

Instrumental Changes in Astronomy

America's great collection of astronomical antiques is coming out of the closet

By JANET RALOFF

Tucked away in the attic of a small, domed structure on Chicago's lakefront rests a little-known scientific trove, a glittering assortment of roughly 1,500 antique instruments and 1,700 rare books known simply as the Adler collection.

Begun as a gift to the people of Chicago from Max Adler, who also built the city's planetarium, the collection today holds 85 antique telescopes. Opulent examples from the 17th and 18th centuries include several covered in hand-tooled leather and at least one of brass appliquéd with silver. In some, lenses are secured with holders of ivory or horn. But the most prized of these devices — a seven-foot reflecting telescope made by William Herschel — is borne in one of the simplest housings. This instrument matches precisely the description of the one through which Herschel discovered the planet Uranus in 1781.

The Adler collection's 95 astrolabes — instruments used to observe the positions of celestial bodies before the invention of the sextant — constitute the largest assemblage in North America and one of the three or four most comprehensive

such groups in the world. Among the rarest of these is a Jewish astrolabe. Lettered in Hebrew, it's one of only three known to exist.

Within the collection's library resides a first edition of Johann Kepler's *Rudolphine Tables*, named for Kepler's benefactor, Emperor Rudolph II of Prague. Published in 1627, these astronomical tables describe the positions of celestial bodies. In the Adler volume, Kepler has penned a Latin inscription to a friend. The library also contains a second edition of Sir Isaac Newton's *Principia Mathematica*, published in 1713.

Most of the 700,000 people who pass through the Adler Planetarium each year know nothing of the growing collection of astronomical history that sleeps upstairs. Over the past 30 years, however, historians have developed a deep respect for this tangible embodiment of early modern science.

They and others attracted to this marriage of art and science will get their first glimpse of the full breadth of the collection in the new year, when the Adler Planetarium will begin publishing a series of books cataloging — in text and pho-

tographs — each artifact. The books are the first in a series of projects to share the Adler collection more fully with the public and the research community alike.

Max Adler was one of a number of wealthy Chicago merchants who wanted to bestow a cultural legacy on his hometown. About the time his brother-in-law was founding Chicago's Museum of Science and Industry, Adler, a retired officer of Sears, Roebuck and Co., decided to bring Chicago the first planetarium in the western hemisphere. Made in Germany, the complex optical device — then just the third full-size planetarium in the world — projected a near-perfect reproduction of the night sky onto a domed ceiling.

Adler expected that the planetarium's entertaining sky shows would inspire in the public a sense of awe at humanity's insignificance in the context of the universe — a humility he hoped might discourage violence and foster a sense of global community. Adler's gift — the instrument and the rainbow-granite facility he built to house it — opened to the public in May 1930.

That same year, Adler purchased a European collection of roughly 500 antiques, most of which had been acquired around the turn of the century by Raoul Heilbronner, a German dealer living in Paris. Heilbronner "had a weakness for old scientific instruments, trading some and keeping most," notes Roderick S. Webster, who together with his wife, Marjorie, served for 29 years as curators of this collection.

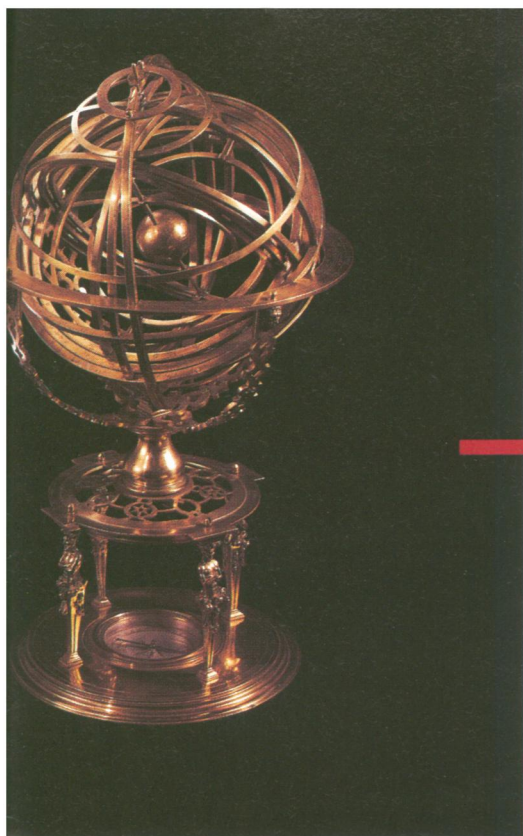
With the onset of World War I, Heilbronner returned to Germany — without his belongings. While the French government sold off most of Heilbronner's acquisitions piecemeal, Webster says the instruments, books, globes, and charts were sold together. A.W.M. Mensing, a connoisseur and close friend of Heilbronner's, bought the lot on behalf of the Müller auction house in Amsterdam.

Mensing added several pieces before commissioning a catalog of the artifacts for sale. One of these catalogs, published in 1924, found its way to Adler around 1929. Adler purchased the entire collec-

Hebrew astrolabe, probably made in Europe around 1550. On Jan. 29, this solid brass instrument begins a three-month stay at the Meadows Museum in Dallas. While the maker of this astrolabe is unknown, Johannes Fusoris, a Parisian who made another astrolabe in the Adler collection, gained considerable notoriety. When one of Fusoris' English clients, the Bishop of Norwich, refused to pay for instruments he had commissioned, Fusoris decided to appeal to the cleric's liege. He found King Henry V at Winchester, preparing to set sail for France. Fusoris not only failed to win payment, he also arrived home to face charges of consorting with the enemy. Initially banished to southern France, Fusoris ultimately won a pardon from his king, who decided he needed the services of this mathematician and clockmaker back in Paris.



Photos courtesy of The Adler Planetarium, Chicago, Ill.



In 1562, Gualterus Arsenius of Louvain (in what is now Belgium) produced this gilded-brass armillary sphere. The compass mounted in the base indicates that this was a working instrument, used to model the celestial sphere by showing the apparent paths of the sun and planets about the Earth. A fixed armilla, or ring, designates the plane of the equator. Other rings identify the horizon, meridian (great circle passing through the poles), and ecliptic (sun's apparent path among the stars).

Webster volunteered.

That was in 1962. And though they were named curators emeriti last year, they continue to commute to Chicago to work with the collection about four days a week.

Rod still has the Martin pocket sundial that kindled their initial interest in the history of astronomy and timekeeping. Over the years, he and Marjorie acquired quite a few other instruments — many of which they have since donated to the Adler — while helping the planetarium strengthen its own collection.

They've also enhanced the Adler's reputation, says William Andrewes, David P. Wheatland curator of the collection of historical scientific instruments at Harvard University. The Adler possesses "an important resource to the history of science and technology in astronomy and navigation," he says. "And Roderick and

Marjorie Webster have done a great deal in the last 30 years to build it into one of the premier collections of its kind."

Indeed, adds Owen J. Gingerich, also at Harvard, "anybody who is seriously interested in [antique] instruments knows about Adler. And this is largely because of the efforts of Rod and Madge, who have been indefatigable about visiting other museums and collections and playing a very active role in the [scientific societies]" — avenues through which professionals become aware of important instruments.

And the Adler collection has quite a few, according to Robert Anderson, director of the British Museum. President of the Scientific Instrument Commission of the International Union for the History and Philosophy of Science, he described the Adler's holdings as "the best collection of early astronomical instruments in the whole of the United States and probably the whole continent." Adds Noel M. Swerdlow at the University of Chicago, "Anybody who's working in the study of [early instruments] would want to be using material from this collection."

How? Gingerich has used Adler instruments in documenting forgeries of 17th century astrolabes made by 'Abd al-A'Imma. With plates for one or more specific latitudes, these sophisticated planar devices could solve problems involving such things as time, star positions, and length of the day merely by rotating an attached, openwork star map. Many museums had collected ornate brass astrolabes bearing 'Abd al-A'Imma's signature and dates that matched the Persian's active period. Gingerich says the astrolabes' delicate calligraphy, "first-

tion and turned it over to the new planetarium bearing his name.

Though some pieces were displayed immediately, the bulk of the collection went into storage in a combination of locked cases and open shelves in the planetarium's attic. While many experts knew of their whereabouts, garnering details on these instruments proved a challenge — until the Websters stumbled onto them.

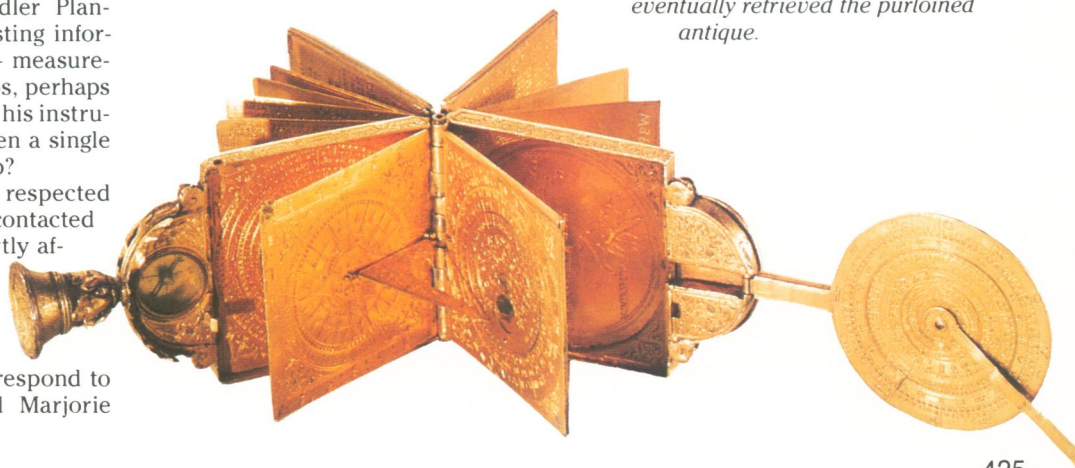
It started with an antique pocket sundial Rod Webster picked up from a local dealer. Recalls Marjorie, "We weren't familiar with its maker — Johann Martin of Augsburg — or era, so we took it to the British Museum [in London] and a curator showed us similar German ones." The curator spent a lot of time with the couple, who had traveled all the way from Winnetka, Ill., just north of Chicago.

As the Websters prepared to depart, the curator asked a favor in return. His museum had written the Adler Planetarium several times, requesting information about its collection — measurements of specific items, photos, perhaps details on how a maker signed his instruments — but there'd never been a single reply. Could the Websters help?

Happy to learn of a major, respected local resource, the Websters contacted the planetarium director shortly after they returned home. The good news: He still had all the British Museum's correspondence. The bad news: the Adler lacked the staff to respond to such inquiries. So Rod and Marjorie

Dated 1557, this gilded-brass astronomical compendium bears the signature V.C. "We know it's English, because it lists about six English ports," notes Marjorie Webster. The navigator's equivalent of a Swiss army knife, this instrument, when closed, compactly stored nearly all a traveler's needs — sundial, tide tables, perpetual calendar for figuring out Easter's date, a nocturnal (for reckoning time at night), and blank pages to inscribe personal formulas or details.

A similar compendium by Christopher Schissler of Augsburg, dated 1559, was stolen in 1960 while on loan from the Adler to St. John's College in Annapolis, Md. In 1985, Marjorie Webster thought she recognized a photo of the compendium in the announcement of an upcoming sale at Christie's auction house in New York. The Adler eventually retrieved the purloined antique.



class metalworking," and airy, vine-like filigree seemed to "appeal to curators of art museums." But quite a few museums that didn't understand the science of astrolabes found themselves with non-working fakes.

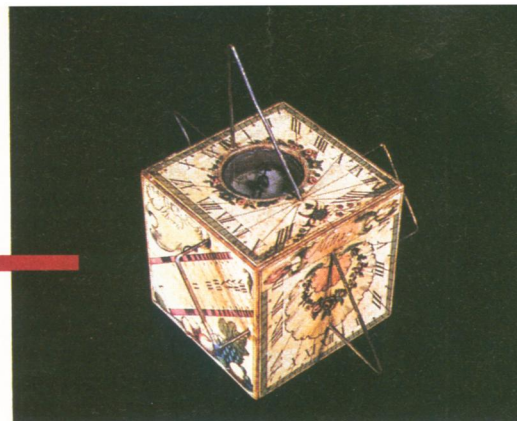
By comparing these "degenerates" to true 'Abd al-A'imma astrolabes such as the Adler's, Gingerich was able to identify stylistic differences and errors that characterize the lovely forgeries, probably made early in this century.

He has also studied a "theorica orbium"—a model of the spheres—created in 1582 by the Florentine craftsman Hieronymus Vulparius. This rare instrument, part of the original Mensing collection, contains a series of nested brass rings to model the arrangement of crystalline spheres. They correspond to Mercury's alleged orbit about the Earth.

Gingerich believes such devices were special teaching tools to "demonstrate how an eccentric planetary orbit can be arranged with auxiliary spheres so that the inner and outer surfaces are still concentric with the Earth." Explains Gingerich: "By writing up and describing that [Adler] instrument, I helped scholars get a better insight into that aspect of 16th century thought."



Paper-covered wooden sundial by David Berlinger of Nuremberg, Germany, circa 1750. Owners put these compact devices, which were popular in the British Isles, in a south-facing window. The shadow cast by the wire gnomons indicates the time.



learn something that is directly applicable to the history that you're studying." Examining the instruments' lenses, looking at their decoration, and using them "gives me a feel for the science that I could never have gotten just from reading." That's why he argues that "instruments ought to be an original resource for historians doing research" on laboratory science or technology.

For instance, the difference between looking through a modern telescope and one of Galileo's early 15th century instruments—plagued by a small field of view and primitive optics—"is like night and day," Van Helden says, and allows modern scientists to appreciate Galileo's superb observational abilities.

"When you read about other people claiming not to be able to see what Galileo did through the telescope, you can begin

centered universe, Nicolas Copernicus' sun-centered universe, and Tycho Brahe's compromise: the sun orbiting a stationary Earth, with all other planets orbiting the sun. Rod Webster notes that "all were bound into the same book, since at the time no one was sure which interpretation was correct."

Similarly, he argues, Julius Schiller's 1627 *Coelum Stellatum Christianum* marks the growing political influence of the church. Scandalized by science's use of heathen gods to coordinate relationships among celestial bodies, writers of this text offered a biblical reinterpretation of the traditional constellations. Eridanus, "the River," for example, was renamed Transitus Israel and said to show the Israelites crossing the Red Sea.

Quadruple sand glass, circa 1700, from Germany. Used in churches, it was typically mounted on a wall peg right next to the minister. Preachers turned it over at the start of a sermon—to help pace their delivery and ensure that they did not run overtime.

to understand why," he says. "You really couldn't see much with them." Indeed, Van Helden maintains, it makes sense out of the whole history of opposition to Galileo. "While his discoveries challenged religious beliefs of the time, they were also hard to validate with early telescopes."

Astronomical instruments also serve "as important evidence for the history of astronomical ideas," notes Anderson. They're three-dimensional embodiments of the concepts of their day, he explains. Studying early instruments also enables astronomers to calibrate the accuracy of early recorded data, he adds.

Some of the Adler's texts do the same thing. By comparing successive generations of star charts, astronomers can not only help date when certain novas appeared, but also chart the improvement in optics as observers mapped ever fainter, more distant objects.

These books also chronicle revolutions in ideas. For instance, *Harmonia Macrocosmica*, a 1667 atlas of the universe by Andreas Cellarius of Amsterdam, includes depictions of Ptolemy's Earth-

Since becoming the Adler Planetarium's director in July 1991, Paul Knappenberger has been helping to shape a new, long-range strategy for the institution. One aspect includes plans for "historically evocative" exhibits focusing on the antiques, notes Adler curator Liba Taub. These settings will demonstrate not only how the instruments were used at home or in the lab, she says, but also how the science these artifacts represent reflects humanity's changing conception of its place in the universe. Taub hopes to develop special-interest groups among scholars by sponsoring symposia, colloquia, and workshops focusing on the collection over the next few years.

"Ours is one of the three outstanding collections [of antique instruments] in the world," Knappenberger says. And neither of its European counterparts—in Oxford, England, and Florence, Italy—"is as accessible to the public or interpreted in this social and cultural way," he asserts.

The biggest challenge, Knappenberger foresees, "is how to continue to grow the collection." Its oldest artifact, a brick depicting Leo the Lion with stars imprinted on his body, dates to 2000 B.C. The Adler's oldest instrument is an Arabian astrolabe from 1131 A.D. Few items are less than 100 years old. "Should we be collecting newer pieces?" Knappenberger asks. If so, what kinds? "These are the kinds of things we must wrestle with over the next few years." □

Between World War II and the mid-1980s, "the history of science has been largely the history of theory," asserts Albert Van Helden of Rice University in Houston. "But in the last 10 years, increasingly, historians have begun paying more attention to the context within which science was done," he says. "And that means studying the laboratory—and instruments." Concludes Van Helden, "The study of scientific instruments is in its ascendancy."

"I've taken apart 60, maybe 70 telescopes," he says, "and every time you