SPECIAL EXHIBITION FUND

Jim Cornell said: Probably went to W.C. by now when I. Shapiro. (Latest date mentioned not sure 3-06-89

MAR 6 1989

Bureau or office	**Type of exhibition**
Smithsonian Astrophysical O...tation	___ temporary X permanent
Exhibition title	
A Design Concept for a Coor... Astronomy and Astrophysics ...sonian Partnership in	
Project director	
Dr. Frederick D. Seward	
Project administrator	
Mr. Richard Vannelli	617/495-7279
SEF request: $12,900	**Date exhibition opens:** 1990-1991
Total budget: $17,900	**Date exhibition closes:** N/A

Project summary (please do not exceed this space)

This proposal seeks funds to plan and design a public visitor area at the Harvard-Smithsonian Center for Astrophysics that will incorporate interpretative exhibits on modern astrophysics with the display of in situ instruments and artifacts linking current research to its historical roots. This area will be within the Sears Tower, a two-story structure housing the 15-inch "Great Refractor" of the Harvard College Observatory. Erected in 1846--the same year as the founding of the Smithsonian Institution--this building is now planned to be repaired and refurbished with support from the Massacnusetts Historical Commission and private sources. Once the building is deemed structurally sound, the interior spaces, including the observing room with its telescope, the "director's office," and the ground-level rotunda surrounding the telescope pier, can be developed as an unusual introduction to the history of American astronomy as seen through the parallel and related research of the Smithsonian and Harvard observatories. The exhibits and displays would be open to students, amateur astronomers, professional visitors, historians of science and architecture, and the general public, including the attendees of the Center's "Observatory Nights" and "Children's Nights" program.

Have you previously received funding from SEF for an exhibition, and, if so, when and how much?

No

Director's signature	**Date**
Irwin Snapiro	7 March 1989

SPECIAL EXHIBITION FUND

FACE SHEET

Bureau or office	Category	Type of exhibition
Smithsonian Astrophysical Observatory	X planning ___ implementation	___ temporary X permanent

Exhibition title

A Design Concept for a Coordinated Exhibit on the Harvard-Smithsonian Partnership in Astronomy and Astrophysics

Project director Dr. Frederick D. Seward	**Telephone number** 617/495-7282
Project administrator Mr. Richard Vannelli	**Telephone number** 617/495-7279
SEF request $12,900 **Total budget** $17,900	**Date exhibition opens:** 1990-1991 **Date exhibition closes:** N/A

Project summary (please do not exceed this space)

This proposal seeks funds to plan and design a public visitor area at the Harvard-Smithsonian Center for Astrophysics that will incorporate interpretative exhibits on modern astrophysics with the display of in situ instruments and artifacts linking current research to its historical roots. This area will be within the Sears Tower, a two-story structure housing the 15-inch "Great Refractor" of the Harvard College Observatory. Erected in 1846--the same year as the founding of the Smithsonian Institution--this building is now planned to be repaired and refurbished with support from the Massacnusetts Historical Commission and private sources. Once the building is deemed structurally sound, the interior spaces, including the observing room with its telescope, the "director's office," and the ground-level rotunda surrounding the telescope pier, can be developed as an unusual introduction to the history of American astronomy as seen through the parallel and related research of the Smithsonian and Harvard observatories. *The exhibits and displays would be open to students, amateur* astronomers, professional visitors, historians of science and architecture, and the general public, including the attendees of the Center's "Observatory Nights" and "Children's Nights" program.

Have you previously received funding from SEF for an exhibition, and, if so, when and how much?

No

Director's signature **Date**

Irwin Shapiro 7 March 1989

BUDGET--PLANNING

	Bureau contribution	Outside resources (Harvard)	Other SI resources	SEF request	Subtotals
1. SALARIES & BENEFITS *(category and % of total or hourly rate)*					
Scientific Consultants	200 hrs N/C	100 hrs N/C			
Writer-Researchers	300 hrs N/C	100 hrs N/C			
Conservation Architect				$1200	
Instrument Engineer				$1000	
Exhibit Designer				$4200	$6400
2. RESEARCH *(specify travel and other research related expenses)*					
Renovation/Repair Estimates		$500			
Historic Documentation	$1000				
Photographic Research	$ 500				
New Image Generation	$1500 (computer time)				$3500
3. OTHER					
Presentation Package Production				$5000	
Report Printing/Photography	$ 500			$1500	
Communications/Postage	$1000				$8000

Subtotals by resource	Amount
Bureau contribution	$4500
Outside resources	$ 500
Other SI resources	0
	$12,900

A Design Concept
for a
Coordinated Exhibit

on

THE HARVARD AND SMITHSONIAN PARTNERSHIP
IN ASTRONOMY AND ASTROPHYSICS
at the

Harvard-Smithsonian Center for Astrophysics
Cambridge, Massachusetts

A Planning Grant Proposal
to the
Special Exhibition Fund

Submitted to the
Office of the Assistant Secretary for Museums
Smithsonian Institution

Smithsonian Astrophysical Observatory
Cambridge, Massachusetts 02138

March 7, 1989

BACKGROUND

For more than 150 years, the histories of the Harvard College Observatory (HCO) and the Smithsonian Astrophysical Observatory (SAO) have been intimately entwined. President John Quincy Adams, an early and vocal advocate for American astronomy initially urged that the Smithson bequest be used to establish a national observatory, or, as he termed it, "a lighthouse of the skies." Upon returning to private life, Adams provided invaluable assistance to the fledgling HCO, helping to make it a preeminent research institution. The young Samuel Pierpont Langley worked at HCO as an observing assistant many years before he became the Smithsonian's fourth Secretary and founder of SAO. In 1955, SAO moved from Washington to Cambridge to share research and facilities with HCO. In 1973, this long and fruitful relationship was recognized by the formation of the Harvard-Smithsonian Center for Astrophysics (CfA), a joint enterprise under a single director.

Today, as HCO marks its sesquicentennial and SAO nears its centennial, there is an unusual opportunity to celebrate the roles these two pioneering observatories have played in American science. Harvard's proposed restoration of the Sears Tower at HCO will provide a unique site for linking the current astrophysical investigations of the modern CfA with the pioneering research of its two progenitors. This proposal seeks funds to design and plan interpretative exhibits on modern astrophysics in combination with <u>in situ</u> displays of historic instruments and artifacts. The goal is a coordinated educational exhibition that spans centuries of science and serves a variety of audiences, including students, amateur astronomers, professional visitors, historians of science and architecture, and the general public.

THE SEARS TOWER AND 15-INCH TELESCOPE

The oldest part of the complex now occupied by the CfA on Observatory Hill in Cambridge is the two-story-high "Sears Tower" housing Harvard's historic 15-inch (Great Refractor) telescope. The building was erected in 1846--the same year as the founding of the Smithsonian Institution--and the telescope was installed one year later. For the next twenty years, this beautiful, 20-foot-long, mahogany-veneered telescope was the largest in the United States.

Inside the tower, a granite pier supporting the telescope rises 43 feet to the observing floor under the dome. That pier is topped by an 11-ton solid granite block that carries the telescope and its mount. The 30-foot-diameter dome, weighing approximately 14 tons, was reputedly built by a whaling shipwright and is sheathed in copper. A velvet-upholstered observers chair once moved around the telescope on circular tracks and could be raised or lowered by a pulley system, so the observer could be put into position at the eyepiece. The entire system--telescope, dome, and observing chair--was a prime example of 19th Century craftsmanship.

Among its many early scientific triumphs, the refractor was used to discover the eighth satellite of Saturn and to make the first observation of Saturn's inner ring. The first photograph of a star (a daguerreotype of Vega) was made in 1850, and plates of many more followed thereafter. Ironically, photography contributed to the demise of the Great Refractor as a useful research tool, since its color correction and clock drive were ill-suited to the new photographic methods. Gradually, the instrument and its magnificent observing chair fell into decay, as did the building around it.

Recently, HCO began the fund-raising necessary for the restoration of the Sears Tower and its contents. The first, and most urgent, phase is the repair of the building and dome exterior, at a cost estimated to be $190,000. The second phase will be restoration of the historic telescope and other instruments as in situ displays and the installation of interpretative exhibits on modern astronomy.

As owner of the Sears Tower, HCO has accepted the responsibility for the structural restoration of the building. Thus, it has applied to the Massachusetts Historical Commission for a grant to support carpentry, masonry, exterior painting, roofing, and door and window repair. The first $50,000 of the required matching funds has been raised already by HCO from private sources.

INTERIOR SPACE: MODERN EXHIBITS AND HISTORICAL DISPLAYS

As a scientific partner of thirty years standing, SAO recognizes its obligation--and its advantage--in assisting HCO with the development of the Tower's interior spaces for public education and information programs. This proposal therefore seeks $12,900 to design and plan exhibits and displays within the refurbished Tower.

The overall design concept for the public areas within the Sears Tower encompasses three distinct spaces, each with a distinct function, and each representing a distinct era in American science.

The Observing Room: 19th Century Beneath the huge dome of the Sears Tower, the top-floor Observing Room houses the telescope and its observing chair. Ideally, to capture the spirit and style of the 19th Century builders, both

the instrument and its surrounding environment should be returned to their original states. Following standard restoration techniques, the instrument would be stripped of all modern additions and, whenever possible, authentic period gears and fittings reinstalled. Any repairs or replacements would be so marked for the benefit of future researchers.

The space would also be surveyed for possible installation of historical astronomical instruments on permanent or extended loan from the Harvard and Smithsonian collections.

The design plan for this space would include a review of past studies and a new site survey by an instrument expert of the possible approaches to restoring the telescope, mount and clock drive, the observer's chair and track, and the dome drive system. In addition, an analysis of the observing room's architectural elements and furnishings, with an assessment of the preservation techniques required, would be provided by a conservation architect. The surveys would produce a set of restoration options, with schedules and estimated costs.

<u>The Director's Office: 20th Century</u> Immediately below the Observing Room and just off a landing on the spiral staircase to the ground floor, there is a small room called the "Director's Office." If refurbished as a typical astronomer's office of the early 1900s, the room's centerpiece could be the famous "rotating desk" of E.C. Pickering. As fourth director of HCO, Pickering had a special lazy-susan-style desk constructed so he could work concurrently on several different projects, moving the separate piles of paper in front of him each time he switched subjects. (The actual table has

been preserved and is promised to HCO upon completion of this section.) Plexiglass barriers would allow visitors to enter at least part-way into the room. Artifacts and books now in storage at HCO could be integrated with photomurals of historic scenes from that era.

The design concept, to be developed by a conservation architect and historians of science, would include a floor plan, a guide to period furnishings and artifacts, and suggestions for maximum visibility and security.

<u>The Rotunda: 21st Century</u> The Rotunda is a circular room 28 feet in diameter set within the square walls of the Tower at ground level. The granite pier supporting the telescope is at the center of this chamber. The rotunda serves as a passageway between two buildings of the CfA which join the Tower on the east and west sides. It also serves as the entry to the historic telescope for public visitors during the monthly Observatory Nights and the twice-annual Children's Nights.

Four alcoves fill the space between the walls at the corners of the building. These presently hold very outdated exhibits on Halley's Comet, x-ray astronomy, optical tracking of meteors, and radio astronomy. Two of the alcoves have hoods that protrude into the walk space. Light boxes with (faded) transparencies line portions of the wall. Although some of the exhibits are moderately interesting, the overall impression is of a dark, cluttered place with dust-filled corners; an embarrassment to any organization associated with the Smithsonian.

[redacted] must be remodelled to create a large, [redacted]. The extraneous structures, such as the hoods and [redacted] need to be removed. Finally, the alcoves must be redesigned to [redacted], and, if possible, interactive exhibits that represent [redacted] research interests of the CfA.

In fact, since much of CfA's research is at the cutting edge of modern astrophysics, exhibits here might well describe projects and programs that reach into the 21st Century. Among the possible subjects: a survey of large-scale structure in the universe, the development of a submillimeter-wave telescope array, experiments planned for the Advanced X-ray Astrophysics Facility (AXAF), and large optical telescopes of the future. In each case, the exhibits should both inform the public of the CfA's leadership while educating them about the significance of the research.

The design concept should include detailed plans for three or four permanent (10- to 15-year lifetime) exhibits for the alcoves, as well as suggestions for temporary displays, including the possible illustrations, text, and models. The design plan would specify changes in structures, lighting, and interior decoration needed to enhance viewing of the exhibits within the limitations of the existing alcoves. Ideally, the designer will explore possible interactive exhibits, perhaps ones involving direct observation of astronomical objects from rooftop telescopes or the computer manipulation of data through the Image Processing Laboratory. Despite the topicality of subject matter, the design for this area should be coordinated with that for the other two areas. And provisions for making exhibits accessible for the hearing and seeing-impaired will be addressed.

(N.B. The Observatory Nights, a longtime community affairs program of the CfA, has produced a cadre of knowledgeable and concerned laypersons who might serve as an informal "review panel" for testing exhibit and display concepts. During these monthly evenings, we could display proposed exhibit plans and ask for suggestions on topics, or for comments on the clarity and conciseness of text and illustrations.)

SCHEDULE AND PERSONNEL

Fred Seward, Astrophysicist, SAO, will serve as Project Director and Richard Vannelli, SAO, as Administrator. Consultants and advisors to the project, with their specialties, include: Will Andrewes, Curator, Historical Scientific Instruments Collection, Harvard (artifacts); James Cornell, Publications Manager, SAO (public education and information); Owen Gingerich, Astronomer, SAO, and Professor of Astronomy and the History of Science, Harvard (science history); Edward Haack, Designer, Museum of Comparative Zoology, Harvard (exhibit design); Nathan Hazen, Engineer, Harvard (instrument restoration); and Patricia Weslowski, Director, Conservation Center, Society for Preservation of New England Antiquities (architecture and furnishings). The contributions to the project of Mr. Haack, Mr. Hazen, and Ms. Weslowski would be supported under this proposal. (See budget.)

The design for the interior (public) areas of the Sears Tower should be completed within six months of the receipt of grant. The final design concept will include detailed plans and cost estimates for implementation of exhibits and displays as well as a presentation package for potential donors.

VITA

FREDERICK DOWNING SEWARD

Astrophysicist

Education:

Princeton University, A.B., Physics (1953)
University of Rochester, Ph.D., Nuclear Physics (1958)

Positions Held:

1953-1958	Research and Teaching Assistant, University of Rochester
1958-1966	Research Scientist, Lawrence Livermore Laboratory
1967-1975	Group Leader, High Altitude Physics Group Lawrence Livermore Laboratory
1975-1976	Senior Visiting Fellow, University of Leicester and Mullard Space Science Laboratory
1977-	Astrophysicist, Harvard-Smithsonian Center for Astrophysics
Summer 1982	Guest Research Fellow of the Royal Society Institute of Astronomy, Cambridge, England
1984-	Harvard University - Lecturer

Professional Duties:

AEC/USAF Vela Satellite Scientific Overview Committee, 1961-67
NASA HEAO Instrument Proposal Review Committee, 1970,1973
NASA ASTP Instrument Proposal Review Committee, 1973
NASA Spacelab II Instrument Proposal Review Committee, 1977
NASA XTE Instrument Proposal Review Committee, 1978
NASA Spacelab Instrument Proposal Review Committee, 1979
NASA Einstein Observatory Guest Observer Proposal Review Committee, 1978-81
Einstein Observatory Users Committee, Chair, 1979-88
NASA High Energy Astrophysics Management Operations Working Group, 1984-86
Executive Committee, High Energy Division American Astronomical Society, 1984,5
SI Scholarly Studies Proposal Review Committee, 1985,6
ROSAT Users Committee, Member, 1985-
Executive Committee, Astrophysics Division, American Physical Society, 1987-89

Professional Societies:

Fellow, American Physical Society
American Astronomical Society

General Fields of Investigation:

Low Energy Nuclear and Photonuclear Reactions
Space Physics
X-ray Diagnostics of Laser plasmas
X-ray Astronomy

Curriculum vitae: William J. H. Andrewes

Position since September, 1987: Curator of the Collection of Historical Scientific Instruments, Harvard University.
Appointed the first David P. Wheatland Curator of the Collection in July 1988.

Born, England, 3 April 1950. Married, one son, one daughter.

BA with honors (Three-Dimensional Design) Kingston College of Art, 1972.

1966: Began clockmaking apprenticeship.

1969-1972: Worked under the guidance of George Daniels during the restoration of one of the first clocks made by John Harrison, the inventor of the first marine timekeeper. (Daniels is recognized as the greatest living watchmaker).

1973-1975: Taught design and clockmaking at Eton College.

1974: Commissioned by the Royal Mint to design and model a set of three medals to commemorate the tercentenary of the Old Royal Observatory at Greenwich.

1974-1976: Responsible for the conservation and restoration of the clocks at the Old Royal Observatory and National Maririme Museum

1977-1987: Curator of The Time Museum, Rockford, IL. During this period, this collection tripled in size and became recognized as having the most comprehensive collection of timekeeping devices in the world.

Feb. 1977: Commissioned by the National Maritime Museum to make a reconstruction of a Shelton journeyman clock. Now on permanent exhibition at the Old Royal Observatory at Greenwich.

1980-1987: Coordinator of the catalogues of The Time Museum's collection. Originally intended as a 40 volume series, these publications would have formed one of the most extensive scholarly publishing projects ever devoted to a single subject, involving over 20 authors from all over the world. Due to lack of funding, this project has been terminated at four volumes.

Member of the following societies:
Antiquarian Horological Society (USA);
Scientific Instrument Society (U.K.)

Honors:
1973 Recipient of the first British Crafts Advisory Committee Award.
1977 Elected Freeman of the Worshipful Company of Clockmakers.

Publications:

1979 "A Study of the Early Work of John Harrison," The Journal of the American Section of the Antiquarian Horological Society, vol. 1.

1983 The Time Museum--An Introduction. General introductory booklet on The Time Museum and the history of timekeeping devices, published by The Time Museum.

1984 "From Seasons to Picoseconds," Progress--the journal of the Museum of Science and Industry, Chicago, IL.

1985 "Time for the Astronomer 1484-1884," Vistas in Astronomy, Volume 28, Parts 1/2. Oxford: Pergamon Press.

1986 "Timekeeping in the Renaissance," From a lecture delivered at the Ringling Museum Symposium on Decorative Arts. To be published by the Ringling Museum, Sarasota, FL.

Jan. 1986 "The Time Museum--Its Past and Present," Horological Journal, vol. 128, no. 7.

1987 "The Contribution of Christiaan Huygens to the Development of Precision Clocks," from a lecture delivered at the VIth Scientific Instrument Symposium, Florence, Italy in Oct. 1986. (to be published)

1987 "A Description of the Precision Clocks in De Astronomica Specula by J.J. Marinonius." Translation from the Latin made in collaboration with Dr. Donald Martin, with an introduction on the history of the clocks described. (work in progress)

JAMES CORNELL
Harvard-Smithsonian Center for Astrophysics
60 Garden Street
Cambridge, MA 02138
617/495-7461

James Cornell is Publications Manager of the Harvard-Smithsonian Center for Astrophysics, Cambridge, Mass., where he is responsible for programs of both technical information and public education.

A graduate of Hamilton College (BA 1960) and Boston University (MS 1968), he worked for the Worcester (Mass.) Telegram and Gazette before joining the Smithsonian staff in 1963. His articles on astronomy, science, and travel have appeared in Smithsonian, Harvard, Science World, Sky and Telescope, the New York Times, the Boston Globe, and other periodicals. He contributes regularly as a book reviewer for the Quincy (Mass.) Patriot-Ledger.

Mr. Cornell is the author or editor of more than a dozen books, including THE FIRST STARGAZERS (Scribner's, 1981), THE GREAT INTERNATIONAL DISASTER BOOK (Scribner's, 1982), REVEALING THE UNIVERSE (MIT Press, 1982), ASTRONOMY FROM SPACE (MIT Press, 1983), INFINITE VISTAS (Scribner's, 1986), BUBBLES, VOIDS, AND BUMPS IN TIME (Cambridge University, 1989). He has produced and written several audio-visual shows for the Smithsonian Institution, including "The Electronic Sky" and "Visions of Einstein;" and he produced the exhibit "Light Paths" at the Whipple Observatory.

He is President of the International Science Writers Association and a member of the National Association of Science Writers, American Association of Museums Committee on Public Relations and Communications, and the AAAS. From 1976 to 1985, he was also a Lecturer in Science Communication at Suffolk University, Boston.

VITA
OWEN GINGERICH

Present Positions:

Senior Astronomer, Smithsonian Astrophysical Observatory
Professor of Astronomy and of the History of Science,
Harvard University

Education:

Goshen College, A.B. (1951)
Harvard University, A.M. (1953)
Harvard University, Ph.D. (1962)

Past Positions:

1953-55 Teaching Fellow, Harvard University
1955-58 Director, American University Observatory, Beirut, Lebanon
1957-58 Assistant Professor of Astronomy, American University of Beirut
1958-59 Lecturer in Astronomy, Wellesley College
1960-68 Lecturer, Harvard University
1962-86 Astrophysicist, Smithsonian Astrophysical Observatory
1968-69 Associate Professor, Harvard University
1969- Professor of Astronomy and of the History of Science,
Harvard University

Academies:

American Academy of Arts and Sciences
(Rumford Prize Committee)
American Philosophical Society (Vice President, 1982-85)
(Library Committee; chairman, Magellanic Premium Committee)
International Academy of the History of Science

Honors:

Phi Beta Kappa

John F. Lewis (1976) of the American Philosophical Society for an important paper at a meeting later published by the society, for "From Copernicus to Kepler: Heliocentrism as Model and as Reality."

Order of Merit, Commander Class, People's Republic of Poland, 1981

Harvard-Radcliffe Phi Beta Kappa Prize for Excellence in Teaching, 1984

Asteroid 2658 = 1980CK has been named "Gingerich" by the International Astronomical Union's Minor Planet Bureau.

Publications:

The complete bibliography lists 13 books edited, translated, or written by Owen Gingerich, over 100 technical or research articles, over 150 educational, encyclopedia or popular articles, and 100 reviews. One of the astrophysics papers has been cited over 500 times.

December 1987

EDWARD HAACK

Current Position

DIRECTOR OF EXHIBITS June 1979 to Present
The MUSEUM OF COMPARATIVE ZOOLOGY
Harvard University
Cambridge, MA 02138

Responsible for all activities related to the public exhibits: planning and design of new exhibits; label production for exhibits; maintenance of existing exhibits; monitoring of exhibit specimen condition (facilitates treatment of specimens); supervision of departmental staff; work schedules; purchase of materials and contract services.

Special Project

INSTALLATION COORDINATOR
HARVARD ART MUSEUMS June through October 1985

Responsible for the exhibit design and the installation of the nineteen galleries of the Fogg Art Museum during the complete renovation and reinstallation.

Relevant Experience

EXHIBIT CONSULTANT 1976 to present

Isabella Stewart Gardner Museum; Boston Museum of Fine Arts; the Old State House (Boston); Boston Zoological Society; the Paul Revere House; State Street Bank; Shreve Crump & Low Co.; Mineralogical Museum; Peabody Museum; Semitic Museum.

Education

B.A. American Studies - Pennsylvania State University 1969

Special Skills & Knowledge

Exhibition design, project administration, concerns of conservation, graphic design and production, construction, and manufacturing processes.

NATHAN L. HAZEN
50 Radcliffe Road
Weston, MA 02193
(617) 235-0712

Mr. Hazen is a mechanical engineer with over 30 years experience, 28 of which have been in the design and development of scientific instruments for astronomy, astrophysics, and atmospheric photochemistry. His specialties include conceptual design of new equipment, system and detail design, follow through in fabrication, integration, test and field application.

For the last 8 years, he has been Head Project Engineer with the Division of Applied Sciences of Harvard University, responsible for the above phases of a number of projects requiring flight instruments for stratospheric scientific balloons and high-altitude (ER-2) aircraft. In this work he has developed many novel systems and elements and has spent considerable time in the field on successful flight campaigns in Texas (NSBF), California (NASA ARC), Chile (Antarctic Ozone Hole) and Norway.

Prior to 1978 and a 2-year stint as Program Manager at Itek Optical Systems Division managing NASA-oriented new business areas, Mr. Hazen was with the Harvard College Observatory for 17 years. Here he was project engineer for a variety of satellite, balloon-borne, and ground-based instruments. In 1969, while a member of the observatory staff, he prepared a detailed engineering and structural analysis of the Sears Tower and its contents, with recommendation for the repair and restoration of the 15-inch telescope.

His experience also includes project management areas such as proposals, cost budgeting and analysis, schedule management including PERT, and subcontract management. He is the author or coauthor of 15 published technical papers and numerous studies, reports and proposals. He graduated from MIT with a BS in mechanical engineering, is Registered Professional Engineer in Massachusetts and a member of several professional societies.

The Great Refractor at Harvard College Observatory

In 1839 Merz and Mahler of Munich built a fifteen-inch refractor for the Pulkovo Observatory (outside of St. Petersburg), and eight years later they completed a duplicate for the Harvard College Observatory in Cambridge. By 1884 the Pulkovo instrument had been remounted, eliminating the original design, and in World War II the replacement mounting was itself destroyed. In contrast, the Great Refractor at Harvard still rests on its original 13-meter granite pier, remaining fully movable and virtually operative.

The Great Refractor saw its "first light" on June 24, 1847. In the next few years Harvard astronomers used it for the independent discovery of the inner or "crepe" ring of Saturn and its satellite Hyperion. George Phillips Bond's studies of Donati's Comet and the Great Nebula in Orion brought the first gold medal of the Royal Astronomical Society to be awarded to an American. Within four years of its installation, the Great Refractor had also taken the world's first daguerreotype of a star (α Lyrae), and before a decade was out it had taken the first wet plates of stars. In a sense, these pioneering experiments paved the way for its own obsolescence, because the long-focal-length visual lenses eventually proved ill-suited for photography. Nevertheless, the telescope was used extensively for photometry throughout the nineteenth century. During the twentieth century it found frequent use for public open nights. Alas, the ravages of time, and misguided attempts to modernize the telescope in the 1950s, have eroded or damaged the tube and its mounting, the magnificent observing chair, and the general surroundings.

In many instances historic old telescopes have simply been junked when they became obsolete for astronomical research. Fortunately the Harvard astronomy faculty has recognized the historic significance of the Great Refractor and its usefulness as a public exhibit, and has voted, despite the considerable expense, to seek ways to preserve and restore the instrument and its historical environment to its original 1850s splendor.

At present we have in hand $78,500 from the Perkin Fund in Connecticut and $40,000 from a private donor, which is not quite enough to carry out the complete the sheathing of the telescopes large copper dome and ancillary roof areas. We hope to raise the additional funds required so that it is not necessary to limit ourselves to some temporary and less desirable repair for this part of the project. We will eventually raise additional funds for the restoration of the telescope and its tube, the restoration of the ingenious observing chair and its track, the strengthening of the two cantilevered floors, the construction of two large secure exhibit cases in the northern alcoves, and new lighting that can be automatically controlled for a sound-and-light visitors' program in the dome.

Rough
Not Complete

RENOVATION OF THE SEARS TOWER, THE 15″ TELESCOPE, AND THE ROTUNDA

1 Introduction

One-hundred and forty years ago, the Harvard the "Great Refractor" was the largest telescope in the United States. For the past decade it has stood unused and immobile under the dome atop the two-story Sears Tower in Cambridge. The room below the telescope room, the Rotunda, presently contains four 1957-era exhibits and pictures of astronomical subjects which surround the granite supporting pier. This room serves as a rather dark passageway connecting two buildings. Over the years, there have been several plans to refurbish the telescope or the exhibits but very little has actually changed.

This report describes a plan to renovate the building, the telescope, and the exhibits to make a small, integrated, astronomy museum. The material will emphasize both historical accomplishments, and current projects at Harvard College Observatory and the Smithsonian Astrophysical Observatory. (These jointly form the Center for Astrophysics).

The overall design concept for the public areas encompasses three distinct spaces, each with a distinct function, and each representing a distinct era in American science. The old building and the magic of the old telescope will give visitors a sense of history and

an appreciation for the problems and techniques of astronomy in the 19th century. An office, located midway on the stairs between the first floor and the dome will be furnished as the director's office at the turn of the century. This will bridge the gap between old and new and will contain furniture and equipment used by local astronomers at that time. Exhibits illustrating modern astronomy will occupy four alcoves surrounding the pier in the Rotunda. A second small office at the foot of the stairs leading to the dome will contain an interactive computer display.

This report details the necessary renovations, the exhibits, the interior design, and the associated costs.

2 The Sears Tower

The oldest part of the complex, now occupied by the CfA on Observatory Hill in Cambridge, is the two-story-high "Sears Tower" housing Harvard's historic 15-inch (Great Refractor) telescope. The building was erected in 1846–the same year as the founding of the Smithsonian Institution–and the telescope was installed one year later. For the next twenty years, this beautiful, 20-foot-long, mahogany-veneered telescope was the largest in the United States.

Inside the tower, a granite pier supporting the telescope rises 43 feet to the observing floor under the dome. That pier is topped by an 11-ton solid granite block that carries the

telescope and its mount. The 30-foot-diameter dome, weighing approximately 14 tons, was reputedly built by a whaling shipwright and is sheathed in copper. A velvet-upholstered observer's chair once moved around the telescope on circular tracks and could be raised or lowered by a pulley system, so the observer could be put into position at the eyepiece. The entire system–telescope, dome, and observing chair–was a prime example of the 19th Century craftsmanship.

Among its many early scientific accomplishments, the refractor was used to discover the eighth satellite of Saturn and to make the first observation of Saturn's inner ring. The first photograph of a star (a daguerreotype of Vega) was made in 1850, and plates of many more followed thereafter. Ironically, photography contributed to the demise of the Great Refractor as a useful research tool, since its color correction and clock drive were ill-suited to the new photographic methods. Gradually, the instrument and its magnificent observing chair fell into decay, as did the building around it.

Exterior repair (cornice), dome repair, dome floor, Rotunda floor.

3 Telescope and Observing Room (to be restored to 1847-1866)

Beneath the huge dome of the Sears Tower, the top-floor Observing Room houses the telescope and its observing chair. To capture the spirit and style of the 19th Century builders, both the instrument and its surrounding environment will be returned to their

original states.

After the external work has been accomplished on the dome and the shutters, the first priority would be the telescope itself. A replica of the original clock drive has been completed, but there is not much sense in installing it now, since the telescope itself has to be dismounted for general repairs. The metal replacement section at the upper end of the tube will be replaced with a laminated mahogany veneer section. The motor drive from the declination axis will be removed. These changes will lighten the instrument and make it possible to remove most of the ugly set of lead counterweights near the eyepiece end.

The observing chair is in bad disrepair and needs to have fractured member replaced, new upholstery, and paint. It needs a fresh set of pulley ropes so that the chair can revolve around the dome. In conjunction with the restoration of the chair, the floor needs to be refitted, and the iron rails on which the chair moves have to be re-anchored.

Thus, the telescope and observing chair will be restored to operating condition. We are advised, however, that the chair will probably not stand up if used by every visitor. The dome shutter will also not remain watertight under continuous use. The restoration, therefore, is to "limited operation." The instrument could be available for observing on special occasions but not for open nights or on a regular basis.

The two alcoves on the northeast and northwest sides of the dome will be cleaned

out and fitted with special high-security plexiglas doors. The alcoves also need attractive indirect lighting for the exhibits to be chosen by Will Andrewes, curator of the Harvard Historical Scientific Instruments Collection. We expect to place an early brass telescope in the northwest alcove and a variety of nineteenth-century instruments in the northeast alcove. Robert Noyes has promised some original drawings of Donati's Comet, made with the 15-inch telescope, and it would be appropriate to place them in the northeast alcove. The Smithsonian is also purchasing a set of Trouvelot astronomical drawings. Since Trouvelot worked with the 15-inch telescope, it would be appropriate to frame a few of them to place on the walls of the dome, if the temperature extremes do not propose a problem with the plates.

After renovation is finished, we will install a sound-and-light program in the dome so that an automatic program will spotlight various parts of the telescope and exhibits in synchronism with a short soundtrack.

4 The Director's Office: (to be restored to 1905-1910)

Immediately below the Observing Room and just off a landing on the spiral staircase to the ground floor, there is a small room called the "Director's Office." This will be refurbished as a typical astronomer's office of the early 1900s. The room's centerpiece will be the famous "rotating desk" of E.C. Pickering. As fourth director of HCO, Pickering

had a special lazy-susan-style desk constructed so he could work concurrently on several different projects moving the separate piles of paper in front of him each time he switched subjects. The desk was later used by Harlow Shapley, and is now in the hands of his son, Alan Shapley, in Boulder, Colorado, but has been promised to us. There will be shipping fees for this and also for the two chairs from the residence, once owned by Bart J. Bok and now in the hands of Ray White in Tucson. We have recently received the candelabrum from Annie J. Cannon's family home, whose prisms inspired her to think about spectra. We expect to place the candelabrum and other artifacts in this room. A glass or plexiglas arrangement will be constructed to allow unobstructed viewing, but providing protection for the items displayed.

5 The Rotunda (Astronomy of the late 20th and 21st Centuries)

The Rotunda is a circular room 28 feet in diameter set within the square walls of the Tower at ground level. The granite pier supporting the telescope is at the center of this chamber. The Rotunda serves as a passageway between two buildings of the CfA which join the Tower on the east and west sides. It also serves as the entry to the historic telescope for public visitors during the monthly Observatory Nights and the twice-annual Children's Nights.

Four alcoves fill the space between the walls at the corners of the building. These

presently hold outdated exhibits on Halley's Comet, x-ray astronomy, optical tracking of meteors, and radio astronomy. Two of the alcoves have hoods that protrude into the walk space. Light boxes with (faded) transparencies line portions of the wall. Although some of the exhibits are moderately interesting, the overall impression is of a dark, cluttered place with dust-filled corners; rather an embarrassment to the Center.

This most public of spaces will be remodeled to create a large, cheerful, well-lit area. The stone pier, a feature of interest and beauty, will fill the center, and will not be obstructed by any unnecessary attachments. The modifications made in the 1950's will be removed, leaving the structure closer to its original configuration. Four exhibits, one in each alcove, will illustrate the work of the Center, and pique the curiosity of visitors.

The following modifications are necessary to accomplish this: The light boxes (with photos) and the supporting struts presently attached to the west wall will be removed. The hoods and elevated floor inside will be removed from the two east alcoves. The lights and wiring presently attached to the stone pier, will be removed. The two east alcoves (formerly with hoods) will be modified to the same form as the others. Floor, wooden wall, and window (so alcove is sealed and dust free) will be added. We will also install a box for small pictures and a brass rail below windows. The ceiling and walls will be painted a light color. New lighting is necessary for the exhibits. Heavy duty carpeting will cover the floor.

The black ceiling with stars and the amateurish murals over the east, west and south doors, would be painted over. The sun mural over and on the east door could be preserved, if desired. The milky-way mural over the north door is on plywood and will be removed and stored.

The Rotunda exhibits will be designed to impart to visitors some of the magic of astronomy and to illustrate the distribution of matter and radiation in the universe. The exhibit will illustrate current research at CfA, and will include historical contributions of HCO. Modern multiwavelength astronomy, will play a prominent role. The four alcoves will follow a common style so the Rotunda-as-a-whole is consistent and pleasing. The three-dimensional displays in each alcove will be semi-permanent (5-10 years) and maintenance free, but accompanying pictures and text will be arranged so that they can be changed often (yearly) with minimal effort.

WORK SUMMARY

15-Inch Telescope

1.	Extension of Wooden Tube	$ 9,500.00
2.	Metal Cleaning	$15,000.00

Metal cleaning will require the disassembly of the telescope, therefore it is advantageous to do this work when the wooden tube is extended. However, metal cleaning is not necessary for the successful repair of the wooden tube.

Observer's Chair

1.	Repair of the Chair Assembly	$10,000.00

This work should be done to prevent further damage to the chair and for safety reasons.

2.	Upholstery of the Observer's Chair Seat and Foot Rest	$ 3,000.00
3.	Cleaning of the Hand Railing	$ 800.00
4.	Identification of Paint on Observer's Chair Assembly	$ 600.00

from Ed Hacker ~ 15 April Not Complete

steam clean central pier	500
wash, prep. and paint walls (two coats)	
lower rotunda	5,300
upper rotunda	1,400
inside dome ?	3,900
floor underlayment - lower rotunda	1,920
carpet lower rotunda	2,600
electrical work rotunda and alcoves	9,000
lighting fixtures lower rotunda	2,700
lamps one year 100 @ 4.50	450
build fascia to conceal light strip	1,000
typesetting	250
silkscreens 24 @ 100 ea	2,400
photographs (40 ciba transparancies)	2,800
misc signs	200
graphic production artist 150 hr. @ 20/hr	3,000
24 lightboxes or edgelit panels	2,400
4 alcove models	4,000
model maker 400 hours @ 20/hr	8,000
prep A/V room	
exhibition	
director's office painting	
exhibition	
2 cases upper rotunda	10,000
refractor recorded program with light show	
display fixtures sci. instruments	500
lighting fixtures upper rotunda	1,200
alarm upper rotunda	
new dome machinery guard of expanded metal	150
installation	150
upper rotunda floor	
observer's chair restoration	

management of project