

Report on some Scientific Instrument Collections in Japan

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Viewing an instrument collection for the first time is always a joy in terms of discovery and surprises. Flying 6,500 miles to do so only adds to one's satisfaction when the time finally arrives to enter a museum and view the many objects on display. Last summer I journeyed to Japan to examine Japanese scientific instruments collections as part of my own research to better understand the history of science in this area of the world and, in light of the upcoming 2005 meeting in Beijing of the IUHPS and SIC, to generate more awareness about collections in the region. The report that follows describes my venture into the land of the Rising Sun and surveying some of its notable and varied instrument collections.

I started my journey in Japan with a two-night stay in the city of Narita, located about 60 km northeast of Tokyo and about a 15-minute train ride from Narita International Airport. This pleasant city gave me the chance to recover from jetlag, visit the imposing thousand-year-old Buddhist temple Naritasan Shinsh-ji, and take a 30-minute train ride to Sawara city to visit my first museum – the Ino Tadataka Museum (Fig. 1). Opened in 1998, this museum presents the surviving land surveying instruments and maps of Ino Tadataka (1745-1818) who made the first complete coastal survey of Japan during the early 19th century. These instruments are based on European designs obtained from western science texts acquired from China and include a four-draw telescope, various scales engraved with diagonals for greater accuracy, a graphometer-like instrument using raised sighting vanes, a waywaiser having wheels that are geared to internal distance counters, and a large quadrant of 4-foot radius with a frame of wood and metal supporting an engraved metal scale with diagonals. The museum display area consists of a single large room with subdued lighting except for where exhibit material is dis-



Fig. 1 *Tadataka Museum, Sawara.*

played and offers a chronological route that follows Ino's life in Sawara. Undertaken late in life, Ino's coastal survey work required a decade and a half to complete and resulted in a set of accurate and beautiful maps of Japan. In this museum, Ino's instruments are given suitable emphasis which allows them to speak persuasively to the historical significance of his accomplishments in support of the Japanese nation.

Leaving Narita, I took a local train for Tokyo Station where I transferred to a Shinkansen, or a bullet train as it is commonly known, for my next destination: the former capitol city of Kyoto where I spent the next seven days of my visit. Within this culturally rich city is the scientifically rich Shimadzu Foundation Memorial Hall Museum, which is part of the Shimadzu Corporation founded in 1875 by Shimadzu Genzo Sr. (1839-1894). Shimadzu formed this enterprise after the 1868 Meiji Restoration when Japan

struggled to pull even scientifically and technically with the West and this museum puts on display the talent of this early maker of Japanese teaching instruments and other advanced apparatus. Following the death of Genzo Sr. in 1894, his son Genzo Jr. (1869-1951) took over the firm and continued producing the instruments and other equipment needed by a developing Japan.

This museum resides in an older two story building located on the grounds of the original firm and offers to the visitor an enjoyable display of both Japanese and imported Western instruments. Things of interest include the earliest microscope made in Japan dated 1781, natural philosophy teaching apparatus, Leyden jars, medical models, electrical items such as Geisler tubes and Crooke's Radiometers (Fig. 2), wireless equipment, and a wardrobe sized x-ray machine (Fig. 3). In addition to these items,



Fig. 2 *Wall cases containing primarily nineteenth-century instruments at the Shimadzu Foundation Memorial Hall Museum, Kyoto.*



Fig. 3 *Large x-ray machines at the Shimadzu Foundation Memorial Hall Museum, Kyoto.*



Fig. 4 Entrance of the Kyoto University Museum.



Fig. 5 The Ebayama Museum of Meteorology, Hiroshima.

important documents such as the 1882 Shimadzu Science Equipment Catalogue List are on display. The obvious historical lesson found here is one of Japan's growing scientific prowess as conveyed by the increasing sophistication of Japanese instruments and how the Shimadzu Corporation helped create a foundation of science for this country.

At the end of my visit, I chatted with the museum's manager (in a combination of English and Japanese) and enjoyed hearing him refer to Genzo Jr. as 'Japan's Edison' because he had only one year of higher education before coming to work with the family business. It should be noted that in this museum, like many of the science museums I visited in Japan, the non-Japanese reader will encounter a language barrier with labels and one must let the instruments speak for themselves in silent appreciation. Many institutions offer summary handouts in English which are sufficient to convey the basics, but not all details. Yet it is clear from what is on display at this museum that the Shimadzu's, father and son, worked hard in contributing to Japan's modernization in science, technology, and industry.

A modest display of mechanical model replicas is found in the Kyoto University Museum (Fig. 4). These hands-on reproductions are a selected subset of the instruments originally imported by Japan in the 1890s for teaching purposes from German makers Gustav Voigt and Peter Koch and stand for the only items currently on public display from this notable university collection. However, with the assistance of Prof. Shiroshita Sohei from Kyoto University and Prof. Nagahira Yukio from Osaka University of Economics and Law (the latter being one of the two SIS members from Japan), I was given access to the historical instruments located in storage behind the scenes at this museum. Here I found a wide range of optical, electrical, and other physics instruments employed in research and teaching at this higher education facility founded in 1897. An echelon spectroscope by the English maker Adam Hilger quickly caught my atten-

tion as it linked to my own research on Japanese physicists Nagaoka Hantar? (1865-1950) and Takamine Toshio (1885-1959). Although most of this collection remains hidden from the visiting public, traveling researchers with a valid need should be able to arrange permission to see this collection (though a nicely illustrated 349 page Japanese language catalogue of the collection was published in 2001).

Kyoto is a great city to explore beyond instruments and offers an impressive history with many remarkable temples and other interesting sights to visit. From Kyoto, Hiroshima is an easy day-trip visit via Shinkansen and, in addition to the Peace Memorial Museum and A-bomb Dome, I would propose visiting the Ebayama Museum of Meteorology (Fig. 5). Science exists here mainly in the shape of modern instruments along with a building that survived the August 6th, 1945 destruction. The hilltop location gives a fine view of the harbour and a pleasant way to break away from the hectic tourist crowd for a moment, recommendation enough in busy Japan.

Moving north from Kyoto, I travelled by Shinkansen to the busy and demanding national capital of Tokyo where 12 million people call home. This city ranges from intense neon-showered modernity to the quiet found in a small neighborhood park or Buddhist temple. Numerous instrument collections are found in this metropolitan area and I began my visit with the National Science Museum in Tokyo's Ueno Park. Appropriate for a family visit, the museum displays various instruments in their Astronomy Gallery, the largest being an 8" equatorial by Troughton & Simms of London. Japanese telescopes and globes receive prominent attention with an early 4-draw telescope cut open to reveal its construction and part of the exhibit is devoted to Japanese astronomers such as Kunitomo T?bei (fl. 1830s). An adjoining room holds a wide-ranging collection of Japanese clocks and dials while the basement areas allows one to see a Foucault Pendulum. This muse-

um, clustered among a number of other national museums in Ueno Park, makes for an easy starting point in your instrument viewing pursuits around Tokyo.

The smaller (and free) NHK Broadcast Museum offers three floors of displays connected to radio and television broadcasting history in Japan. NHK (which stands for the Nippon Hoso Kyokai or Japan Broadcasting Corporation) commenced broadcasting on March 22nd, 1925, and the museum exhibits receivers, transmitters, antennas (the Yagi antenna design came from Japan), TV cameras, etc., to bring to light its rich history. During my visit, an old German Blatthaller (or leaf speaker, Fig. 6) was being demonstrated and I was informed that it had been recovered from a city dump sometime after WW II. The leaf speaker worked well in playing music from a modern CD player and the NHK guide, a 72 year-old retired news reporter, was quite happy to provide further details about it and show me around the museum. Yet again, a mixture of English and Japanese verbal communication made for a delightful encounter at this well-ordered museum.

The collection on display in the Science and Technology Museum at Tokyo University of Science (Fig. 7) highlights calculating and computing instruments from the past 150 years. Japan both imported and exported this technology and the many objects shown reveal this, from an arithmometer by C&E Layton of London to a 1923 Japanese-made Tiger Calculator. A number of abacuses, slide-rules, adding machines, and calculators make it apparent Japan responded and contributed to the development of these instruments based on the materials they delivered. Japanese typewriters, a cabinet of polyhedron models, a water level for surveying, and an Edison phonograph from 1915 fill out their exhibit. My favorite item was an early 1980s Fujitsu Micro 8 personal computer that used the BASIC language and was powered up for me so I could run a short program. While this 8-bit system was advanced for its day, today Japan boasts



of having the fastest supercomputer in the world with the 'Earth Simulator' system in Yokohama (and another 'scientific instrument' that I visited as part of this journey to Japan).

About 30 minutes from Tokyo by train is the Tokyo Electric Power Historical Museum in the old treaty port of Yokohama. Not to be confused with the Electrical Energy Museum in Shibuya within Tokyo which is more of a children's museum and has little of historical interest, TEPCO's historical museum offers a splendid collection of electrical generation, measurement, and distribution related instruments in an ample and well-organized setting. As electrical energy fueled Japan's progress as a nation since the first electric light turned on in 1878, the apparatus and technology required for this progress receives fine attention here and is well displayed in its social and cultural context. For example, the demand for the 'three electric treasures' - a refrigerator, washing machine and b/w television set - in post-war Japan is shown fitting in with the growth of a mass consumption society and the growing middle-class. Museum facilities includes an archive that holds documents, films, and journals related to electric power in Japan and is accessible by prior reservation.

The Yokohama Maritime Museum is another stopover prospect in the same city. Situated on the harbour, it focuses on the larger aspects of Japanese maritime history and exhibits a handful of navigation-related instruments. I saw a Ulysse Nardin chronometer, a celestial globe of 6" diameter by Tamaya & Co. of 'Ginza, Tokyo, Japan', and a backstaff labeled 'Made by Alex Stephens Temple Barr Dublin for George Kiddrington' among a basic set display items. Adjacent to the Japanese sailing ship Nippon Maru which is open for tours as well, this museum underlines how Japan's maritime setting determined her interactions with the other seafaring nations of the world when it came to scientific instruments.

To conclude, if you are making plans to visit China for the IUHPS/SIC meeting next year

Fig. 6 *The author and guide with the German Blattballe, or leaf speaker; at the NHK Broadcast Museum, Tokyo.*

Fig. 7 *Entrance to the Science and Technology Museum at Tokyo University of Science.*



in Beijing, then consider adding a stopover to Japan where a number of collections await your inspection. Or, better yet, make Japan your next travel destination on its own merits. I would like to return to the Shimadzu and TUS collections - these were my favorites and resonant with my own research interests. And I know more collections lurk behind doors somewhere in Japan, waiting to be spotted, and reason enough for another visit.

Museum WWW URLs:

Ino Tadataka Museum, Sawara:

<http://www.city.sawara.chiba.jp/english/tadataka.htm>

Shimadzu Foundation Memorial Hall Museum, Kyoto:

<http://japan.k-cip.org/business/tech-visits/K-42.html>

Kyoto University Museum, Kyoto:

http://inet.museum.kyoto-u.ac.jp/index_e.htm

Ebayama Museum of Meteorology, Hiroshima:

http://www.hcvb.city.hiroshima.jp/e_navigator/main/1_05.html

National Science Museum, Tokyo:

<http://www.kahaku.go.jp/english/>

Tokyo Electric Power Historical Museum, Yokohama:

<http://www.tepco.co.jp/rd/shiryokan-e/home-e.html>

Yokohama Maritime Museum, Yokohama (Japanese only):

<http://www.nippon-maru.or.jp/top.html>
"Earth Simulator" Supercomputer Facility, Yokohama:

<http://www.es.jamstec.go.jp/esc/eng/>

Suggested readings:

James R. Bartholomew, *The Formation of Science in Japan: Building a Research Tradition* (New Haven: Yale University Press, 1989). ISBN: 0-300-05580-3.

Ryokichi Otani, Tadataka Ino, *the Japanese Land-Surveyor* (Safety Harbor, FL: Simon Publications, 2001). ISBN: 1-931541-22-1.

Yukio Nagahira and Yoko Kawai, *Kindai nihon to butsuri jikken kiki: Kyoto daigaku shozo meiji taishoki butsuri jikken kiki* [Experimental Physics Instruments from Japan's Modern Era: Instruments belonging to Kyoto University from Meiji and Taisho Periods] (Kyoto: Kyoto University Press, 2001). ISBN: 4-87698-419-0.

Shigeru Nakayama, *A History of Japanese Astronomy: Chinese Background and Western Impact* (Cambridge: Harvard University Press, 1969).

Jan Dodd and Simon Richmond, *The Rough Guide to Japan* (London: Rough Guides Ltd., 2001), 2nd edition. ISBN: 1-85828-699-9.

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