A Bibliophile's Quest for Copernicus

For a decade Owen Gingerich has scoured the world for copies of a 16th-century classic, in the process rewriting a chapter in the history of the scientific revolution

Philadelphia. Late one night in 1971, over a drink with a friend, historian Owen Gingerich speculated that only a handful of people in the 16th century actually read *On the Revolutions of the Celestial Spheres*, the complex 400-page treatise of 1543 that paved the way for the scientific revolution. It seemed entirely possible that the vast majority of the book's readers were modern. A few days later Gingerich had the opportunity to examine a rare copy at the Royal Observatory in Edinburgh. To his surprise, the wide margins from start to finish were peppered with handwritten notes in Renaissance Latin.

Thus began an odyssey that has taken him from Kiev to Guadalajara, from Palermo to Uppsala, from the vaults of the Vatican to a castle in England. So far he has tracked down 251 copies of the first edition.

"I've been waiting to see the annotations that say, this book is absurd, or, this is crazy," Gingerich told the annual meeting of the History of Science Society on 31 October. "I'm still waiting."

Never before has a complete census been attempted for a classic of scientific history. Heretofore such concern has been lavished only on the Gutenberg Bible, the first folio of Shakespeare, and the elephantine folios of Audubon.

Contrary to conventional wisdom, Gingerich has found that Copernicus was widely read in the 16th century, many of the rare volumes filled with detailed marginalia. Further, a history of each volume's ownership has helped Gingerich trace the passage of the books through time, a powerful tool for analyzing the past. He has chronicled, for instance, the futility of the Inquisition's attempt in the 17th century to censor the book. Such detective work has also taken Gingerich outside the world of scholarship. He recently testified about a stolen Copernicus during an FBI investigation. An ordinary first edition can bring anywhere from $40,000 to $60,000, the price skyrocketing to $200,000 for volumes with hand-written notes by illustrious astronomers of the 16th century.

Born at the end of the Middle Ages, Nicolaus Copernicus challenged the notion that the earth stood at the center of the universe, a belief passed down from Aristotle. The revolutionary astronomer early in his career came to believe that the earth and other planets revolve around the sun. Afraid of ridicule, Copernicus waited to publish until he lay on his deathbed.

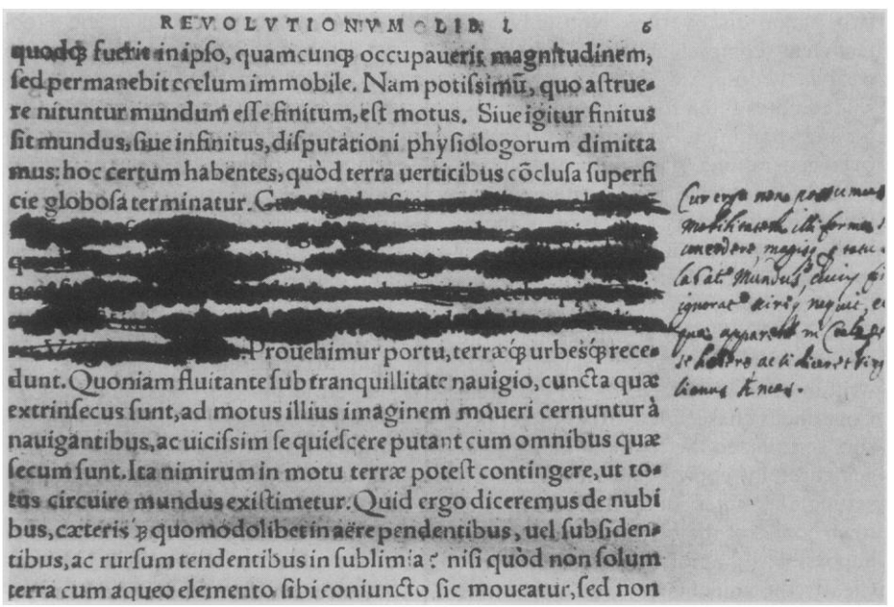
The starting point in Gingerich's quest was a list compiled in 1943. It gave the whereabouts of 70 copies, mainly in Germany. He then turned to sleuthing. An energetic gray-haired historian of astronomy with a joint appointment at the Smithsonian Astrophysical Observatory and Harvard University, Gingerich mailed letters of inquiry, consulted dealers, and advertised in bibliophilic journals. A trip to Paris yielded 12 first editions. Oftentimes the books were under lock and key, and could be examined only under supervision. The École Polytechnique put up a fight, letting Gingerich see its Copernicus only after he presented his "Harvard dazzler," a letter of introduction with engraved letterhead and bright gold seal. Unexpectedly, a wider search revealed more copies in the provinces than in Paris itself. In southern France, Gingerich came across a tiny library that let him take the valuable tome to the town square, so he could photograph the title page in the sunlight.

At the Lenin State Library in Moscow, Gingerich inquired about the single Copernicus that the library listed. After some quiet discussion, the librarians showed him three.

A few copies went up in smoke during the Second World War. In an air raid over Germany, one librarian refused to protect the books on the grounds that such pessimism would be unpatriotic. In an earlier age, pirates, outraged that they captured a boatload of books, tossed at least one Copernicus into the Mediterranean.

America turned out to be a treasure trove of first editions, 50 in all, with an unusually large number in private hands. The earliest surviving first edition is probably the one in the Boston Athenaeum, which arrived around 1825. Thomas Jefferson bought a second edition for the University of Virginia. At a West Coast collection, Gingerich was not allowed to see the book on the grounds that he came from Massachusetts, the only state that had not cast its lot with Richard Nixon. In Philadelphia, Gingerich visited the private collection of the late Henry Posner, the entrepreneur who gave the world neon advertising signs.

In his detective work, Gingerich uses ultraviolet light to reveal faded ink, scrutinizes styles of handwriting, and spends long hours at translation. The clues are adding up. Emerging from his research is a detailed picture of who owned each book down through the centuries. Christopher Clavius, a Jesuit astronomer who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quodq; fuctie in ipſo, quamcunq; occupauerit magnitudinem, ſed permanebit cœlum immobile. Nam potiſsimũ, quo aſtruere nituntur mundum eſſe finitum, eſt motus. Siue igitur finitus ſit mundus, ſiue infinitus, diſputationi phyſiologorum dimittamus: hoc certum habentes, quòd terra uerticibus cõcluſa ſuperficie globoſa terminatur. C[illegible]

[illegible] Prouehimur portu, terræq; urbesq; recedunt. Quoniam fluitante ſub tranquillitate nauigio, cuncta quæ extrinſecus ſunt, ad motus illius imaginem moueri cernuntur à nauigantibus, ac uiciſsim ſe quieſcere putant cum omnibus quæ ſecum ſunt. Ita nimirum in motu terræ poteſt contingere, ut totũs circuire mundus exiſtimetur. Quid ergo dicemus de nubibus, cæteris q; quomodolibet in aëre pendentibus, uel ſubſidentibus, ac rurſum tendentibus in ſublimia? niſi quòd non ſolum terra cum aqueo elemento ſibi coniuncto ſic moueatur, ſed non

A censored copy of Copernicus, with the church's rephrasing at the right.

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engineered the reform of the Gregorian calendar, wrote in his copy beside a faulty trigonometric theorem, "Here Copernicus is dreaming!" Several score of the books reveal detailed technical critiques by astronomers. The marginal notes of Erasmus Reinhold, the foremost astronomer in the mid-16th century Lutheran world, ignored the heliocentric cosmology but devoted great attention to questions such as the motion of the moon and the slow precession of the stars. And contrary to the conventional wisdom, Gingerich has shown that Copernicus was quickly taught at the graduate level in many of the great Lutheran universities.

Do notes appear in all the books? "It's hard to say," Gingerich told the History of Science Society. "It's difficult to find a copy that is totally clean, that doesn't have at least a little bit of underlining. Then there were the people who wrote index notes in the margin, sometimes losing interest after about 20 pages. About 10 percent of the books contain really interesting comments."

A book's provenance can also illuminate the sheer sweep of history. A copy now in a private collection in Oxfordshire was previously owned by William Jones, an English mathematician in the circle of Newton and Halley. Earlier, it was owned by Richard Bently, a classical scholar and master of Trinity College. Still earlier, it was in the possession of John Greaves, a 17th century astronomer at Oxford who apparently bought the book in Italy on the way to the Middle East. On the endpapers and flyleaves, Greaves took notes on Ur and Lahore, and noted that someone had sighted two unicorns in India.

So far Gingerich's survey has yielded two major discoveries. Not only was technical comprehension of the epic treatise widespread, but a network of shared notes often formed between master and apprentice, sometimes stretching over generations. This path of learning took place outside the tradition of the universities, and is therefore a major find. Some of Reinhold's comments over the course of the 16th and 17th centuries found their way into more than a dozen books. Another scholar's notes appear in six different volumes. As Gingerich has written in an article entitled "The great Copernicus chase": "Astronomy professors scrutinized the text and their protégés carefully copied out their remarks, setting the notes onto the margins of fresh copies of the book with a precision impossible by aural transmission alone. Clearly the students sat with the master book before them as they transcribed

Los Alamos Alumnus Touted as NSF Chief

Announcement of a new director of the National Science Foundation (NSF) is said to be imminent. The leading contender is said to be the foundation's current assistant director for mathematical and physical sciences, Edward A. Knapp, who joined NSF in September after 24 years as a scientist and administrator at Los Alamos National Laboratory.

Knapp has been active in scientific organizations in his discipline and to some extent in international scientific affairs, but is not well known in the science establishment. What is important is that he is apparently well known to President's science adviser George A. Keyworth II, who also came up through the Los Alamos hierarchy and is consulted in Administration appointments in the science sector.

Departing NSF director John B. Slaughter has accelerated his exit from the foundation in order to take up his new post as chancellor of the University of Maryland's College Park campus on 1 November. Slaughter announced in June that he would leave NSF for the university job. He said then that he would delay his departure from NSF to give President Reagan time to appoint a successor.

NSF deputy director Donald N. Langenberg will serve as acting director of the foundation until a new director takes over. Langenberg will be undertaking his second stint as acting director. He was acting director from July to December 1980 in the interval between terms of Slaughter and his predecessor, Richard C. Atkinson, now chancellor of the University of California, San Diego.

Knapp, 50, whose name has been mentioned increasingly on Capitol Hill and elsewhere as the probable White House choice to lead NSF, was head of the Accelerator Technology Division at Los Alamos when he was named to the NSF assistant director post. He earned a Ph.D. in high energy physics from the University of California, Berkeley, in 1958 and joined Los Alamos that year. Knapp's career at the laboratory included participation in the planning of the lab's Los Alamos Meson Physics Facility; he organized the accelerator technology division in 1978.

Slaughter's timing in leaving NSF was something of a surprise to the NSF staff. Slaughter was unavailable for comment, but sources in the foundation indicated that his decision was influenced by considerations that he had completed his role in NSF budget activities and that a longer absence from the university post could cause difficulties. Slaughter, 48, who was provost of Washington State University before becoming NSF director, will head Maryland's 37,500-student main campus outside Washington.

In actions that affected the policy sphere at NSF, President Reagan announced three more nominees to the National Science Board, the policy-making body for the foundation. The nominees are Robert F. Gilkeson, chairman of the board of the Philadelphia Electric Company; William F. Miller, president and chief executive of SRI, International; and William A. Nierenberg, director of Scripps Institution of Oceanography at the University of California, San Diego. If confirmed by the Senate, the appointments would bring NSB membership to within one of its full statutory membership of 24. The Administration for some months appeared to ignore a number of vacancies on the board.

—JOHN WALSH

Nuclear Regulation Run Amok, DOE Reports

Perhaps as early as next January, according to the White House, the Administration will propose new legislation designed to simplify nuclear plant licensing. One of the Administration's oft-repeated promises is that it will do something to shorten the time needed to get a nuclear project approved by the government. President Reagan's appointees have been looking for ways to simplify and centralize the running of the Nuclear Regulatory Commission (NRC), which is charged with protecting public safety. The first substantive indication of what they may propose appears in a paper issued by the Department of Energy (DOE) in October. It was one of several parting shots fired by James Ed-

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key words, data, diagrams, or whole paragraphs of elucidation."

Gingerich's quest has also resulted in a better understanding of just how ineffectual was the attempt at Copernican suppression by the Catholic church. Annoyed by Galileo's polemics, the church in 1616 put Copernicus on the *Index of Prohibited Books*, "until suitably corrected." For the only time in its history, the Inquisition also spelled out the expected changes. About a dozen cosmological passages that sounded too much like laws and descriptions were to be changed so they seemed more hypothetical. However, Gingerich finds that few first editions have been censored, and most of these, according to his reconstruction for the year 1620, were in Italy. And the censorship clearly did not slow the Copernican revolution in Catholic countries such as Spain or France.

Today copies of Copernicus are again in demand, this time among investors and booksellers. A first edition goes for $50,000. Back in 1934 it went for about $800. And the price is expected to rise as potential buyers enter the market. Universities in Japan, for instance, have purchased three out of the last dozen copies put up for sale.

Potential profits have even tempted a nonowner. Gingerich this past summer was called in by the FBI as an expert witness in an investigation. A book had mysteriously shown up in a Washington, D.C., bookstore on consignment. The Franklin Institute in Philadelphia claimed it was one of several rare books that had been stolen. Gingerich, who early in his census had taken notes on the Franklin Copernicus, flew to Washington and met with the FBI at the bookshop. On the inside cover were two spaces that once held bookplates, just like the Franklin book. "It fit like lock and key," says Gingerich. "The shop owner said, 'Take it away, it's yours.' " The FBI is now holding the book until the case comes to trial.

Even after the abducted Copernicus goes back to the Franklin collection, Gingerich's quest will be anything but complete. He hopes other copies will materialize before he commits his census to print, an act of finality he has put off for years. He estimates the print run for the first Copernican edition at 400 to 500 copies. Some have perished over the centuries, but Gingerich feels certain there are copies that have eluded his grasp. "There may be as many as 50 of them out there," he said in an interview after his talk. "Every once in a while a new one unexpectedly shows up."

—WILLIAM J. BROAD

Einstein Papers Coming On

In the year since the legal trammels were removed, the project to publish the Einstein papers has made substantial progress, but still faces major financial and editorial questions. A manuscript for the first volume is expected to be completed in late 1983 and publication is scheduled for 1984. At the anticipated publication rate of a volume a year and an estimated total of 35 volumes for the complete edition, the project will run well into the next century.

A major issue, because Einstein wrote mostly in German, is the amount of English translation to be included. That point appears to be the most difficult one in negotiations between the project, based at Princeton University Press, and the National Science Foundation (NSF), which is regarded as the likeliest source of sustained support for the project.

The project was delayed for nearly a decade by a dispute between the press and the Einstein estate (*Science*, 17 July 1981, p. 309). A year ago the legal impediments were lifted and the way cleared to publication. Funds from the press and the Sloan Foundation enabled the papers editor, Boston University physics professor John Stachel, to keep going on preliminary work. This year, a private gift of $1 million by Harold P. McGraw, a publishing executive and Princeton alumnus, provided an endowment for editorial work. Only part of the income from the gift is available for the project, however, since part is also used to maintain the principal because the funds are to be converted to an endowment for a Princeton professorship when the Einstein papers project is complete.

Prospects for long-term funding hinge on current negotiations with NSF. The foundation provided funds for the project in the early 1970's until the legal impasse developed; signs appear favorable for a resumption of support if details can be agreed on. The project application requests a grant of $1.4 million over 5 years to fund editorial work—the press will pay publication costs. Since the NSF history and philosophy of science program is working under the tight budgets that prevail in federal agencies these days, it is unlikely that the project will get the full amount unless other divisions of NSF with an interest in the papers chip in.

Differences on translation remain the major snag. The project proposal to NSF calls for publication in the dominant languages of the papers—German and English—with other languages translated into English. A main argument against extensive English translation of the German text is Einstein's renown as a stylist in German. Stachel describes the Einstein style as "deceptively simple" and extremely difficult to translate well. Inclusion of extended English translations would increase the burden on the editors, delay publication, and increase costs.

The NSF view is that the published papers will be essentially a research tool and that a translation will make them more useful to the research community. As one NSF official put it, the question is which consideration should govern, the cost of the time of the translator or of the time of the researcher? Underlying, the NSF position is a recognition of the current linguistic limitations of U.S. scholars. What now seems probable is that NSF will agree to a 1-year grant to move the effort forward. The grant would include funds for a translation experiment to determine whether a satisfactory plan can be worked out. A longer term grant would presumably follow.

The planned first volume will contain the earliest material from the archive. The intention is to group the documents into two parallel series of volumes, with letters in one series and other documents in the second.

The status of the papers was affected early this year when the trustees of Einstein's literary estate transferred control to the ultimate heir under the will, Hebrew University in Jerusalem. The trustees were Otto Nathan, who had figured centrally in the dispute over the papers, and Helen Dukas, Einstein's long-time secretary. Miss Dukas died shortly after signing the transfer. The original archive, which has been lodged at the Institute for Advanced Study in Princeton, is expected to be shipped to Israel soon. The Princeton press and Hebrew University are now in a partnership which is said to be harmonious.—JOHN WALSH

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