The Dibner Library of the History of Science and Technology at 25 Years:

Celebrating a Collector's Vision and Its Legacy

Smithsonian Institution Libraries

The Dibner Library of the History of Science and Technology at 25 Years:

Celebrating a Collector's Vision and Its Legacy

Library of Congress Cataloging-in-Publication Data

Gingerich, Owen.
The Dibner Library of the History of Science and Technology at 25 years : celebrating a collector's vision and its legacy / by Owen Gingerich ; with an essay by Roger Gaskell and an introduction by Ronald S. Brashear.
p. cm. — (Dibner Library lecture)
1. Dibner Library. 2. Libraries—Washington (D.C.)—Special collections—Science—Early works to 1800. 3. Dibner, Bern. 4. Scientific literature—Collectors and collecting. I. Gaskell, Roger. II. Title. III. Series.
Z733.D54 G56 2002
026'.5—dc21

2002004530

Published by the Smithsonian Institution Libraries
Design by Stephanie Firestone Design
Funding provided by The Dibner Fund
Printed in the United States of America

∞ The paper used in this publication meets the minimum requirements of the American National Standard for Permanence of Paper for Printed Library Materials Z39.48-1984.

Photo Credits

Front Cover
Michael Ventura Photography. All rights reserved.

Contributors Section
Photo of Ronald S. Brashear: Harold Dorwin, Office of Imaging and Photographic Services, Smithsonian Institution. Photo of David Dibner and Roger Gaskell: Hugh Talman, Office of Imaging and Photographic Services, Smithsonian Institution. Photo of David Dibner and Owen Gingerich: Hugh Talman, Office of Imaging and Photographic Services, Smithsonian Institution.

Introduction
Photo of National Museum of American History, Behring Center: Office of Imaging and Photographic Services, Smithsonian Institution. Portrait of Bern Dibner, 1957 by Lucerne Roberts: Office of Imaging and Photographic Services, Smithsonian Institution. Photo of the Dibner Library of the History of Science and Technology Reading Room: Savannah Schroll, Smithsonian Institution Libraries. Photo of Dr. Alberto Martinez: Harold Dorwin, Office of Imaging and Photographic Services, Smithsonian Institution.

From Collector to Reader
Figures 1 through 18: Harold Dorwin, Office of Imaging and Photographic Services, Smithsonian Institution.

Icons of Understanding
Figure 1 & Figures 3 through 6: Owen Gingerich. Figure 2: David Holbert, Imaging Center, Smithsonian Institution Libraries.

The Dibner Library of the History of Science and Technology at 25 Years:

Celebrating a Collector's Vision and Its Legacy

Icons of Understanding:
Celebrating Bern Dibner's Heralds of Science
by Owen Gingerich

Dibner Library Lecture
October 3, 2001

---

with an essay by Roger Gaskell
and an introduction by Ronald S. Brashear

Smithsonian Institution Libraries
Washington, DC

The Dibner Library
of the History of
Science and Technology

SMITHSONIAN INSTITUTION LIBRARIES

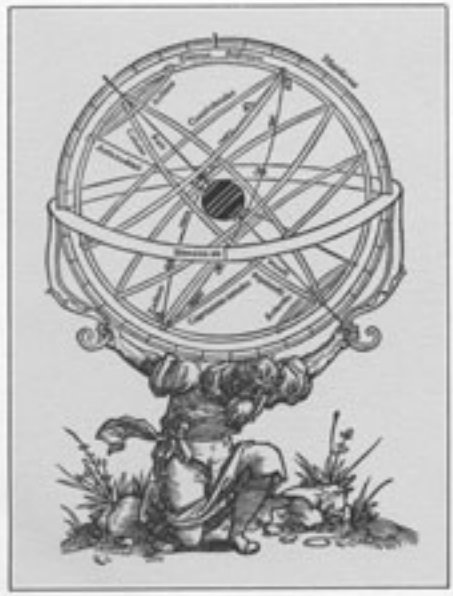

Table of Contents

Contributors

Ronald S. Brashear


Ronald S. Brashear

Ronald Brashear is the head of special collections and curator of science and technology rare books in the Smithsonian Institution Libraries' Dibner Library of the History of Science & Technology. Brashear came to the Smithsonian in 1998 from the Huntington Library, where he was curator of history of science, technology, and medicine, and institutional archivist for ten years. Ron received his B.A. and M.S. from the University of Louisville and spent four years at Johns Hopkins University studying for his Ph.D. in the history of science. He recently co-authored the book, *Star Struck: One Thousand Years of the Art and Science of Astronomy* (2001) and contributed articles for *History of Astronomy* (1997), *Instruments of Science* (1998), *American National Biography* (1999), and the *Oxford Companion to United States History* (2001).

Roger Gaskell


Roger Gaskell (left) with David Dibner

After studying biochemistry at the University of Bristol, Roger Gaskell worked for nine years for Bernard Quartich, Ltd, London's leading antiquarian booksellers. He then moved to Pickering and Chatto Ltd, for which he commissioned editions of the complete works of Malthus, Babbage, Darwin, and Boyle. His field specialties are science, medicine, and engineering. On leaving Pickering in 1979, he began his own business, producing a series of catalogs, which are widely regarded as the most scholarly in the field. In 1999, he took up a Short Term Fellowship at the Clark Library in California to research the bibliography of engraved plates. He is currently engaged in revising Fulton's Bibliography of Robert Boyle.

Owen Gingerich

Keynote speaker Owen Gingerich (left) with David Dibner, President of the Dibner Fund

Owen Gingerich holds a joint appointment as a senior astronomer *emeritus* at the Smithsonian Astrophysical Observatory and research professor of astronomy and the history of science at Harvard University. In the past three decades, Professor Gingerich has become a leading authority on the 17th-century German astronomer Johannes Kepler and on Nicholas Copernicus, the 16th-century cosmologist, who composed the heliocentric system. He has undertaken a personal survey of the first two editions of Copernicus' great book, *De revolutionibus* (1543; 1566) and has now seen 580 16th-century copies all over the world. His annotated census of these books will soon be published as a 434-page monograph. In recognition of these studies, he was awarded the Polish government's Order of Merit in 1981, and more recently, an asteroid has been named in his honor. Gingerich has given the George Darwin Lecture (the most prestigious lecture of the Royal Astronomical Society). Two anthologies of his essays have appeared, *The Great Copernicus Chase and Other Adventures in Astronomical History* from Cambridge University Press, and *The Eye of Heaven: Ptolemy, Copernicus, Kepler in the American Institute of Physics*, part of the Masters of Modern Physics series.

Professor Gingerich has been vice president of the American Philosophical Society (America's oldest scientific academy), and he has served as chairman of the U.S. National Committee of the International Astronomical Union. He has been a councilor of the American Astronomical Society and helped organize its Historical Astronomy Division. In 2000, he won its Doggett Prize for his contributions to the history of astronomy.

Foreword

n October 1976, the Dibner Library of the History of Science and Technology opened its doors in what was known as the National Museum of History and Technology, now the National Museum of American History, Behring Center. This event celebrated the most generous gift of collector Bern Dibner, through the Burndy Library, to the Smithsonian on the occasion of the nation's Bicentennial. The collection of 10,000 books and 1,600 manuscript groups, which had previously traveled to Washington, D.C., from the Burndy Library in Norwalk, Connecticut, has grown in breadth and depth to form one of the cornerstones of the Smithsonian Libraries' collections. In October 2001, the Dibner Library celebrated a quarter century of providing vital primary sources to scholars, curators, researchers, and members of the history of science community.

To mark this anniversary, on 3 October 2001, the Smithsonian Libraries held a series of lectures and an afternoon symposium at the National Museum of American History, Behring Center. In his opening remarks, the Libraries' Head of Special Collections, Ronald Brashear, charted the development of science and technology research at the Smithsonian and detailed the transformation of Bern Dibner's bequest into the Dibner Library of the History of Science and Technology. The symposium that followed, titled *Exploring the Past, Shaping the Future: The Dibner Library of the History of Science and Technology at 25 Years*, speculated on the course of research in the new millennium and appraised the library's continued value to this scholarship. The symposium panel comprised a cross-section of intellectuals, who have benefited directly from Bern Dibner's gift and subsequent acquisitions that further enhanced Dibner's collecting acumen. This group included former Dibner Library Resident Scholars, Smithsonian curators, independent scholars, and academicians.

Two distinguished speakers, whose reflections on Bern Dibner's life and the impact of his collecting practices on his contemporaries are reproduced in the following pages, came to the Smithsonian Libraries to join in the celebrations. Eminent book dealer and scholar, Roger Gaskell, delivered a lecture titled, "From Collector to Reader: Bern Dibner and

History of Science Collections," which dovetailed wonderfully with the topic of the annual Dibner Library Lecture, delivered by Harvard Professor and Smithsonian Astrophysical Observatory's Senior Astronomer *Emeritus*, Owen Gingerich. His "Icons of Understanding: Celebrating Bern Dibner's Heralds of Science" provides evidence of the quality and breadth of Bern Dibner's collections and offers vital insight into comparable library histories. I hope that you enjoy the fascinating narratives that unfold within these pages.

The Smithsonian Libraries is deeply grateful to The Dibner Fund for supporting the lecture series, its publications, and the successful Resident Scholar program. We look forward to many more years of providing inspiration and intellectual support to the scholarly community.

Nancy E. Gwinn
Director
Smithsonian Institution Libraries
October 2001

Introduction

The Dibner Library of the History of Science and Technology

By Ronald S. Brashear, Head of Special Collections
Smithsonian Institution Libraries

This twenty-fifth anniversary symposium presents us with an opportunity to reflect on what the Dibner Library represents to the Smithsonian Institution, the scholarly world, and the nation. With our speakers and panelists we will look at the Dibner Library, other libraries like it, and what we can do to maintain our collections in order to further research and the public understanding of science and technology.

First, I want to tell you about this magnificent collection here at the Smithsonian and set the stage for the speakers who follow. Please bear with me, and I hope that those who know little about the Dibner Library of the History of Science and Technology will understand what we have and what we do. And for those of you who know a good deal about the Library, well maybe I can surprise you with a few tidbits.

The story of the development of history of science and technology at the Smithsonian is told exceedingly well by Pamela Henson of the Smithsonian Institution Archives in her article, "'Objects of Curious Research:' The History of Science and Technology at the Smithsonian," in a special supplement to *Isis,* the journal of the History of Science Society.[1] For our purposes, I want to look at the critical moment at which the study of history of science and technology really took off at the Smithsonian Institution—the authorization of this museum, as the Museum of History and Technology in 1954. The Museum came about thanks to many, but particularly due to the efforts of the Head Curator of the Smithsonian Department of Science and Industry, Frank Taylor, his colleagues, a supportive Congress and President, and the Smithsonian Secretary, Leonard Carmichael. Taylor and Carmichael built up the collections and

[1] See Pamela M. Henson, "Objects of Curious Research: The History of Science and Technology at the Smithsonian," *Isis* 90 (1999): S249-S269.

hired university-trained historians, and the first Ph.D. historian at the Smithsonian was Robert P. Multhauf. Others came along in swift succession, including Silvio Bedini and Uta Merzbach. The journals *Isis,* and *Technology and Culture* were soon being edited out of the Museum, which truly became one of the national centers for history of science and technology.

The National Museum of American History, Behring Center on the National Mall in Washington, D.C. The Dibner Library of the History of Science Technology is located on the first floor, west wing.

When Secretary S. Dillon Ripley started in 1964, he helped create the predoctoral and postdoctoral fellowship programs that enhanced the research of the Smithsonian staff, and this program continues to breath life into the Institution. Over the years, the history of science and technology thrived as new staff joined the Museum and brought new ideas and approaches to the study of the discipline. The Smithsonian was truly the place to be to do history of science and technology.

But even though the Smithsonian had been around for over one hundred years by then, and had amassed an excellent collection of scientific instruments, it had no comparable great library to support the research of the staff or to draw in scholars from elsewhere. The Smithsonian had a library, true, but much of the earlier works were at the Library of Congress as the Smithsonian Deposit, and there was no real collection of primary research sources, apart from a few rare books in the Museum divisions. When Silvio Bedini once noted this sad state of affairs, Secretary Ripley suggested that Dr. Bedini try to find one. Not a man to pass up an opportunity, even if it originated in a light-hearted comment, Dr. Bedini took up the challenge. In a perfect world, the clear choice would be the unparalleled science and technology book collection put together by Bern Dibner, well-known to all scholars, especially because Dr. Dibner was a leading figure in the History of Science Society and because of the research library building built by Bern Dibner to house the collection: the Burndy Library in Norwalk, Connecticut. Happily, and through the efforts of the well-respected book dealer Jake Zeitlin of Los Angeles, the two parties came together, and the great patriotism

Visionary collector Dr. Bern Dibner

of Dr. Dibner helped him see the value of presenting his books to the Smithsonian and the nation in return for the opportunities and benefits he received as a citizen of the United States. After some negotiation, Bern Dibner gave some ten thousand (one-fourth of his entire collection) of his most rare and precious books, along with many manuscripts, portraits, and commemorative medals, to the Smithsonian, and in October 1976, the new Dibner Library of the History of Science and Technology opened its doors on the first floor of the National Museum of American History, at the time known as the National Museum of History and Technology. The Dibner Library was the first rare book library of the Smithsonian Institution Libraries. The collection stands among the great scientific libraries in the United States and forms not only a marvelous research library, but also a collection of artifacts of printing that connects us directly to the great and not-so-great minds that make up the rich tapestry of Western science and technology. The works of Aristotle, Copernicus, Galileo, Newton, Franklin, Watt, Edison, Eiffel, Einstein, and countless others are all found in the Dibner Library. The connection that these works provide to the history of science and technology is necessary for us to understand who we are and how we got here.

The original gift from Dr. Dibner's Burndy Library was and still is the heart of the Dibner Library. The Burndy gift is, to my mind, priceless, and comprehensive in its scope. We will hear more as the day goes on about the works that make up the library and how they were collected: the "Heralds of Science" that reflect the great achievements of Western science and technology; the 320 science incunabula, or books printed in the fifteenth century, one of the largest such collections anywhere; the many special "association" copies of books owned by noted scientists with their notes scribbled in; the approximately 1,600 manuscript groups consisting of letters and documents in the handwriting of figures such as Newton, Galileo, Einstein, and many others. The strength of the collection is in the disciplines of mathematics, astronomy, theoretical and experimental physics, electricity and magnetism, classical, medieval, and renaissance natural philosophy, chemistry, earth sciences, technology,

industry, and engineering, including electrical, mechanical, and civil engineering. That's all.

This original gift started the Dibner Library, but it has become so much more than that. Thankfully, the Smithsonian Libraries realizes that a research library needs to be developed and expanded to keep it alive and relevant. To leave it as it was to sit there over the decades would be to invite a stagnant feeling and let the Library fade into obscurity. Therefore, I am happy to say that the Library has more than doubled the size of its holdings thanks to gifts and purchases. A number of works were already in the Smithsonian; the creation of the Dibner Library allowed us a place to collect these works, providing a secure location and an improved research environment. It also enabled a number of Bern Dibner's works to be returned to the Burndy Library, since we already held copies of them at the Smithsonian. Certainly the largest contingent of early scientific and technical books came from the gift of 40,000 volumes of journals and monographs from the U.S. Patent Office Scientific Library. Searching through the international database OCLC for a number of these works indicates how rare many of these patent office books are. Many of the nineteenth-century European titles now in the United States are often only to be found in the Dibner Library. Gifts from the legacy collections of other federal libraries found their way to us: titles from the Bureau of Railway Economics, the Department of State, the U.S. Military Academy, and the U.S. Naval Observatory are not uncommon in the Dibner Library. Other gifts from private collectors to the Smithsonian have included significant libraries, and these have been excellent additions to the Dibner Library: the John Draper library, the Oscar Richards microscopy collection, the James Arthur horology collection, and the Squibb collection of alchemy books.

Because of the Smithsonian's involvement in the U.S. exhibitions at many of the world's fairs and international expositions between 1876 and 1914, the Smithsonian Libraries has a marvelous collection of printed publications including jury reports, photograph albums, souvenir booklets, exhibitors' catalogs, public guidebooks, and special magazine issues relating to these fairs, showing how they were planned and operated. A large bulk of the scientific, industrial, and technical exhibition materials are now part of the Dibner Library's collection. This collection has been enhanced by the addition of the printed materials from the collections of Larry Zim and Edward J. Orth, which add important materials from later fairs, up through the 1986 Vancouver World Exposition.

Over the years, the gifts and transfers have more than doubled the size of the original gift. But what was also needed was a source of income that would allow the purchase of needed volumes when they became available through book dealers and auctions. In 1994, the sale of a few duplicate gift copies of books and plates by John Gould provided the seed money for an acquisitions endowment that yields a regular

The reading room of the Dibner Library of the History of Science and Technology. A window at the rear of the space provides a glimpse of the library's vast rare book and manuscript holdings.

source of income for the Dibner Library and Smithsonian Libraries' Special Collections. Naturally, the amount provided is not staggering, but it does enable us to buy, through catalogs, several moderately priced rare books that will enhance our collections. Naturally, we would like to increase the acquisitions fund to enable us to buy the significant works that we are lacking but that are out of our price range. But with increased acquisitions money comes a responsibility to purchase wisely. We have a collection development policy in place that ensures that we buy works that strengthen our collection and that are not duplicated by nearby institutions. We also know that purchasing rare books is just as important as preserving and conserving them, so we are also hoping to increase funding for preservation hand in hand with acquisitions. At least that's my plan!

The nature of the Dibner Library collections makes it a truly remarkable library. In a way, it would be a shame to have it serve just as a research library for the Smithsonian staff and fellows. There is so much more that it has to offer, both to scholars and the general public alike. The Library belongs to the nation, and we are obligated to share its riches with as many as we can. In order to involve the outside scholarly world and to make them more aware of our resources, we are planning to become more active in scholarly circles. This includes going to their meetings, publishing in their newsletters, and sending our publications to their membership. We will also start having better and more frequent communication with regional universities and other research libraries whose collections we complement. One of the best programs that we have

started along these lines is our Resident Scholar Program. Thanks to The Dibner Fund, in 1992, we started a program that awards research grants to scholars, who would be able to make use of an extended stay in the Dibner Library for their research. Every year we call for proposals of short term (one to three months) research projects for review by a committee and award the best with cash to help defray costs of travel and living expenses. The program is going strong, and we now offer a total of twelve months of awards with a stipend of $2,500 per month. We have seen the quality of proposals increase, and after ten years, I think we can declare the Resident Scholar Program a success. Having the scholars in the library helps in many intangible ways as well, including the simple act of their learning more about the Library and taking this news back to their colleagues. We in turn, learn much more about our collections from talking with the people who spend weeks just working with the books. This kind of interaction is invaluable and shows how collections at the Smithsonian can help on a nationwide scale.

2001 Resident Scholar Dr. Alberto Martinez working in the Dibner Library reading room

Beyond the scholars, we are doing more to interact with the public at large. In the headier times when this museum was started, it seemed like science and technology was a panacea that would lead us to a near-utopian world. Although that has changed, there is still a fascination with science and technology that exists and is still reflected in the Smithsonian Institution, but it is no longer confined to one museum. The Dibner Library has a collection that, by its nature, provides us with a direct link to times when science and technology provided great breakthroughs, fascinating little developments, and even failure and fraud, stories which are no less fascinating than the successes. We are fortunate to have an exhibition space that allows the Smithsonian Libraries to share our collections with the public. We also are developing our Web site and have already had an exhibition travel to New York. The opportunities are there to let the public see our books not only as transmitters of information but also as the touchstones to dramatic moments in our history.

The collection formed by Bern Dibner and developed by the Smithsonian Libraries is a truly remarkable one that we will hear more about today, and clearly has the potential to be among the forces in our increase and diffusion of knowledge.

From Collector to Reader: *Bern Dibner and History of Science Collections*

By Roger Gaskell

Introduction

My title is chosen in memory of my father, the bibliographer Philip Gaskell, who died of cancer on the 31st of July this year at the age of 75. I grew up surrounded by printing presses and old books, and when I visited my father at work, it was in the special collections department of Glasgow University Library, or the Wren Library of Trinity College, Cambridge. I suppose everyone who loses a parent regrets that he did not fully appreciate him, and learn all they could from him while he was alive. As a schoolboy, who found biology easier than literature, and then a student of biochemistry at university, I did not appreciate the importance of what my father was doing. So I do not claim any special understanding as a result of my upbringing. But I have benefited, as all of us have in the world of books, whether consciously or not, from his enormous contributions to the history of books. He was the first editor of *The Book Collector* from its inception in 1952 and 20 years later published the book for which he is best known, *A New Introduction to Bibliography*. To quote from the *Times* obituary:

> 'Sooner or later most literary students and historians find that bibliographical information gives crucial insights into the what, why and how of anything from Shakespeare's coinages to the economics of Victorian advertising. Since its publication in 1972, Philip Gaskell's *New Introduction to Bibliography* has been the standard manual and point of reference, explaining in exacting detail just about everything that can be derived from a book short of actually reading it[1].'

† British punctuation and spelling standards have been maintained in this essay.

†† All books illustrated in this essay can be found in the Dibner Library of the History of Science and Technology, Smithsonian Institution Libraries.

[1] *The Times*, Monday 13 August 2001, p. 15; Philip Gaskell, *A New Introduction to Bibliography* (Oxford 1972, reprinted with corrections 1974).

In *From Writer to Reader*, published in 1978, the book from which I have adapted my title, Philip Gaskell demonstrated the use of bibliography in textual criticism. This was followed by his *Trinity College Library: the First 150 Years* (1980). His trilogy, the *New Introduction to Bibliography*, *From Writer to Reader* and *Trinity College Library* thus tell the story of how books are made, how they transmit texts, and how they are organised in a library.

My talk is called 'From Collector to Reader' because I want to discuss the ways that books are brought together, and made available to readers. I will show that book collecting is integral to the history of science—nowhere more so than in Dibner's case.

In the first part of this essay I will describe Bern Dibner's career as a collector and his contributions to the history of science, and in the second part I will outline the history of collecting science books.

Bern Dibner (1897–1988)

Several significant anniversaries in the history of science have been celebrated in the last few years, and these help to place Dibner's career in the context of the development of the history of science, which he did so much to encourage. We have passed the 75th anniversary of the founding in America of the History of Science Society in 1924; the 50th anniversary of the British Society for the History of Science, founded in 1947; and the 50th anniversary of the founding of the DeGolyer Collection at the University of Oklahoma, which prompted the establishment of one of the first academic departments for the history of science in America[2]. *Isis*, the leading journal for the history of science, had been founded by George Sarton in Belgium in 1909, and it was to support the journal's publication that the History of Science Society was begun. The British journal, *Annals of Science* was founded in 1936. By the middle years of the twentieth century, history of science, on both sides of the Atlantic, had acquired the three essentials for a professional academic discipline: journals, professional societies, and university departments.

Bern Dibner's company, the Burndy Corporation was founded in 1924, the same year as the History of Science Society. He was inspired to start collecting by reading a book about Leonardo da Vinci in 1930 and the Burndy Library was chartered as a non-profit-making educational institution in 1941. This catalogue of dates shows how prescient Dibner was in embracing the history of science and making his books available for study to the fledgling history of science community. The development of history of science into a major university subject has all taken place in the last 50 years.

[2] The American and British Societies have both published collections of essays on their history: Margaret W. Rossiter, ed. *Catching Up with the Vision: Essays on the Occasion of the 75th Anniversary of the Founding of the History of Science Society* (Supplement to *Isis* 90, 1999); *British Society for the History of Science, 1947–97: A Special Issue* (*BJHS* 30, pt. 1, 1997). Marilyn B. Ogilvie has written a short history of the collections at Oklahoma, http://libraries.ou.edu/depts/histscience/collections/history.html, and is working on a fuller history.

Bern Dibner was a successful engineer and businessman[3]. Arriving with his family in the United States at the age of seven, the youngest of eight children, he attended the Hebrew Technical Institute in Manhattan, a school designed to train immigrant boys to become technicians. He took an electrical maintenance job in the printing industry where workmen's compensation for an industrial accident gave him enough money to enroll in the Polytechnic Institute of Brooklyn. After graduating in 1921, he worked in the electric power industry for only three years before setting up his own business, the Burndy Corporation, in partnership with his brother-in-law, to manufacture connectors for the electrical power supply industry. Six years later, in 1930, Dibner read the book that changed his life, Stuart Chase's *Men and Machines*, which listed Leonardo da Vinci's major scientific achievements and technical inventions. Dibner was astonished and dismayed; he had no idea that engineering and technology were so far advanced in the late fifteenth century. He felt he had been denied an acquaintance with the background to his own field and its development. As he later said, he felt deprived of his own heritage[4]. Nonetheless, he was skeptical of some of the extravagant claims being made for Leonardo as an inventor and set out to read everything he could about Leonardo and his contributions. This was the start of Dibner's collecting and his deep commitment to the history of science.

Dibner was an avid student. He traveled in Europe to study the history of science. Later he enrolled as a special student at Columbia University, where he was taught history of science by Frederick D. Barry, Carl Boyer and Edward Rosen. He also learnt some Latin[5]. Bern Dibner was discovering the heritage he had been denied, and he was collecting books under the guidance of knowledgeable book dealers in Europe and the United States, whose contributions Dibner was always generous in acknowledging.

[3] For biographical details on Bern Dibner and his collecting, see the following: *Octavo* (The Society of Bibliophiles at Brandeis University, Occasional communication number 4, 1973) containing the following: Jacob Zeitlin 'Bern Dibner as Friend and Collector,' 4–5; Lloyd E. Hawes, 'Bern Dibner—Twentieth Century Humanist,' 6–10; David R. Watkins, 'The Burndy Library and its Founder,' 11–13; David S. Berkowitz, 'On Collecting Vinciana: The Dibner Collection at Brandeis University,' 14–20. I. Bernard Cohen, 'Award of the 1976 Sarton Medal to Bern Dibner' *Isis* 68 (1977) 610–615 on 610. Gerald Holton and S.S. Schweber, 'Eloge: Bern Dibner, 1878 [sic] –1988 *Isis* 79, 475–477. Henry Petroski, 'From Connections to Collections' *American Scientist* 86 (1998) 416–420.

[4] Cohen, *op. cit.* 610.

[5] *ibid* 612.

Bern Dibner's collections

Bern Dibner's growing collection of books and manuscripts was first housed in metal boxes in his office in the factory, but books gradually spilled out into bookcases in the offices of colleagues and in the corridors. When the plant moved to an eleven acre site in Norwalk, Connecticut in 1951, collections were housed in conference rooms called the Newton Room, the Einstein Room, the Galileo Room and the Leonardo Room. By this time, the collection was known as the Burndy Library and was chartered as an educational institution in 1941. It was time to separate it from the engineering business, and in 1964, a freestanding building was erected to house the 25,000 volumes then in the collection[6].

The Burndy Library building was a light and airy construction of great charm and modest elegance designed by a local architect, Robert Rogus of the Stamford, Connecticut firm of Sherwood, Mills and Smith[7]. It was a modernist building, speaking the language of modern humanism, very different from the faux-Renaissance, faux-Louis XV; faux-baronial, or faux-what-you-will usually favoured, if you'll forgive my saying so, by American collectors. It looked forward, not back and perfectly suited Dibner's vision of historical research in the service of the modern world; not an antiquarian's shrine, but a place in which to study and understand the contributions of scientists and engineers towards, as he saw it, the creation of a better world.

Beginning in 1945, the library published an annual monograph, twenty-one of which were written by Dibner himself. Several of these were also published commercially[8]. The best known of Dibner's works, is *The Heralds of Science*, first published in 1955, a scholarly and lucidly annotated catalogue expounding on the importance of 200 seminal works in the biological and physical sciences[9].

Even more important than Dibner's own contributions to the

[6] Bern Dibner, *The Burndy Library in Mitosis* (Burndy Library, Norwalk, Ct., 1977, reprinted from the *Book Collector*, Winter, 1977: the reprint contains photographs of the building not in the original article. According to Holton and Schweber the collection was then 40,000 volumes.

[7] Petroski, *op. cit.* 417–8 and fig. 3.

[8] Dibner, *op. cit.* 5,6.

[9] Bern Dibner, *Heralds of Science as Represented by Two Hundred Epochal Books and Pamphlets Selected from the Burndy Library.* (Burndy Library, Norwalk, CT, 1955, reprinted 1961 and MIT Press, Cambridge, MA, 1969; revised edition, Burndy Library, Norwalk, CT, 1980).

literature of the history of science, Dibner's energy and generosity were of enormous value in the establishment of the history of science as an academic discipline. He endowed several chairs and curatorships, including one at the Hebrew University in Jerusalem, and paid for the building of the Bern Dibner library at the Polytechnic University in Brooklyn. He led the drive to secure the financial future of *Isis*, every issue of which carries a modest notice that, since 1984, its publication has been supported in part by an endowment from the Dibner Fund[10]. The culmination of his efforts on behalf of the history of science was the founding of the Dibner Institute for the History of Science and Technology on the MIT campus in Cambridge. Dibner helped to plan the institute and took part in the inaugural meeting on 6 December 1987. He spoke with personal satisfaction of having been able to witness the growth of the history of science as a discipline from its infancy to its present vitality[11].

Above all, Dibner was a truly great book collector. The scope of his collecting was immense. Within the context of a very large library, he gathered together over 320 incunables (one of the largest collection of scientific incunables anywhere), the collection of seminal works that is described in *Heralds of Science*, large quantities of important manuscript material, and portraits and prints. Moreover he secured, by purchase and as gifts, the libraries of a number of major scientists. These included over two hundred books from Alessandro Volta's library and 250 volumes and hundreds of pamphlets from the library of the English physicist John Tyndall (Figures 1 to 3). Dibner was also able to acquire the superb library and offprint collection of the Italian mathematician Vito Volterra (1860–1940), which he donated to Brandeis University, together with a major Leonardo da Vinci collection. He also made substantial contributions of books to Harvard, Yale, and other universities.

Ten thousand volumes of printed books and all the manuscripts, the cream of the collection housed at the Burndy Library in Norwalk, Connecticut, came to the Smithsonian Institution in 1976. The printed books include the 320-title incunable collection and all 200 'Heralds'. These books form the foundation of the Dibner Library of the History of Science and Technology, located in the National Museum of American History.

After the departure of the Smithsonian books, Bern Dibner immediately set about replacing as many as possible, adding many ancillary works. As an electrical engineer, Dibner was especially interested in the history of electricity and magnetism, and his collection of 13,000 volumes in this area, mostly printed before 1900, is one of the largest of its

[10] Michael M. Sokal, 'The History of Science Society, 1970–1999: from Subscription Agency to Professional Society' *Isis* 90, Supplement (1999) S135–181 on 137, 141, 156–7, 165 and 211.
[11] Holton and Schweber, *op. cit.* note 3, 477.

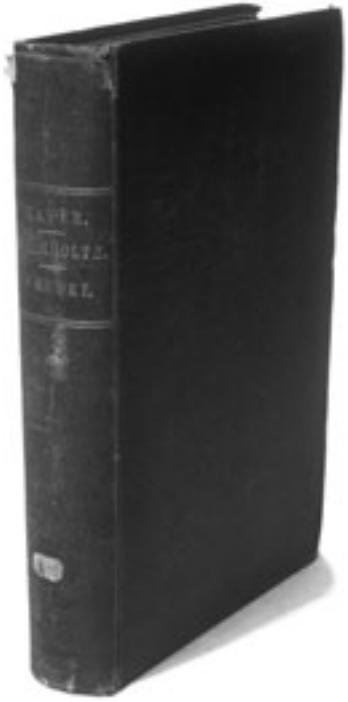

Figure 1
A volume from the library of John Tyndall (1820–1893) containing five tracts on matter and motion. Tyndall himself probably determined the contents of the volume, which serves as an important demonstration of the way he chose to organise his collection.

Figure 2
Julius Robert von Mayer (1814–1878) *Bemerkungen Über das mechanische Aequivalent der Wärme* (Heilbronn, 1851), Dibner 'Herald' no. 157. This is one of the pamphlets in the volume owned by John Tyndall that is illustrated in figure 1; before Tyndall, it was owned by Heinrich Debus (1824–1916). Mayer did important work in thermodynamics, which Tyndall drew attention to when he translated several of Mayer's papers.

Figure 3
Pencil notes by John Tyndall in the volume illustrated in figure 1.

kind. The Burndy Library became the research collection of the Dibner Institute in Cambridge and now includes the Babson Newton collection, on deposit from Babson College, and the Volterra collection transferred from Brandeis. The only sad thing is that the lovely Burndy Library building in Norwalk was torn down after the site was sold to an office equipment company.

In recognition of Bern Dibner's support for the profession and for the foundation of two great research libraries, the History of Science Society awarded him its Sarton Medal in 1976. It bears the inscription: 'To Foster the Study of the History of Science'[12]. Dibner did this with seriousness; he was no mere dilettante, but an amateur in the best sense of the word. His historical research was inspired by his book collecting, and it was through books that he made friends with many leading figures in the history of science, regularly lending rare books to scholars for their private use. Books and manuscripts inspired him to make a deep and lasting contribution to the study of the history of science.

[12] Cohen, *op. cit.* note 3, 615.

Collectors of scientific books

The Dibner Library of the History of Science and Technology is a rich resource for studying the history of collecting science books. This is greatly helped by the excellent catalogue, available on-line, which includes extensive provenance notes[13]. A keyword search for the terms 'former owner' throws up 1024 records for which provenance information has been recorded[14]—but what of the many thousand more books in the collection, in which former generations have not recorded their ownership, or the marks of ownership have not yet been deciphered and recorded? Even if former owners leave no marks in their books, the content of their libraries is sometimes known from catalogues prepared for personal use, probate valuations, or auction or bookseller's catalogues. A former librarian of the Dibner Library of the History of Science and Technology, the late and much missed Ellen Wells, published a pioneering bibliography of secondary sources relating to scientist's libraries in 1983. Wells unearthed catalogues and other material relating to 880 scientists' libraries; more recent research has added many more[15].

From the Renaissance to the close of the eighteenth century, science was the province of all educated men and women (Figure 4). Anyone building a private library could be expected to include what we would now classify as scientific books. To a large extent this was a consequence of the close alliance between natural science and the collecting of cabinets of curiosity, which demonstrated the wealth, intellectual attainments and connoisseurship of the owner. A scholar, a doctor, or a natural philosopher on the other hand might have built up a library for his own use, because he needed to have the books to study. There was probably no public or university library, which had all the books he wanted to work on, particularly the most recently published. Just as any academic does today he wanted to have the books he was using readily at hand.

Isaac Newton (1642–1726) was typical of the scholar collector, a user of books, not a bibliophile. As a young man he wrote his name in his

[13] http://www.siris.si.edu/

[14] My thanks to Christine Ruggere for pointing out that the catalogue can be searched in this way.

[15] Ellen B. Wells, 'Scientists' Libraries: a Handlist of Printed Sources' *Annals of Science* 40 (1983) 317–389. An updated list is a desideratum.

Figure 4
A book from the library of Jacques Auguste de Thou (1553-1617), French historian, statesman, Royal librarian and bibliophile, whose father was a friend of Jean Grolier. The work is Archimedes *Opera* (Basle, 1544), the first printing of Archimedes' works in the original Greek. A typical 'fine book' of the period, the most up-to-date scholarly text of an important work, elegantly laid out and carefully printed. De Thou's books remained together until 1789, when they were dispersed in a series of sales. Dibner 'Herald' no. 137.

books, but he soon gave this up. He never had a book-plate engraved, or made a catalogue of his books, or took any trouble over their arrangement. As he matured Newton did not feel the need to possessively stake out his ownership of his books by writing his name in them. However we can detect a rather juvenile self-centredness in the way he always turned down the pages in other people's books to where his name was mentioned[16].

This dog-earing to mark a specific place on a page was a habit of Newton's throughout his life and, surprisingly, does not seem to have been a common practice, and may even have been unique to Newton. Out of the 862 volumes of Newton's books in Trinity College, Cambridge, 274 have some pages turned down, or have creases where pages have been turned down in the past. Newton found that it is possible to turn down either the top or bottom of a page so that the corner can be brought to point to any word on the page. Otherwise Newton annotated his books to only a limited extent, preferring to make his notes on separate sheets of paper. Nevertheless the dog-ears are a fascinating insight into Newton's reading, showing the places he wanted to get back to quickly. This is an unusual, but telling, example of the ways that the physical evidence of a book's use has been preserved.

[16] John Harrison, *The Library of Isaac Newton* (Cambridge, 1978), 26–27.

Newton's contemporary, John Evelyn (1620–1706), was also a user of books. He read his books and made detailed notes in the margins, from which it is clear that he read some of them over several times, and he was an author in his own right. But unlike the solitary and reclusive Newton, Evelyn was a country gentleman, and his library, like his garden at Sayes Court, was part of his self-image, something to be proudly shown to his visitors. He had his books finely bound—some in London, some in Paris—and decorated in gilt with his initials and arms on the spines and sides, while Newton's books are mostly in the plain sheepskin or calf bindings, without decoration, as they would have come from the booksellers.

In Newton and Evelyn, we see two equally serious intellectual users of books, but their libraries served different social functions. The irony is that when Newton's library was sold after his death, it was bought not for its intellectual content, but to confer gentlemanly status on its new owner. Newton's library was purchased by a rather unsavoury character, John Huggins, warden of the Fleet prison—London's debtor's prison—, who was setting up his son as a country clergyman at Chinnor, near Oxford. By buying the living and presenting it to his son, and then buying Newton's library, he was buying respectability for his son, something that he could not achieve for himself. Newton's ownership of the books was quite forgotten until some of them turned up at an auction in 1920, and the provenance was subsequently demonstrated by Heinrich Zeitlinger, working for the book dealer Henry Sotheran in London. In 1927, the rest of Newton's library, containing most of the scientific books, was tracked down in the library of a house in Gloucestershire and is now in Trinity College, Cambridge. The 1920 sale is the source of the individual volumes found in many institutional and private collections, and the Dibner Library has one, Philippe de La Hire's astronomical tables, published in 1687, the year Newton's *Principia* was published (there is no dog-earing in this copy).

Robert Hooke (1635–1703) was much more of a book collector than Newton or Evelyn. By characterising him as such, I mean that he enjoyed the chase, and he bought books that interested him but that he was not necessarily going to use. Hardly a day went by when he did not record in his diary the purchase of a book at auction, from a bookseller, or from the many bookstalls in Moorfields. In 1693 Hooke recorded in his diary 'I saw neer 100 of Mr Boyle's high Dutch German Chymicall books ly exposed in Moorfields on the railes', and a couple of days later he bought two of them[17]. I'm not quite sure what 'railes' mean here, presumably some kind of market stall: it conjures up a vision of the

[17] Douglas McKie suggested that Hooke's copy of J.J. Becher's *Novum organum philologicum* (1674), which he owned, may have come from Boyle's library: 'Three historical notes' *Nature* 163 (1949) 627–8. McKie's library is described in Roger Gaskell Rare Books catalogue 28 (2001); no. 25; the Becher volume is now in the Wellcome Historical Medical Library in London.

Figure 5
The German edition of Vitruvius, 1575, from the library of Robert Hooke (1635–1703). This classic treatise on Roman architecture was first printed in 1521. As a practising architect, Hooke would have been familiar with the text of Vitruvius; as a collector, he was interested in the history of the book and owned several other editions.

Parisian bouquinistes, who still line the banks of the Seine selling old books, prints and postcards. Hooke also bought at auction, for example his copy of a German edition of Vitruvius (Figures 5 and 6). Hooke had other editions of Vitruvius, and I think this reveals his book collecting instincts, wanting to own multiple editions of an important book. Hooke was a practicing architect, so Vitruvius would have held a particular significance for him. Perhaps because so few of Hooke's buildings survive, his career as an architect has been neglected in comparison with his standing as a natural philosopher, but his books remind us that natural science was only a part of his professional life.

Hooke collated his books and sometimes returned them for imperfections, and he was interested not just in contemporary natural science but in earlier works as well. He owned the second edition of Copernicus, Basle 1566 and possibly the first edition of 1543 as well, though the 1703 auction catalogue lists only the second. He had a couple

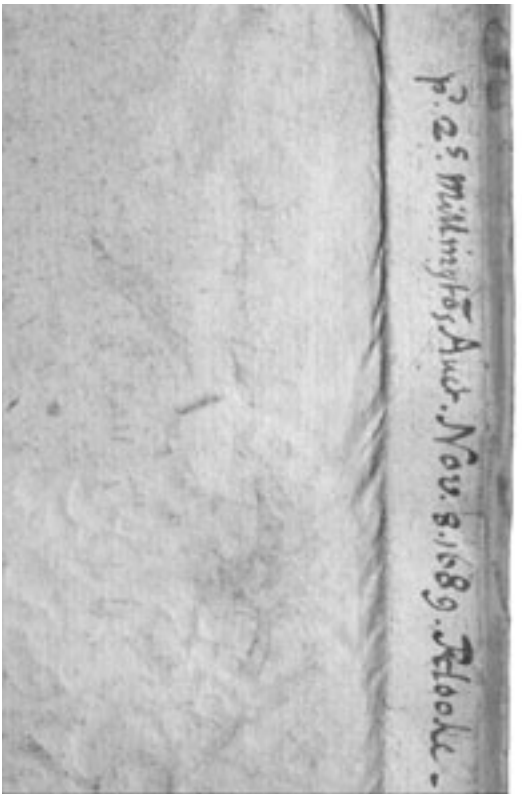

Figure 6
The endpaper of Robert Hooke's copy of Vitruvius illustrated in figure 5. Hooke's annotation reads 'paid 2 shillings Millington's auction 1689 R Hooke'.

of incunables—at least: it is not clear what the entry in the sale catalogue 'Caxton (Will.) Collections, 1490' refers to[18].

On the other hand, another book owned and heavily used by Hooke, *Experiments, notes &c.* (1675) (Figure 7), he did not buy. Rather, it was given to him by the author, Robert Boyle. Hooke has used the endpapers to remind himself of various passages in the separate tracts (Figure 8), noting, for example, in a treatise on 'Tastes' Boyle's description of an excellent raspberry wine, which according to the text on page 29, kept its specific taste for two or three years.

Books were frequently used as gifts, and the exchange of books was an important aspect of early modern book culture. The giving of books was analogous to the very common practice of giving away a portrait

[18] Millington's 1703 sale catalogue of Hooke's library, *Bibliotheca Hookiana. Sive Catalogus Diversorum Librorum*, reprinted in An.N.L. Munby, ed. *Sale Catalogues of Libraries of Eminent Persons, volume 11 Scientists, edited, with an introduction, by H.A. Feisenberger* (Mansell, London, 1975); Leona Rostenberg, *The Library of Robert Hooke: the Scientific Book Trade of Restoration England* (Modoc Press, Santa Monica, Ca., 1989); Robert Hooke, *The Diary of Robert Hooke M.A., M.D., F.R.S. 1672–1680…edited by Henry W. Robinson and Walter Adams* (Taylor and Francis, London, 1935).

Figure 7
The endpapers of a book presented to Robert Hooke by Henry Oldenburg on behalf of the author, Robert Boyle (1627–1691). It is Boyle's *Experiments, notes, &c. About the Mechanical Origine or Production of Divers Particular Qualities: Among which is Inserted a Discourse of the Imperfection of the Chymist's Doctrine of Qualities; Together with Some Reflections upon the Hypothesis of Alcali and Acidum* (London, 1675), a typical Boyle production made up of several separate tracts. After Hooke's death, it passed through a number of other hands, and the bookplates and inscriptions provide an unusually complete record of ownership, from the author giving his book to a respected colleague to the copy's present home. Dibner 'Herald' no. 56.

Figure 8
Hooke's notes on various passages in Boyle's work illustrated in figure 7

of oneself. And indeed, the two were sometimes combined, as in the case of a copy of one of Tycho Brahe's books in the Dibner Library which has Brahe's portrait stamped on the upper cover and must have been a presentation copy[19]. Newton's teacher Isaac Barrow gave away eighty copies of his Geometrical and Optical lectures[20], and for John Evelyn, the main purpose of publication was to have books to give away[21]. Such gifts helped to locate authors in their social and intellectual or scientific networks and played an important part in building up and maintaining these networks. Presentation copies were often bound to a higher standard or in a more distinctive style than copies offered for sale ready-bound by the booksellers. Lavish gilt bindings would have been commissioned where the donor was using them to solicit patronage or support. Sometimes the expense of the binding is evident from the better material

[19] Dibner, *op. cit.* note 6, plate VII, Tycho Brahe, *Epistolarum Astronomicarum Libri* (Uraniburg 1596) wrongly captioned as Brahe's own copy; another copy of the same book, also with Brahe's portrait stamped on the cover, in the Herzog August Bibliothek, Wolfenbüttel, is illustrated in fig. 6.3 in Adam Mosley 'Astronomical books and courtly communication' in Marina Frasca-Spada and Nick Jardine, eds. *Books and the Sciences in History* (Cambridge, 2000), 114–131.
[20] Feingold, *op. cit.* note 21, 336.
[21] Giles Mandelbrote, 'Evelyn and his Library' Conference paper, in 'John Evelyn and his Milieu' at the British Library, 17 September 2001.

Figure 9
This image depicts an imaginary visit by Louis XVI to the Paris Académie Royale des Sciences and was intended to advertise Louis' patronage. Engraved by Sébastien le Clerc (1637–1714) and Jean Goyton (*d.* 1714), it serves as the frontispiece to Denis Dodart (164–1707) *Histoire naturelle des plantes* (Paris, 1676). Dibner 'Herald' no. 84.

used, goatskin ('morocco') instead of calf or sheepskin, or in the amount of gilding, but may be subtler. For example, the copies of his own works that Boyle presented to the Royal Society are in quite simple calf bindings but have gilt edges. Gilt edges on a seventeenth century book should always alert one to the possibility that it was a presentation copy.

An author might seek to gain the respect of someone of higher standing who might advance their career or provide financial support. Patrons also might want to advertise their intellectual interests and their magnanimity. Thus Ferdinando II and Leopoldo de Medici supported the experiments the Accademia del Cimento and the printing of the *Saggi de naturali esperienze* (1666). This work was printed for presentation only, not sold through the booksellers, and the Medici drew up lists of rulers, aristocrats and famous scholars to whom copies were to be presented[22]. Similarly, Louis XVI was the patron of the French Académie Royale des Sciences, and its early publications were printed as gift books. In the famous frontispiece to one of them (Figure 9) the King is inspecting the Academy in the company of his finance minister, Jean Baptiste Colbert. The event is entirely fictitious, but the picture was intended to celebrate the King's interest and solicit his continued financial support. These publications of the French Academy often had the bindings stamped with

[22] Silvia De Renzi, *Instruments in print: books from the Whipple Collection* (Cambridge, Whipple Museum, 2000).

Figure 10
Royal presentation binding on *Veterum mathematicarum* (Paris, 1693), a collection of ancient Greek and Latin texts edited by members of the Académie Royale des Sciences from manuscripts in the Royal Library. Like the Dodart in figure 9, this book was published for presentation purposes. Dibner 'Herald' no. 84.

the Royal arms on the sides in gilt, confirming that they were bound for presentation (Figure 10).

In the eighteenth century, scientists continued to collect books for their own use and increasingly, as Hooke had begun to do in the seventeenth century, scientists systematically collected books by earlier scientists, which provided the historical background to their research. In Hooke's case, I think it was more antiquarianism than a real interest in history, and it was the same for the extraordinary Philadelphia collector James Logan (1674–1751). In 1709, Logan was the first person in America to own a copy of the first edition of Newton's *Principia*, and he later boasted that he had all three editions of the *Principia*, 1687, 1713 and 1726[23].

A real interest in history is seen in Lavoisier's collecting, for he used his books to write historical prefaces in some of his own works. (Dibner was particularly proud of owning Lavoisier's copy of the Latin edition of Boyle's work on colours, London 1665[24].) Between the 1780's and the 1830's, science became more formally divided into separate disciplines, and scientists with historical interests naturally collected in their own areas of research. As part of the process of specialisation, new

[23] Edwin Wolf 2nd, *The Library of James Logan of Philadelphia 1674–1751* (Philadelphia, Library Company, 1974), xix, 347.
[24] Dibner, *op. cit.* note 6, plate X; Marco Beretta, *Bibliotheca Lavoisieriana: the Catalogue of the Library of Antoine Laurent Lavoiser* (Florence, Olschki, 1995).

disciplinary histories were needed, identifying founding fathers, fundamental discoveries and so on, and the scientist-historians needed to collect the early literature in their subject. For example Joseph Priestley, who wrote histories of electricity and chemistry, and J.J. de Lalande, who wrote histories of astronomy, both had large libraries[25].

Disciplinary histories continued to be written, but in the 1830s and '40s a group of collector-historians emerged who were collecting books and writing a new kind of history in what has been called the 'first phase of the history of science in England'[26]. This new history was based on bibliographical and archival work. For the first time, the personalities of the scientists and the history of their publications, not just what the books contained, became the subject of research. The collectors and historians involved were a fairly closely-knit group including George Peacock, Charles Babbage, James Orchard Halliwell, Augustus de Morgan, Francis Baily and Stephen Peter Rigaud.

Augustus De Morgan, whose 1847 annotated bibliography of arithmetical books is still a standard reference, has in its preface this splendid call to arms for collectors and librarians:

> 'The most worthless book of a bygone day is a record worthy of preservation. Like a telescopic star, its obscurity may render it unavailable for most purposes; but it serves, in hands which know how to use it, to determine the places of more important bodies[27].'

The collector James Orchard Halliwell founded the Historical Society for Science in 1840, the first British society for the history of science—a hundred years too early. It fizzled out in 1846, not helped by the revelation that the stunning collection of scientific manuscripts assembled by Halliwell included mediaeval manuscripts dismembered and stolen from Trinity College, Cambridge. (Some of them are still in the British Library because Halliwell's lawyers and the lawyers acting for Trinity fell out, and Halliwell was never brought to trial.) It is odd that two of the pioneers of history of science, both great book collectors, were also great book thieves, Halliwell and his contemporary Guglielmo Libri.

Most important of the historical pioneers were Francis Baily (1774–1844) and his exact contemporary Stephen Peter Rigaud (1774–1839). Baily—an astronomer remembered for 'Baily's beads'—made a study of Flamsteed's correspondence concerning the publication of his

[25] Priestley spent the last years of his life in Philadelphia where his books were auctioned there after his death.

[26] A.N.L. Munby, *The History and Bibliography of Science in England: The First Phase, 1833–1845. To which is added a reprint of a catalogue of scientific manuscripts in the possession of J.O. Halliwell Esq.* (Berkely and Los Angeles, 1968).

[27] Augustus de Morgan, *Arithmetical Books from the Invention of Printing to the Present Time* (London, Taylor and Walton, 1847), ii.

Figure 11.
The signature of the astronomer and pioneer historian of science Stephen Peter Rigaud (1774–1839) on the endpaper of Jakob Bernoulli (1654–1705) *Ars conjectandi* (Basle, 1713), a major contribution to probability theory. Dibner 'Herald' no. 110.

Historia coelestis in 1712, one of the most fascinating and revealing episodes in scientific publishing. Baily's *An account of the Revd. John Flamsteed* was published in 1835 with a supplement in 1837. In his meticulous use of sources, Bailey was a pioneer of the historical method applied to the history of science, and for the first time, he shed light on the personal relations of scientists in the seventeenth century[28]. Bailey's library was sold at Sotheby's in 1845.

Stephen Peter Rigaud was professor of experimental philosophy at Oxford and Savillian professor of astronomy. In 1838, he published his *Historical Essay on the First Publication of Sir Isaac Newton's Principia*, a detailed account of the conception, composition, printing, publication, reception and subsequent revision of the *Principia*. This is the first essay in the historical bibliography of a scientific book. Like Bailey, Rigaud sought out manuscript sources, including the Macclesfield correspondence—which he later published—and the records of the Royal Society[29]. After his death in 1839, Rigaud's library was purchased by the Radcliffe trustees, the governing body of the Radcliffe Observatory, recognising its importance not only as a great collection of early books—Copernicus, a presentation copy of Gilbert, and so on—but also as the library of a working scientist (Figures 11 and 12). Somewhere along the line this vision

[28] Munby, *op. cit.* 3–4.
[29] Munby, *op. cit.* 4–5.

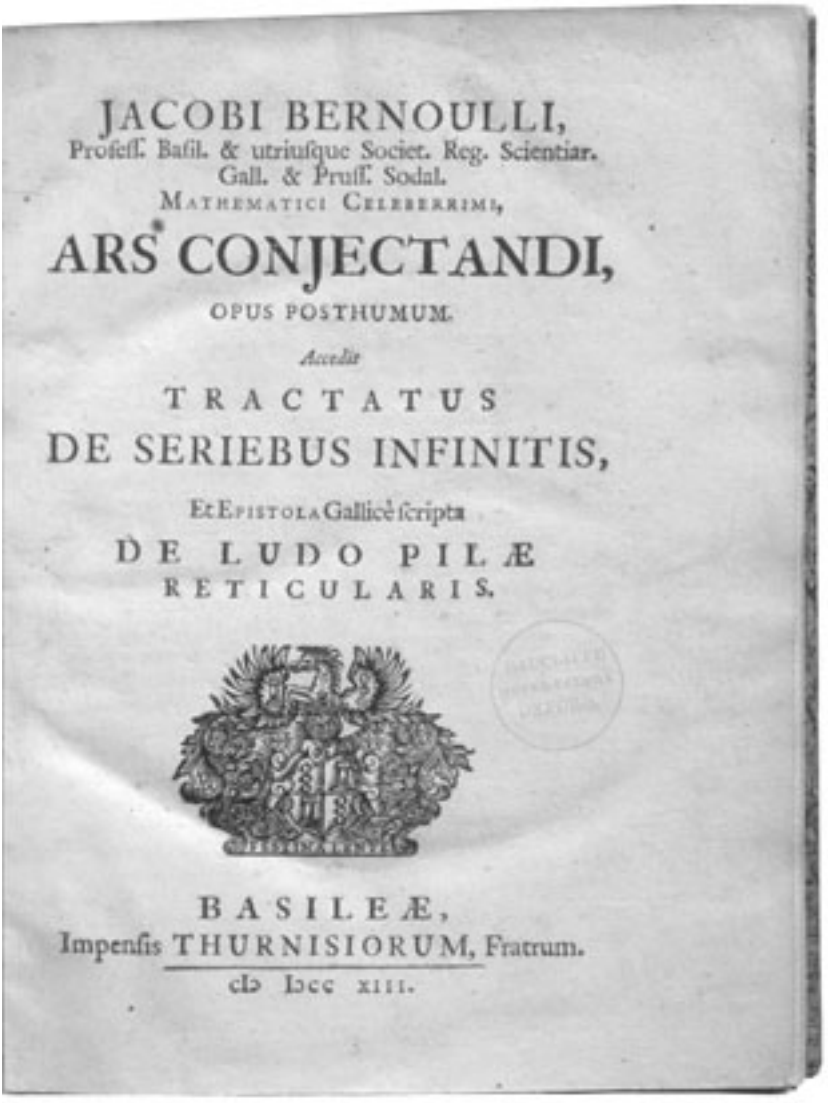
JACOBI BERNOULLI,
Profeſſ. Baſil. & utriuſque Societ. Reg. Scientiar.
Gall. & Pruſſ. Sodal.
MATHEMATICI CELEBERRIMI,
ARS CONJECTANDI,
OPUS POSTHUMUM.
Accedit
TRACTATUS
DE SERIEBUS INFINITIS,
Et EPISTOLA Gallicè ſcripta
DE LUDO PILÆ
RETICULARIS.
BASILEÆ,
Impenſis THURNISIORUM, Fratrum.
cIↃ IↃcc xiii.

Figure 12
Titlepage of the book owned by Rigaud illustrated in figure 11 with the stamp of the Radcliffe Observatory, Oxford. After his death, Rigaud's books were purchased by the Observatory as an important collection in the history of science and as the working library of an important scientist. The books were dispersed at auction in 1935.

was lost, and when the Radcliffe Observatory was moved to South Africa (for the clearer skies) in the 1930's, the library was sold. The sale at Sotheby's in 1935 included Edmund Halley's annotated copy of the 1712 *Historia coelestis*—even though the Bodleian Library had already had a chance to pick over the collection[30].

The collecting activities of three more recent historians of science, Pierre Duhem, J.L.E. Dreyer and Charles Singer, can also be traced in the Dibner Library of the History of Science and Technology (Figures 13 to 18). Now considered to stand among the founders of the modern history of science, they were working before the professionalisation of the discipline, and all were working scientists, not full time historians. Indeed all the collectors I have mentioned, apart from the Renaissance collector Jacques August de Thou, were working scientists, or scientist-historians, whose work developed the history of science from antiquarianism, through disciplinary history, to the modern history of science.

However, my survey is unbalanced because I have concentrated on a few collectors, whom we now regard primarily as scientists working in the physical, rather than the biological or medical sciences. A much

Figure 13
A book from the library of the great French historian of science, Pierre Duhem (1861–1916), Joannes de Sacro Bosco (*fl.* 1230) *Sphaera Mundi* (Venice, 1499).

[30] This copy is now in the National Maritime Museum, Greenwich.

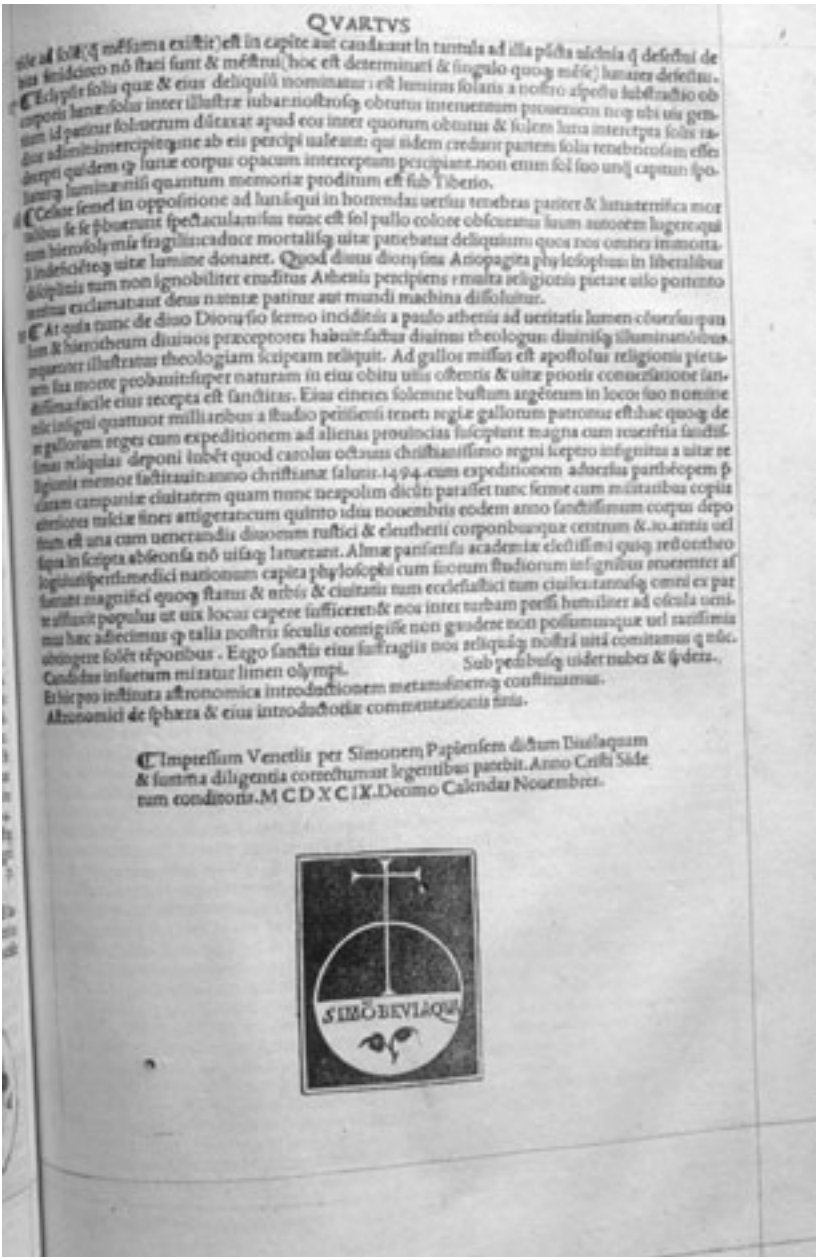

Figure 14
Colophon of the book illustrated in figure 13

bigger category of science collector is the doctor-collector: Ellen Wells identified 640 of her 880 scientists—three quarters—as physicians. Medical books were among the first categories of books to be provided with bibliographies. There were printed book lists as early as the late fifteenth century, and these lists provided a framework for collecting. These early book lists include what we would now call physical science, and doctor-collectors have generally included physical sciences in their libraries. The tradition of the physician-collector is a long one, and it seems that the urge to collect books in all subjects, and art and other objects as well, has been stronger among physicians than perhaps any other profession. But there have been changes in the late twentieth century, which I will just mention very briefly.

One of the last of the great physician collectors was Sir William Osler, who was enormously influential in popularising book collecting. Though interested primarily in medical texts, he also collected books on the physical sciences and was responsible for identifying a canon of the key works in all the sciences that a collector should aspire to own. This took the form of a 'bibliotheca prima', a list of primary works, which is the first section of the catalogue of his library, published under the title of *Bibliotheca Osleriana* in 1929, ten years after his death in 1919. A more refined list of canonical works was published in 1934, the catalogue of the *Exhibition of First Editions of Epochal Achievements in the History of Science*, mounted by another physician-collector, Herbert McLean Evans at the University of California at Berkeley.

Unlike Osler's 'bibliotheca prima', which cites a range of titles by each author, the 1934 Evans list selects just one, the number of authors being just over a hundred in both cases. The Evans List strongly influenced Bern Dibner in selecting his *Heralds of Science* in 1955, and indeed Dibner bought quite a number of books formerly owned by Evans, of which 12 are 'Heralds'. Dibner's *Heralds* was followed by the Grolier Club exhibition of 'One Hundred Books Famous in Science', curated by Harrison D. Horblit in 1958 or which was published in 1964. These lists concentrated attention on a small number of books whose prices began to rise much faster than the general inflation in rare book prices. In this process, the 'Printing and the Mind of Man' exhibition, held in 1963, and the 1967 book with the same title (known as 'PMM') were especially influential[31].

Osler's legacy then, to which Dibner and Horblit unwittingly contributed, has been a rise in the popularity of science collecting, which

[31] Frank Francis, Stanley Morison and John Carter, supervisory committee, *Printing and the Mind of Man. Assembled at The British Museum and Earls Court London 16–27 July 1963* (F.W. Bridges, London, 1963); John Carter and Percy Muir, *Printing and the Mind of Man* (London, 1967, revised edition, Karl Pressler, Munich, 1983).

Figure 15
The bookplate of J.L.E. Dreyer (1852–1926) in a copy of Kaspar Peucer (1525–1602) *Hypotheses astronomicae* (Wittemberg, 1571). Born in Copenhagen, Dreyer wrote the standard biography of Tycho Brahe and spent his working life as an astronomer in Ireland.


HYPOTHESES
ASTRONO
MICÆ, SEV THEO
RIAE PLANE
TARVM.
EX PTOLEMÆI ET ALIO
rum veterum doctrina ad observationes Nic
olai Copernici, & canones motuum
ab eo conditos accom
modatæ.
OPERA ET STVDIO
CASPARIS PEVCERI
in Academia Vvitter
Mora Acc gymn. Schönthal.
Cum Priuilegio Cæsareo & Electoris
Saxoniæ
EXPRIMEBAT VVITEBER
gæ Iohannes Schwenckel.
ANNO M. D. LXXI.

Figure 16
The title page of Dreyer's copy of Peucer illustrated in figure 15 showing earlier marks of ownership

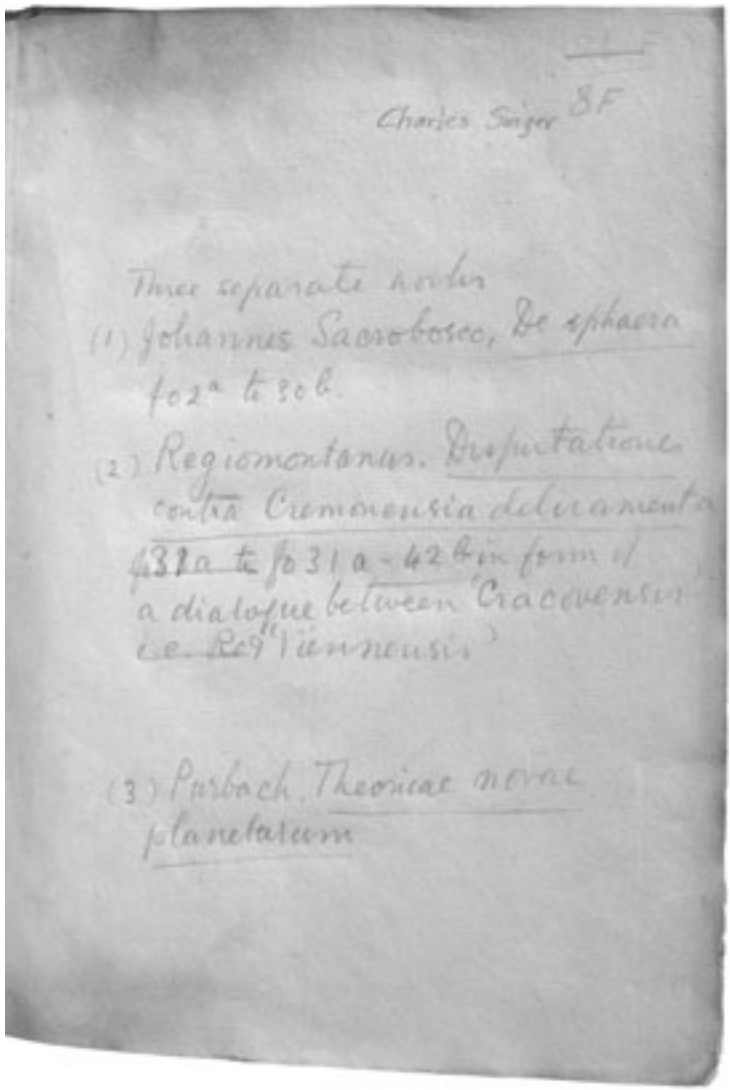

Figure 17
The endpapers of a volume of early astronomical treatises by Sacrobosco, Regiomontanus, and Peurbach from the collection of the English historian of science, Charles Joseph Singer (1876–1960). The volume is an example of the practice of binding several small, separately published, works together in one volume, both for economy and convenience. This volume was probably assembled in the late fifteenth century: a nineteenth-century example is illustrated in figure 1.

Figure 18
The first page of Joannes de Sacro Bosco (*fl.* 1230) *Sphaera mundi* (Venice, 1488) in the volume illustrated in figure 17. The arms of an unidentified contemporary owner, perhaps the first owner, are painted at the foot of the page.

has now overtaken medical collecting financially[32]. A new generation of collectors has emerged whose collections are focused on the great books. Typically they will first buy the major books in the canon established by Dibner, Horblit and 'PMM' and only collect the supporting literature sparingly. It is a top down approach, very different from Dibner's much more broadly based collecting, in which the *Heralds* are the keystones that keep the whole structure standing.

Dibner collected books to use because he wanted to know the history, first of his own discipline of engineering, then, as his interests deepened, of science in general. He was therefore a user of books, and I place him in the same category as the scientist-collectors and scientist-historian-collectors, whom I have been discussing. As an historian, he was a user of books, so I think he was different from Osler, Evans and Horblit, who were pure collectors, however knowledgeable and sophisticated. His collections quickly grew so large that he himself could not use them all, but he made sure they were available for use by others.

[32] In the discussion following the lecture, Ronald Smelzer pointed out that there were probably still numerically more medical collectors; it would therefore be difficult to assess the total value of medical and scientific books being sold, but certainly the impetus for the rapid increase in prices of scientific and medical books in the last few years has come from collectors, often with technological backgrounds like Dibner, who are primarily science collectors rather than medical collectors.

Conclusion

t is clear from these examples that there are a number of different, often overlapping, categories of owners of science books: the bibliophile, the antiquarian, the intellectual, the working scientist, the historian, the patron, and the recipient of a gift. And each of these kinds of owner might use their books in one or more ways: for demonstrating their wealth, taste, or connections; for reading and studying professionally; or for personal improvement or enjoyment. Readers leave evidence of how they have used their books, and as I have suggested, such evidence consists of more than annotations. The binding material and decoration, the style of a bookplate, the wording of a manuscript ex-libris, dog-ears and thumb marks all tell their stories. And it may be just as interesting to observe that a reader never opened a book, or never got beyond the first chapter.

I have also shown how collections of early science books have come into existence and the role of the private collectors of various kinds, who have laid the foundations on which academic libraries have built. Readers in these academic libraries are the new users of the books. They are working with physical objects which, though primarily carriers of texts, also contain a large amount of historical information, which can be used in the interpretation of those texts. Studying books as physical objects can reveal much about the history of their production, their intended audience and their actual use. Every single copy adds something to this information. It is not easy to learn how to 'read' the non-textual information, to know the meaning of typography, decoration, illustration, paper, binding, and evidence of use (or non-use) left by readers. In many areas, the dictionaries and grammars of this kind of 'reading' have not yet been written. This approach to books is a part of what has become known as the history of the book, still a very young discipline, much younger than the history of science.

Most books are studied by historians for their texts alone, but my contention is that the historian who thinks he or she can deal with the intellectual content of a work without engaging with the physical book is a bad historian. The study of old books is too important to be left to bibliographers and librarians (let alone booksellers). By working in a collection such as the Dibner Library of the History of Science and

Technology, the attentive researcher can learn to interpret the whole book. Bern Dibner's legacy is to have gathered together books, whose former ownership and use can be studied as an adjunct to reading their texts. A collector himself, he conveyed these books from collector to reader.

Acknowledgements

I would like to thank Ron Brashear for inviting me to participate in the 25th anniversary celebrations of the Dibner Library of the History of Science and Technology and for asking me to deliver the lecture on which this essay is based. I am most grateful to Christine Ruggere for a number of discussions while I was planning the lecture, and for her help in giving the talk its final shape. In revising the text for publication I have relied heavily on valuable suggestions made by Sara Schechner, to whom I am greatly indebted.

Icons of Understanding: Celebrating Bern Dibner's Heralds of Science

By Owen Gingerich
Harvard-Smithsonian Center for Astrophysics

Figure 1
From Roberto Valturio, *De re militari*, Verona, 1472.

† All books illustrated in this essay can be found in the Dibner Library of the History of Science and Technology, Smithsonian Institution Libraries.

Icons of Understanding: Celebrating Bern Dibner's Heralds of Science

By Owen Gingerich
Harvard-Smithsonian Center for Astrophysics

lmost forty years ago the most magnificent exhibition of rare books ever assembled took place in London. Organized primarily by British Museum staff in conjunction with the eleventh International Printing Machinery and Allied Trades Exhibition, its more than 400 selections ranged from the Gutenberg Bible to *Mein Kampf*, papers on the atomic bomb, and Churchill's speech in the House of Commons that "never in the field of human conflict was so much owed by so many to so few." Loans were provided from around the world. On display, for example, was the unique copy of the first edition of the Columbus Letter, borrowed from the New York Public Library. Other items included were Luther's German translation of the New Testament, Milton's 1644 *Aeropagitica, a Speech for the Liberty of Unlicenc'd Printing*, the French *Encyclopédie*, Johnson's *Dictionary*, Fox Talbot's *Pencil of Nature*, Darwin's *On the Origin of Species*, and Marx's *Das Kapital*. All this for a trade show, mind you.

The exhibition was called 'Printing and the Mind of Man'. It's a splendid title, perhaps by today's standards not politically correct, but it does reflect the dual nature of the exhibition. On the one hand is Printing, the technology of communication for so many centuries, and the chosen works illustrated its progress. On the other hand is the Mind of Man, humankind's intellectual progress, history if you will. And what an interesting parallel, in both respects, to the former name of this museum, also bipartite: The National Museum of History and Technology, technology being a vestige of our nation's displays in the great international exhibitions, so heavy on hardware. Despite the change in name to the National Museum of American History, as you look around in these halls, you see it is still a museum of history and technology, grappling with historical ideas in the context of artifacts, most being the products of technology, if not technology itself.

The great 'Printing and the Mind of Man' exhibition had a pronounced effect on collecting tastes and led to a generation of so-called PMM collectors, frequently looked upon with a certain amount of disdain

as millionaires chasing the intellectual high points without the depth to understand their context.

Bern Dibner was not a PMM collector, and I want to spend a substantial part of this essay demonstrating that this was not the case. Rather than being influenced by the PMM show, it was the other way around: Bern Dibner in fact influenced it. In 1955 he published the first edition of his *Heralds of Science*. If you match up the *Heralds* against the science and technology in the PMM titles, you can see how heavily the British organizers leaned on his foundation. Take electricity, for example. Of course they would include Franklin, Galvani, Ohm, and Ørsted. But would they think of Marconi or Alexander Graham Bell? Bern had them, and so did the PMM. Over and over again the great landmarks found in the PMM show match with Bern's. But I think the smoking gun is my first item (Figure 1): Valturio's 1472 treatise on military machinery, illustrated in the 1955 *Heralds*, popped up eight years later in the 1963 exhibition, surely a sleeper that the experts might have skipped without the groundwork prepared at the Burndy Library.

In this essay I would like to explain why I believe that these icons of science and technology have a natural place within the Smithsonian and a special role to play, but first I need to review the historical context of science collecting.

Throughout the ages some men of means have formed impressive libraries, and when these collectors were what we would today call scientists, their holdings were rich in scientific titles. There are basically two ways we can know about such collections: First, if the books themselves are preserved intact in some institution; or second, if a catalog was made, possibly an inventory in the collector's lifetime, or alternatively, an estate sale. Thus, we have a pretty good idea about Copernicus' relatively small library because a major part has been preserved in Uppsala, whereas we have excellent information on the books owned by that remarkable Elizabethan magus John Dee because manuscript inventories exist, which have been published by the London Bibliographical Society. Dee amassed a collection of roughly 5,000 books, making it one of the largest libraries in sixteenth-century England. We know its details: for example, that he owned two copies of Copernicus' *De revolutionibus*, even though we don't know where the majority of his books, including the Copernican volumes, have gone.

The library of Dee's contemporary, the Louvain astronomer and cartographer, Nicholas Mercator, is known because there once existed a printed inventory of his holdings. The single known copy of the list seems to have vanished, but someone made a manuscript copy of it in the nineteenth century. Again, not many original books from his library can now be located. The list indicated that he had an annotated copy of Copernicus' book, and a few months ago, I was able to use his distinctive handwriting to identify that copy, now at the University of Glasgow.

Another sixteenth-century astronomer, Tycho Brahe, had an inventory of his books made when, near the end of his life, he left Denmark for Prague, but a record of neither the count nor the titles themselves seems to have survived. Roughly a hundred of his books are specifically identified, mostly in the Clementinum, the old library of the Charles University in Prague, but he must have owned many times this number.

All of these collections were working libraries, essentially formed with books contemporary to those astronomers. By the eighteenth century this had gradually changed, and astronomers could include antiquarian works in their libraries. The French astronomer Joseph Nicolas Delisle went to the Russian Academy of Sciences in the 1720s and there built up a large library including many older books, which he walked off with when he returned to France after a 22-year sojourn. His collection became the heart of the Depôt de la Marine library, and today is the central antiquarian part of the Observatoire de Paris Bibliothèque. After Delisle returned to Paris, he had a young protégé, one Charles Messier, whose name is now familiar to most amateur astronomers because the Messier catalog of nebulae and clusters includes most of the brighter telescopic objects of the northern hemisphere.

A few years ago, when I was browsing in the stock of Roger Gaskell (the antiquarian bookman who opened our seminar), I selected an early French geometry text, Errard Bar-le-Duc's *La geometrie et practique generalle d'icelle*. After I concluded my purchase, Roger asked with some puzzlement, "And why are you interested in an old geometry text?" since he knew I generally limited myself to astronomy.

"Ah," I replied, "because it was owned by Charles Messier, the eighteenth-century astronomer who sparked my interest in the history of science." The book contains an anamorphic bookplate, and you must foreshorten it to read the provenance. The imprint is Basel, 1602, well out of date by over a century when Messier acquired it, but today a fine demonstration of how Delisle's antiquarian interests apparently rubbed off on his young apprentice.

In the nineteenth century two particularly noteworthy antiquarian astronomical collections were formed. The first was the pride of Otto Struve, founder of the Pulkovo Observatory in St. Petersburg. Using book dealers throughout Europe, he acquired, among other impressive volumes, a fabulous collection of early comet tracts, and of course the observations recorded in them were still part of a working library for celestial mechanicians interested in cometary orbits. His catalog of the collection, published in Petrograd in 1860, in turn became the checklist when James Ludovic Lindsay, the 26th Earl of Crawford, began in England and Scotland to assemble his own celestial library. His magnificent astronomical collection, ultimately a gift to the Scottish nation, is beautifully preserved at the Royal Observatory, Edinburgh, and like the Pulkovo library, it too has a printed catalog.

Lord Crawford's personal observatory was the envy of many professional astronomers in the British Isles in the 1880s and '90s. Later his interests gradually moved from stars to books, so that the family library, already brilliantly established by his father, became the finest private library in Britain. Thus we cannot simply claim that the final shape of his astronomical collection was primarily motivated as a by the desire to create a working library.

However, as I thought about this essay, I realized that some working scholarly collections were formed during this period with a strong ancillary interest in the history of their subject. I am thinking particularly about three mathematicians:

We know of the collection of Karl Gustav Jacob Jacobi because after his death in 1851 the Asher Company in Berlin issued a catalog with 998 items from his library. George Phillips Bond, the second director of the Harvard College Observatory was visiting Europe at that time, and bought en bloc the 900 items still unsold. Jacobi had both current and antiquarian items. For example, his group of Kepler titles became the foundation of Harvard's extraordinary collection of Kepler's works, which is exceeded only by the state library in Stuttgart.

A second remarkable antiquarian collection, known to us by its sale catalog in 1880, was formed by the French geometer Michel Chasles. In the 1860s Chasles' collecting passion caused him to fall victim to the forger Denis Vrain-Lucas, who sold him thousands of manuscripts including a correspondence between Newton and Pascal demonstrating that Pascal had anticipated Newton in the discovery of the law of universal gravitation. When Chasles presented the letters to the French Academy of Sciences, a scandal erupted and in the ensuing trial of Vrain-Lucas, Chasles was forced to admit that he had purchased letters from Mary Magdalene to Pontius Pilate and Cleopatra to Anthony, all written in old French.

A third collection was formed around the turn of the century by the Italian mathematical-physicist Vito Volterra. It remained intact long after his death in 1940 and was eventually acquired by Bern Dibner. Something over 100 items were initially denied an export permit by the Italian government, but after some delicate diplomatic negotiations, these rare titles were placed on permanent loan at the Dibner Institute in Cambridge with the Italian government retaining their ownership.

As for twentieth-century science collecting, let me single out four medical collectors, each of whom had collecting interests that ranged well beyond just medical books. The first three are Sir William Osler, whose books are now at McGill University in Montreal and whose posthumously published *Bibliotheca Osleriana* provided an important guide for later collectors; Harvey Cushing, a dominant figure in neurosurgery who died in 1939, whose collection forms the core of the Yale Historical Medical Library; and Erik Waller, a Swedish surgeon who died in 1955 and whose

acquisitions went to the Uppsala University Library. The Waller collection, like Osler's, has a printed catalog that serves as a useful bibliographic tool. Probably the most intriguing of the medical collectors was Herbert McLean Evans, who put together one history of science collection after another—it is said that each time he got a divorce he was obliged to sell his collection and start over, so, for example, my census of Copernicus' *De revolutionibus* shows four copies owned at one time by Evans. At least one of his collections is preserved intact, at the Institute for Advanced Study in Princeton. And the "Exhibition of First Editions of Epochal Achievements in the History of Science" he organized at Berkeley in 1934 for a meeting of the American Association for the Advancement of Science, together with the published checklist of 114 items, provided a starting point for other collections, such as the impressively complete "Milestones of Science" assembled at the Buffalo Museum of Natural History and now in the special collections of the Buffalo and Erie Country Public Library.

What is noteworthy about these collectors was their love of old books simply for the sake of collecting—their books were prized possessions, but not research tools, unlike the libraries of astronomers and mathematicians of previous centuries. Their collections characterize a major transformation of the twentieth century—science collecting has become a status symbol, and the landmarks of science are finally recognized as icons symbolic of humankind's intellectual achievements. Never mind if the owners cannot read Latin—Copernicus' *De revolutionibus* is now a half-million-dollar treasure.

Bern Dibner was surely a man who appreciated this context, the symbolic significance of these books as heralds of our understanding of the world around us. He was a collector of icons, certainly, but his interest was very much broader than just the antique highlights of scientific progress. He was deeply interested in specific things: electricity, obelisks, Leonardo da Vinci, or the Stradanus images of what was seen as new in the sixteenth century. And he was keen to have the fruits of modern studies as well, so he never restricted himself simply to buying *old* books. It was always exciting to look over the shelves of the Burndy Library in Norwalk. Where else could you find rare first editions nestling side-by-side with the latest scholarship explaining their significance? But it was more than this—among the old books were many lesser known works, little treasures that never made it into the list of Heralds, yet part of the fabric of early science.

In the scope of this essay, it would be impractical for me even to list the 200 items in the *Heralds of Science* catalog. Instead, I have chosen a dozen representatives. And then I have selected ten more non-herald items to illustrate the great depth of the Dibner collection here at the Smithsonian, if for no other reason than to show that Bern Dibner was definitely *not* a PMM collector!

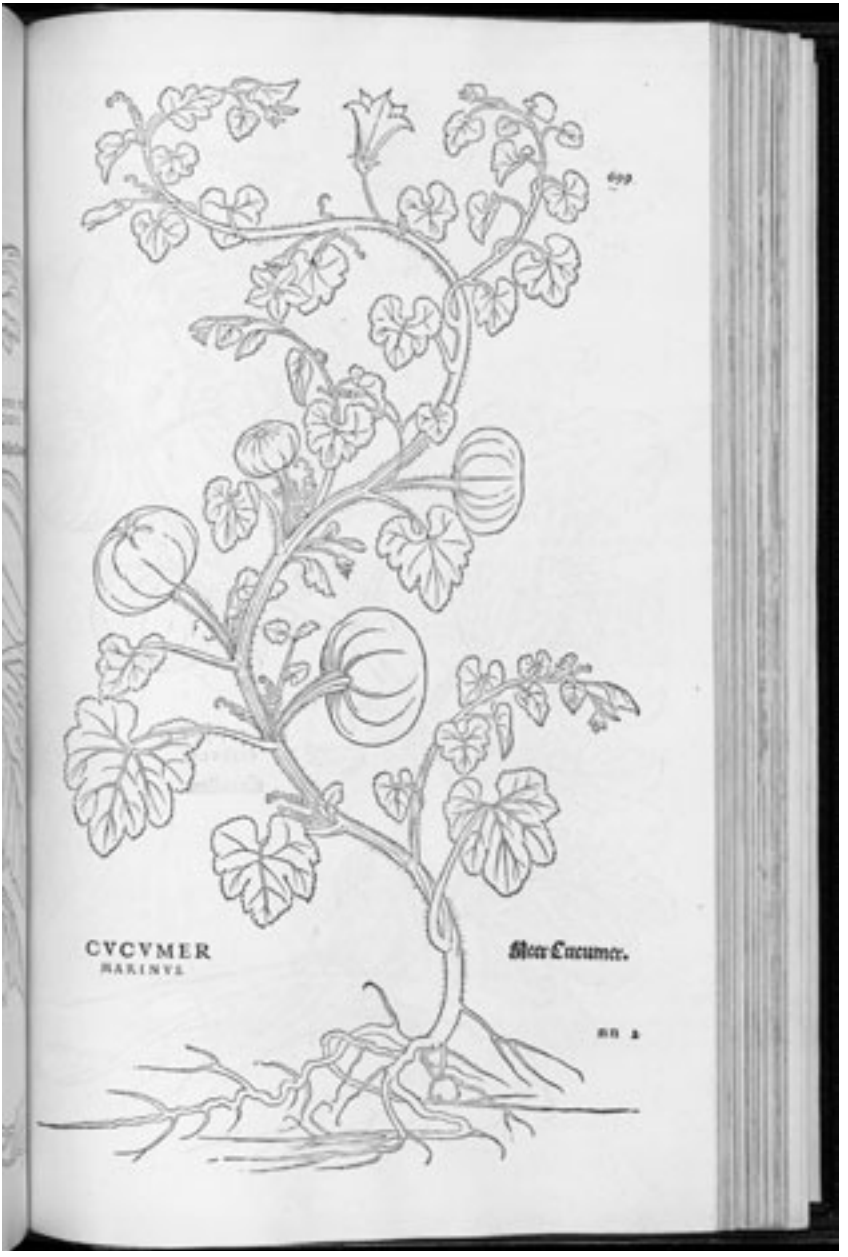

Figure 2
Fuch's herbal features illustrations of botanicals from the New World. Pictured here is 'Cucumer marinus,' commonly known as a pumpkin. From Leonhart Fuchs, *De historia stirpium*, Basil, 1542.

A Dozen Heralds of Science

Roberto Valturio, *De re militari* ([Verona], 1472). This volume from "the cradle of printing" is chosen not because it is one of the oldest of the 320 incunables in the collection, but because it is contemporary with Leonardo da Vinci, and in fact, Leonardo owned a copy of this book. Bern's fascination with Leonardo sparked his interest in the history of technology and science, but Leonardo, despite all his versatility and brilliance, was astonishingly disorganized and never brought any publishing intention to fruition, so no early Leonardo books exist for such a collection. Nevertheless, Bern formed a massive collection of 800 modern works on Leonardo, which he eventually gave to the Brandeis University Library (Figure 1).

Euclid, *Liber elementorum* (Venice, 1482). The earliest of 20 mathematical heralds, this edition of the *Elements* came from the press of the finest scientific printer of the incunabula period, Erhard Ratdolt. If the collection is used to illustrate the progress of printing itself, Ratdolt's efforts represent not only some of the most beautiful typesetting of the age, but several milestones such as the use of large block initials (rather than spaces for hand illumination).

Three books in the Dibner Library of the History of Science and Technology come from one of the most remarkable publishing seasons in all of the history of science, 1542–43:

Leonhart Fuchs, *De historia stirpium* (Basel, 1542). Although painters had long turned to nature, the manuscript botanical tradition tended to copy from previous manuscripts until this epoch-making herbal appeared. As the *Heralds* record, the American *fuchsias* were named for him. (Figure 2)

Andreas Vesalius, *De humani corporis fabrica* (Basel, 1543). "[A] revolutionary moment in anatomy and surgery in a format surpassed by no other scientific treatise," is Bern's description of this magnificently illustrated folio. The full-page plates of the skeletons and muscle men are set against an actual landscape in Siena, so that the entire set forms a 360-degree panorama.

Nicolaus Copernicus, *De revolutionibus orbium coelestium* (Nuremberg, 1543). There would be a beautiful unity if we could say that all three of these books resulted from fresh observations of the natural world, but in fact, Copernicus' triumph was "a theory pleasing to the mind," a new way of seeing the universe that did not depend on any new astronomical data. The heliocentric system was an audacious rearrangement of the cosmic blueprint, a bold move that jump-started the scientific revolution, a highly intelligent gamble, but not something that Copernicus could prove. That would come much later.

Georg Joachim Rheticus, *Narratio prima* (Gdansk, 1540). The harbinger of the Copernican system was this small pamphlet prepared by Copernicus' only disciple and published as a trial balloon three years before the main treatise. Only two dozen copies have been located, with just two copies in private hands. There are four other copies in America, at Harvard, Yale, the University of Louisville, and in a private collection. The Yale copy was in Cushing's medical collection along with a first edition of *De revolutionibus*, since he intended to put together the sort of library that a sixteenth-century medical doctor might own.

The "big three" technical treatises of the astronomical revolution are Copernicus' *De revolutionibus*, Kepler's *Astronomia nova*, and Newton's *Principia*. The Dibner Library has first editions of all three:

Johannes Kepler, *Astronomia nova* (Prague, 1609). In his "warfare on Mars" Kepler demonstrated how, by using Tycho Brahe's observations and by taking Copernican astronomy seriously and thus treating the earth's orbit exactly the same way as that of the other planets, he could make a major leap forward in the accuracy of planetary predictions, that is, how they appeared to move against the distant background of stars. His "law of areas," here a useful device not labeled as a law, turned out to be one of the truly fundamental aspects of orbital motion; the ellipse, a natural consequence of the law of areas, was frosting on the cake. *Astronomia nova* is a tall folio, the most handsome of Kepler's many titles.

One day when I visited the Burndy Library in Norwalk, some years before the books came to the Smithsonian, Bern confided to me that his copy of the *Astronomia nova* was missing. Its box was on the shelf, but empty. He asked me to keep my eyes open should a copy come suspiciously onto the

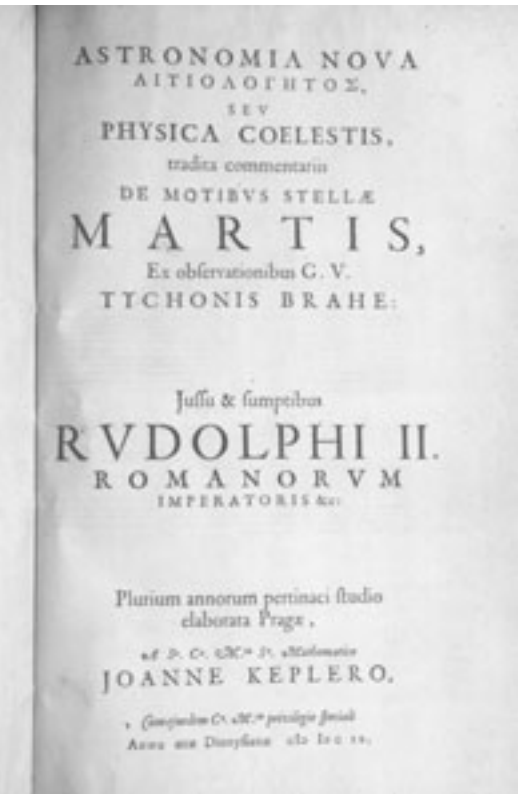
ASTRONOMIA NOVA
AITIOΛOΓHTOΣ,
SEV
PHYSICA COELESTIS,
tradita commentariis
DE MOTIBVS STELLÆ
MARTIS,
Ex observationibus G. V.
TYCHONIS BRAHE:
Jussu & sumptibus
RVDOLPHI II.
ROMANORVM
IMPERATORIS &c.
Plurium annorum pertinaci studio
elaborata Pragæ,
JOANNE KEPLERO.

Figure 3
Title page of Johannes Kepler, *Astronomia nova*, [Prague], 1609.

market. As I admired the many cases of books, my eyes fell on a tall vellum folio labeled "Brahe." I was puzzled, because I couldn't think of any book by Tycho Brahe in that format, so I asked Bern to see it. He unlocked the glass door and handed me the book. I opened it and turned to the title page. Bern, whose synapses worked faster than mine, was stunned. "Owen, you've just cost me $600!" was his instant reaction.

It took me a few more seconds to realize that I was looking at the title page of the tall, handsome *Astronomia nova* (Figure 3). Bern always insured his books only for the original purchase price, and the insurance company had paid him the $600 when the book went missing. By that time the volume was worth over $6,000, so I had just saved him at least $5,400. I have always been tickled thinking about his initial gut reaction when the mislabeled book turned up, and we often had a good laugh about it.

Isaac Newton, *Philosophiae naturalis principia mathematica* (London, 1687). The cornerstone of any historical science collection, Newton's book provided physical laws that operate equally on

earth and in the heavens, finally breaking down the old Aristotelian dichotomy between terrestrial and celestial.

Luigi Galvani, *De viribus electricitatis in motu musculari* (Bologna, 1791). The *Heralds of Science* treated electricity and magnetism as a separate category from physics, as well it might, considering the special strength of this part of the library. Bern Dibner bought several complete collections, including 250 books from the library of Alessandro Volta, from which this item comes (although there is no physical evidence of this provenance in the book itself). This booklet is one of only 12 offprints that Galvani received from the Bologna Academy of Science. The academy transaction dealt with an electrical twitch of frogs' legs, a stepping stone (a few years later) to Volta's discovery of the electrical battery.

Roderick Impey Murchison, *The Silurian System* (London, 1839). One of the memorable controversies in the history of geology took place in Victorian England between Adam Sedgwick, professor of geology at Cambridge, and Roderick Impey Murchison, a wealthy independent investigator. Sedgwick mapped the Cambrian strata of Wales, moving upward and eastward through the layers into what he called the Upper Cambrian, while Murchison worked downward and westward in his great Silurian system, finally overlapping in the Welsh borderlands with the Upper Cambrian, which he called the Lower Silurian. Murchison's splendidly colored geological maps of this Herald reflected his view of the strata. The battle was ultimately settled when two major discontinuities were discovered so that a new geological period was established, the Ordovician, replacing both the Upper Cambrian and Lower Silurian.

Charles Darwin, *On the Origin of Species* (London, 1859). The work of Murchison and Sedgwick essentially established the geological column and provided evidence that life forms on earth changed throughout the long geological ages. Their work thus furnished an essential background for Darwin's epochal explanation of how variation and selection could act together to change the flora and fauna on earth.

Domenico Fontana, *Della trasportatione dell'obelisco Vaticano* (Rome, 1590). The magnificent plates in this book, illustrating the engineering bravado required to erect the great obelsik in St. Peter's Plaza, captured Bern Dibner's imagination so that he made a specialty of collecting this topic.

Ten Notable Non-Heralds

Carlo Fontana, *Templum Vaticanum* (Rome, 1694). Not a Herald, this volume by another Fontana a century later, but with equally impressive engineering plates relating to the great obelisk, once again demonstrates the depth of Bern's collecting passion (Figure 4).

Johannes Regiomontanus, Manuscript, c. 1475 ? An extraordinary acquisition showing the handwriting of the most important mathematician of the fifteenth century (Figure 5) and the earliest scientific printer, representative of the large group of autograph manuscripts including Tycho, Kepler, Newton, Cassini, Huygens, Herschel, Hevelius, and Laplace.

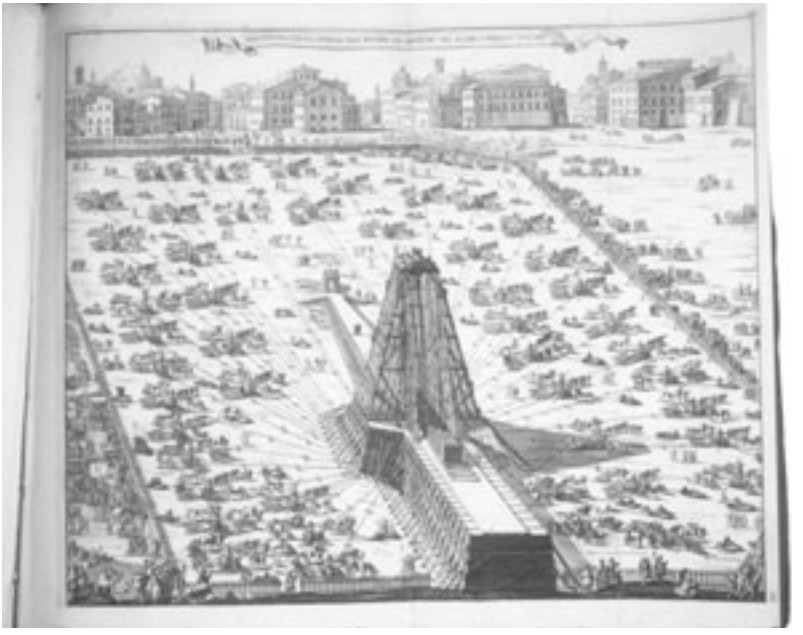

Figure 4
From Carlo Fontana, *Templum Vaticanum*, Rome, 1694.

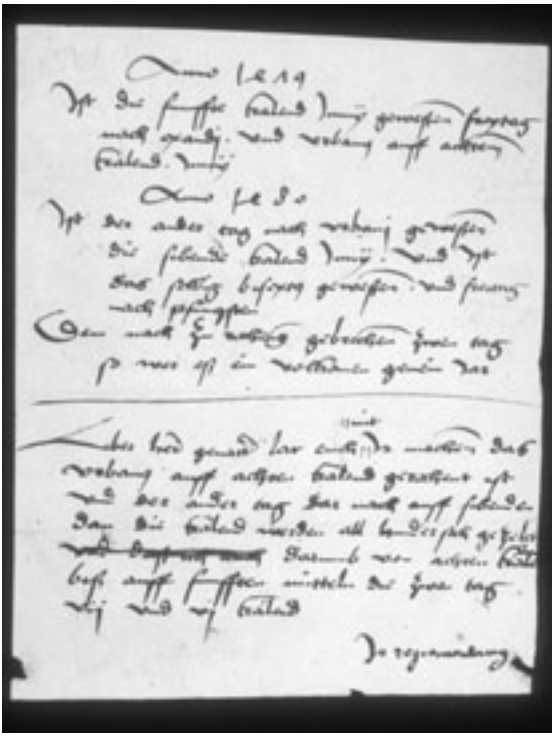

Figure 5
Manuscript of Joannes Regiomontanus, c. 1475.

Johannes Sacrobosco, *Sphaera* (Leipzig, [1489]) (Hain 14116). The most frequently reprinted astronomy textbook of all time began, in this decade, to incorporate wood cut illustrations, and here the one showing evidence that the earth is round, based on sightlines from ships, is delightfully primitive. It's also interesting to see the heavy interlinear annotations in the Dibner copy (Figure 6).

Robert Recorde, *Castle of Knowledge* (London, 1557). The first extensive popular astronomy text in the English vernacular, Recorde's dialog between a student and master contains a fascinating reference to Copernicus' recent work. The student protests that "I desire not to heare such vaine phantasies," to which the master rejoins, "You are too yonge to be a good judge in so great a matter."

Caspar Peucer, *Hypotheses astronomicae* (Wittenberg, 1571). Most astronomers of the sixteenth century suspended judgment on Copernicus' heliocentric cosmology, but they were quite willing to accept his principle that celestial motions should be explained by uniform motions in combinations of circles; this very rare

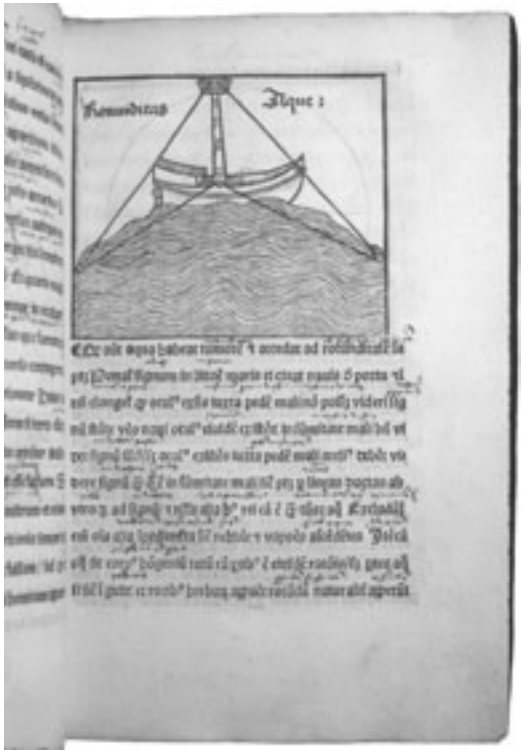

Figure 6
From Sacrobosco (Joannes de Sacro Bosco), *Sphaera mundi*. Leipzig, [1489].

book by the Wittenberg astronomy professor fits into that pedagogic style. I suspect that at most four or five copies of this edition came on the market in the entire twentieth century.

Michael Maestlin, *Ephemerides novae* (Tübingen, 1580). I happen to be extremely jealous of this volume of daily planetary positions prepared by Kepler's teacher at Tübingen. My personal collection of early ephemerides is rivaled only by the Bibliothèque Nationale in Paris, but in over three decades of collecting, I have never seen this book on the market. What is more, I recognized Maestlin's handwriting on the title page of the Dibner volume, so it turns out to be a presentation copy from the author himself.

Tycho Brahe, *Epistolae astronomicarum* (Uraniborg, 1596). This item is actually one of the Heralds, but for the wrong reason. The book has a wonderful binding with Tycho Brahe's portrait and arms stamped on the cover, which Bern Dibner took as evidence that it was Tycho's own copy. In fact, it is more likely a presentation copy from Tycho, a splendid example, but not the most

important Tycho Brahe book in the collection. Bern should have chosen either the *Astronomiae instauratae mechanica* (Prague, 1602) or *De mundi aetherei recentioribus phenomenis* (third issue, Frankfurt, 1610) wherein Tycho shows that the Comet of 1577 lay beyond the earth's atmosphere (contrary to Aristotle's teachings) and where he presents his new geo-heliocentric Tychonic cosmology.

Galileo Galilei, letter to Claude de Peiresc, 1635. Writing from Arcetri, where he was under house arrest, Galileo described to his French correspondent a clock with a rotating globe to represent the earth. This long-lost letter resurfaced in 1961, was acquired by the Burndy Library and published in facsimile in 1967 with a fine biographical account of Galileo written by Bern Dibner.

Robert Hooke, *An Attempt to Prove the Motion of the Earth* (London, 1679). This fascinating account of the first scientific apparatus designed to solve a specific problem is one of the parts of Hooke's Cutlerian Lectures volume, which is in fact a Herald but chosen for a completely different part, the one where he propounds what is now known as Hooke's law of elasticity.

J.L.E. Dreyer, Original drafts for the introductions to *Tycho Brahe Dani Opera Omnia*, c. 1910–15. A Danish scholar working in England, Dreyer edited the monumental edition of Tycho's books, correspondence, and observations, writing the volume introductions in English after which they were translated into Latin for the edition itself. Bern Dibner was eager to collect modern scholarship as well as the original texts, and these English versions have proved a helpful aid to modern workers.

Conclusion

Bern Dibner's remarkable collection was divided in 1976, with a bicentennial gift to the nation arriving at the Smithsonian 25 years ago. This gift included the 320 scientific incunables, the first editions, the 200 Heralds of Science, in other words, the *crème de la crème*. Why was it appropriate for this fraction of the treasure to come to an institution sometimes called "the nation's attic," a repository for America's hardware? The Institution had not really gone for books as artifacts, as hardware. Do they have a place here?

If the engines and calculating machines, and even the Star Spangled Banner and the first ladies' gowns can be called hardware, then there is a whole other aspect of our history and technology that might be called software, the world of understanding. It is not so easy in a museum context to illustrate ideas like the elliptical orbits of planets or the conflict over cosmology at the time of Galileo or the origin of species. Here, in the Dibner Library of the History of Science and Technology, are the icons that symbolize the concepts that have shaped our understanding of our modern world. It is true that the breadth of the collection serves as a research base for the history of science and technology, and it is also true that these fragile objects can't go onto permanent display. Nevertheless, these precious first editions are themselves objects to be admired as representative relics and markers of intellectual achievements—veritable icons of understanding, valued and revered. I believe these artifacts can and must play an appropriate role in both the increase and the diffusion of knowledge. To me it has always seemed wonderful for this section of Bern's monument to have found this home on the National Mall.

Dibner Library Lectures on the History of Science and Technology

Supported by The Dibner Fund

2001 **Commemorating the Dibner Library's 25th Anniversary**
Owen Gingerich (Harvard University and Smithsonian Astrophysical Observatory) on "Icons of Understanding: Celebrating Bern Dibner's Heralds of Science" and eminent British antiquarian book dealer Roger Gaskell on "From Collector to Reader: Bern Dibner and History of Science Collections" with an introduction by Ron Brashear (Head of Special Collections, Smithsonian Institution Libraries), October 3, 2001

2000 **Scientific Discoveries**
Kenneth L. Caneva (University of North Carolina at Greensboro) on "The Form and Function of Scientific Discoveries," November 16, 2000

2000 **Astronomy**
Steven J. Dick (U. S. Naval Observatory) on "Extraterrestrial Life and Our World View at the Turn of the Millennium," May 2, 2000

1999 **History of Architecture**
Charles Brownell (Virginia Commonwealth University) on "Horrors! Changing Views of the American Victorian House" in conjunction with the Washington Collegium for the Humanities Lecture Series on Shifting Perspectives in History, Culture, and the Arts, May 21, 1999

1998 **History of Medicine and Anatomy**
Katharine Park (Harvard University) on "Visible Women: Anatomical Illustration and Human Dissection in Renaissance Italy," June 3, 1998

1997 **Technology and Invention (Centenary of Bern Dibner's Birth)**
Henry Petroski (Duke University) on "Pencils, Paperclips, and Invention," November 18, 1997

1996 **Earth Sciences (Smithsonian 150th Anniversary, Honoring the Institution's Benefactor James Smithson, Geologist)**
Robert Hazen (Carnegie Institution of Washington Geophysical Laboratory and George Mason University) on "Earth Sciences, Unanswered Questions, and the Dibner Legacy," September 25, 1996

1995 **Chemistry and Art**
Roald Hoffmann (Cornell University) on "Chemistry Imagined" in conjunction with Smithsonian Libraries—Washington Project for the Arts exhibition, *Science and the Artist's Book*, May 30, 1995

1994 **History of Technology. The Telephone**
Bernard Carlson (University of Virginia) on "Making Connections: Alexander Graham Bell, Elisha Gray, and Thomas Edison and the Race to the Telephone," March 17, 1994

1993 **Natural History of the Renaissance**
William B. Ashworth, Jr. (University of Missouri, Kansas City) on "Animal Encounters of the Emblematic Kind: Re-writing the Book of Nature in the Late Renaissance," May 13, 1993

1992 **History of Technology. The Printing Press, 15th to 20th Centuries**
Elizabeth Eisenstein (University of Michigan Emerita) on "Celebrating Western Technology in the Age of the Hand Press," June 4, 1992

The Smithsonian Libraries

Anacostia Museum & Center for African American History and Culture Library

Anthropology Library

Botany and Horticulture Library

The Dibner Library of the History of Science and Technology

Freer Gallery of Art and Arthur M. Sackler Gallery Library

Hirshhorn Museum and Sculpture Garden Library

Joseph F. Cullman, 3rd Library of Natural History

Museums Information Library

National Air and Space Museum Library

National Museum of American History Library

National Museum of Natural History Library

National Postal Museum Library

National Zoological Park Library

Smithsonian American Art Museum/National Portrait Gallery Library

Warren M. Robbins Library, National Museum of African Art

Cooper-Hewitt, National Design Museum Library
(New York, New York)

Museum Support Center Library
(Suitland, Maryland)

National Museum of the American Indian Library
(Suitland, Maryland)

Smithsonian Environmental Research Center Library
(Edgewater, Maryland)

Smithsonian Tropical Research Institute Library
(Republic of Panama)


1486
PTOLEMAEUS
GEOGRAPHIAE
1552