)	Mrs. Adelyn Dohme Breeskin, Stefan P. Munsing
Curator (Painting and Sculpture)	Richard P. Wunder
Curator (Exhibits)	Harry Lowe
Curator (Information and Lending)	Rowland Lyon*
Chief, International Art Program	Lois Bingham
Librarian	William Walker

*Deceased October 21 1966.

Administrative Officers	HARRY W. ZICHTERMAN, Mrs. LOUISE W. ROBINSON
Smithsonian Art Commission	EDGAR P. RICHARDSON, Chairman GILMORE D. CLARKE, Vice Chairman S. DILLON RIPLEY, Secretary
Members	PAGE CROSS, DAVID E. FINLEY, LLOYD GOODRICH, WALKER HANCOCK, BARTLETT H. HAYES, JR., WILMARTH S. LEWIS, HENRY P. MCILHENNY, PAUL MELLON, OGDEN M. PLEISSNER, CHARLES H. SAWYER, STOW WENGENROTH, ANDREW WYETH
Members Emeritus	LEONARD CARMICHAEL, ALEXANDER WETMORE

NATIONAL PORTRAIT GALLERY

Director	CHARLES NAGEL
Historian	DANIEL J. REED
Curator	ROBERT G. STEWART
Assistant Historian	Mrs. VIRGINIA PURDY
Librarian	WILLIAM WALKER
Design Consultant	VICTOR PROETZ
Assistants	Mrs. GENEVIEVE A. KENNEDY, Museum Specialist Mrs. MARCIA SIMON, Research Assistant Mrs. PAMELA CHRISTOFFEL, Research Assistant LEWIS T. MCINNIS, Museum Technician
Commission	JOHN NICHOLAS BROWN, Chairman, CATHERINE DRINKER BOWEN, JULIAN P. BOYD, LEWIS DESCHLER, DAVID E. FINLEY, EDGAR P. RICHARDSON, WILMARTH SHELDON LEWIS, RICHARD H. SHRYOCK, Col. FREDERICK P. TODD
Ex Officio	CHIEF JUSTICE OF THE UNITED STATES SECRETARY, SMITHSONIAN INSTITUTION DIRECTOR, NATIONAL GALLERY OF ART

NATIONAL GALLERY OF ART

Trustees	EARL WARREN, Chief Justice of the United States, Chairman DEAN RUSK, Secretary of State HENRY H. FOWLER, Secretary of the Treasury S. DILLON RIPLEY, Secretary of the Smithsonian Institution PAUL MELLON, JOHN HAY WHITNEY, JOHN N. IRWIN II, LESSING J. ROSENWALD, FRANKLIN D. MURPHY

President	PAUL MELLON
Vice President	JOHN HAY WHITNEY
Secretary-Treasurer	ERNEST R. FEIDLER
Director	JOHN WALKER
Administrator	E. JAMES ADAMS
General Counsel	ERNEST R. FEIDLER
Chief Curator	PERRY B. COTT
Assistant Director	J. CARTER BROWN

JOHN F. KENNEDY CENTER FOR THE PERFORMING ARTS

Chairman	ROGER L. STEVENS
Officers	ROBERT O. ANDERSON, Vice Chairman
	SOL M. LINOWITZ, Vice Chairman
	RALPH E. BECKER, General Counsel
	DANIEL W. BELL, Treasurer
	K. LEMOYNE BILLINGS, Secretary
	PHILIP J. MULLIN, Assistant Secretary and Administrative Officer
	HERBERT D. LAWSON, Assistant Treasurer
	KENNETH BIRGFELD, Assistant Treasurer
	PAUL SELTZER, Assistant Treasurer
	L. CORRIN STRONG, Chairman Emeritus

INTERNATIONAL EXCHANGE SERVICE

Chief	J. A. COLLINS

Honorary Smithsonian Fellows, Associates, Collaborators, Custodians of Collections, and Honorary Curators

NATURAL SCIENCES

Anthropology	JOHN M. CAMPBELL (Archeology), Sister INEZ HILGER (Ethnology), C. G. HOLLAND (Archeology), NEIL M. JUDD (Archeology), OLGA LINARES DE SAPIR (Archeology), BETTY J. MEGGERS (Archeology), FRANK H. H. ROBERTS, JR. (Archeology),* MATTHEW W. STIRLING (Archeology), WILLIAM J. TOBIN (Physical Anthropology), DOUGLAS TAYLOR (Ethnology), THEODORE A. WERTIME (Archeology), NATHALIE F. S. WOODBURY (Archeology)

*Deceased February 23, 1966.

Vertebrate Zoology	JOHN W. ALDRICH (Birds), OLIVER L. AUSTIN, JR. (Birds), LEONARD CARMICHAEL (Psychology and Animal Behavior), HERBERT G. DEIGNAN (Birds), ROBERT W. FICKEN (Birds), HERBERT FRIEDMANN (Birds), LAURENCE IRVING (Birds), E. V. KOMAREK (Mammals), RICHARD H. MANVILLE (Mammals), EDGARDO MONDOLFI (Mammals), ROBERT B. PAINE (Birds), MICHAEL PALMIERI (Birds), DIOSCORO S. RABOR (Birds), LESTER L. SHORT (Birds), ALEXANDER WETMORE (Birds), JOHN G. WILLIAMS (Birds)
Invertebrate Zoology	WILLARD W. BECKLUND (Helminthology), J. BRUCE BREDIN (Biology), MAYBELLE H. CHITWOOD (Worms), AILSA M. CLARK (Marine Invertebrates), ELISABETH DEICHMANN (Echinoderms), WALDO L. SCHMITT (Marine Invertebrates), FRANK R. SCHWENGEL (Mollusks), GILBERT L. VOSS (Mollusks), Mrs. MILDRED STRATTON WILSON (Copepod Crustacea)
Entomology	WILLIAM H. ANDERSON (Coleoptera), DORIS H. BLAKE (Coleoptera), FRANK L. CAMPBELL (Insect Physiology), DOMICIANO DIAS (Insect Ecology), K. C. EMERSON (Mallophaga), FRANK M. HULL (Diptera), WILLIAM L. JELLISON (Siphonaptera, Anoplura), CARL F. W. MUESEBECK (Hymenoptera), THOMAS E. SNYDER (Isoptera), ROBERT TRAUB (Siphonaptera)
Botany	JOSE CUATRECASAS (Flora of Tropical South America), ELBERT L. LITTLE, JR. (Dendrology), FLOYD A. MCCLURE (Bamboos), KITTIE F. PARKER (Compositae), EGBERT H. WALKER (Myrsinaceae, Eastern Asian Floras)
Paleobiology	C. WYTHE COOKE (Intertebrate Paleontology), J. THOMAS DUTRO (Invertebrate Paleontology), REMINGTON KELLOGG (Vertebrate Paleontology), AXEL A. OLSSON (Invertebrate Paleontology), FRANCO RASETTI (Invertebrate Paleontology), WENDELL P. WOODRING (Invertebrate Paleontology)
Mineral Sciences	EDWARD P. HENDERSON (Meteorites), JOHN B. JAGO (Mineralogy), GUNNAR KULLERUD (Meteorites), ROSSER REEVES (Mineralogy), HARRY WINSTON (Mineralogy), WALDEMAR T. SCHALLER (Mineralogy)

National Zoological Park	JEAN DELACOUR, E. P. WALKER, CONSTANCE WARNER
Smithsonian Astrophysical Observatory	CHARLES G. ABBOT
Smithsonian Tropical Research Institute	CHARLES F. BENNETT, JR., ROBERT H. MACARTHUR, ERNST MAYR, GILES W. MEAD, W. JOHN SMITH, C. C. SOPER, MARTIN YOUNG
Exhibits	W. L. BROWN (Taxidermy)
Science and Technology	DEREK J. DE SOLLA PRICE
Arts and Manufactures	HANS SYZ (Ceramics)
Civil History	Mrs. ARTHUR M. GREENWOOD (Cultural History), ELMER C. HERBER (History), IVOR NOËL HUME (Cultural History), FRED W. MCKAY (Numismatics), Mrs. EMERY MAY NORWEB (Numismatics), R. HENRY NORWEB (Numismatics), Mrs. JOAN PEARSON WATKINS (Cultural History)
Armed Forces History	WILLIAM REA FURLONG, FREDERIC C. LANE, BYRON MCCANDLESS
Freer Gallery of Art	OLEG GRABAR, MAX LOEHR, KATHERINE N. RHOADES
National Air Museum	FREDERICK C. CRAWFORD, ALFRED V. VERVILLE
Smithsonian Press	PAUL H. OEHSER