For my last "News from Japan" article, I have asked Alfredo Petrov to be coauthor. Alfredo regularly travels to Japan for the Osaka and Tokyo mineral shows and to lead field excursions around the country. He lived in Nagoya for four years and may have the unique distinction of being the only person to have been escorted on a mineral collecting trip by several Yakuza (members of the Japanese mafia); next time you see Alfredo ask for the full story!

It is midsummer at this writing, and there are only two words to describe Kyoto: hot and sticky. It may be a coincidence, but in the stifling heat and humidity one wonders if this city was chosen for an international congress on global warming (resulting in the Kyoto Protocol) for visual flair. With the arrival of early summer in Kyoto comes the building of noryo yuka (waterfront decks) at restaurants and izakaya (bars) along the Kamo River and elsewhere. The warm nights are made more pleasant by sitting on tatami (traditional rush matting that is used as a floor covering), savoring cold sake (rice wine), unagi (braised eel), and cold soba (buckwheat noodles) or other seasonal delicacies while enjoying cool breezes from the river. For a more energetic and lively respite from the heat, rooftop beer gardens, affording nice views of the city and the sunset over the western mountains, are a great (and less expensive) alternative.

Summer is also host to two of the largest matsuri (festivals) in Japan. During the entire month of July the ancient capital of Kyoto is taken back in time during the Gion Matsuri, which originated in A.D. 869. During this festival many streets in Gion and central Kyoto are closed at night to all but foot traffic. They are lined with countless street vendors offering games and Japanese festival foods such as takoyaki (balls of egg-battered octopus) and tomorokoshi (grilled ears of corn brushed with soy sauce). Another summer delicacy common in Kyo-ryori (Kyoto cuisine) is hamo (pike eel). Hamo is an exceptionally bony fish and conjures up images of esophageal acupuncture until it is expertly prepared through the art of honekiri (bone-slicing). Master chefs are said to make up to ten cuts per centimeter. When grilled, it is wonderful and not to be missed. Many people, even a gaijin (an outside person), attending the festival wear yukata (a light-weight summer version of a kimono for both men and women). The focus of the street festival is the construction of parade floats (called hoko and yama), many of which are several hundred years old and may weigh as much as ten tons. Gion Matsuri reaches its pinnacle on 17 July when thirty-two yama and hoko are paraded through downtown Kyoto.

August is the season of o-bon, the festival of the dead, one of the most important events in Japan. Many of the temples in Kyoto have special ceremonies during this time, from...
the lighting of countless paper lanterns and candles to the immense bonfires (gozan okuribi). On 16 August, the last day of the o-bon festival, gozan okuribi, in the shape of Chinese language characters (kanji), or Buddhist-related symbols, are lit on five of the mountains around Kyoto, including Daimonji (see yozakuraishi below). Custom holds that the lanterns illuminate the path that the ancestors' spirits must take to move on to the next world.

To learn more about contemporary Japan and Japanese culture, I highly recommend Nipponia, a fun, quarterly magazine that is available in print and online at http://web-japan.org/nipponia/backnumber/index.html. Another great Web site is Web Japan (http://web-japan.org/).

University of Tokyo Mineral Collection

The University of Tokyo was the first university in Japan to offer a program in mineralogy, and Tsunashiro Wada, the first Japanese professor of mineralogy, taught there for much of his career. Wada amassed what is still considered the finest collection of Japanese minerals. Its excellence is largely the result of the Japanese government's intervention, based on their interest in exhibiting the mineral wealth of their country at the 1873 International Exposition in Vienna and the 1877 National Exhibition in Tokyo (Nambu 1970). After his retirement from the university, Wada kept much of the collection, which was eventually sold to Mitsubishi Corporation and is now an important part of the exhibit at the Ikuno Mineral Museum. The University of Tokyo's collection, which today consists of approximately 27,000 items and 950 different mineral species. More than 2,000 of these specimens comprise the Wakabayashi collection, another of what are considered the four most important collections of Japanese minerals.
Yaichiro Wakabayashi (1874–1943) was born in Kana-
za, Ishikawa Prefecture, on 30 August 1874 (fig. 10). In 1889
he earned a doctoral degree from the Imperial University of
Tokyo (University of Tokyo, today) and soon thereafter went
to work for the Mitsubishi Company, Ltd., starting his career
as a mining engineer. He eventually became chief engineer
in both the Mitsubishi Company and the Mitsubishi Mining
Company and contributed greatly to Japanese developments
in mining technology in the early twentieth century. Wak-
abayashi was an avid mineral collector, and his professional
appointments afforded him many unique opportunities to
field collect. He had a discerning eye and collected specimens not only for their beauty and rarity but also for their scientific worth.

On his sixtieth birthday, Wakabayashi donated his entire collection to the Mineralogical Institute of the University of Tokyo. Today it resides in the University Museum, which was founded in 1966. Research on the collection after its donation has led to the recognition of approximately thirty new species, including wakabayashilite, which was named in honor of Wakabayashi and was found in the collection labeled as orpiment.

A detailed catalog of the Wakabayashi mineral collection (Sadanaga and Bunno 1974) was published in English and is available on the Internet at http://www.um.u-tokyo.ac.jp/publish_db/bulletin/no07/no07000.html. This thorough description of the specimens is an excellent English-language reference (extensive although not comprehensive) about Japanese minerals and mineral localities. The collection has numerous strengths including many specimens of chalcopyrite with varying and unusual morphologies from Akita Prefecture. Other noteworthy specimens in the university's collection that were not part of the Wakabayashi collection include a large, artificially constructed group of Ichinakawa stibnite crystals and a sharp, lustrous 2.6-cm pyroxmangite crystal on matrix.

Today the University of Tokyo mineral collection is housed in the museum on the university's Hongo (Main) Campus. The museum building is just south of the Akamon (Red Gate) entrance to the campus. Dr. Tokuhei Tagai, a mineralogist in the Department of Earth and Planetary Science, is curator of the collection. The museum is very active, and specimens rotate on and off display several times a year.

The National Science Museum Collection

The National Science Museum (NSM) in Tokyo houses a collection of more than forty-eight thousand mineral specimens, most of which are from Japan. Approximately 90 percent of the mineral species found in Japan and many Japanese type-specimens are represented. The number of acquisitions is considerable—in recent years more than two thousand specimens annually—as the result of the research activity of museum scientists. Much of the collection was donated by mining companies and private collectors. Among these, the most notable and important is the collection of Dr. Kinichi Sakurai (fig. 11). More than fifteen thousand specimens compose what is considered the greatest private collection of minerals put together in Japan.

Parts of a biography of Sakurai (Miyajima 2000; in Japanese), paraphrased in English by one of us (AP) and his wife, Tomoko, are given here:
Dr. Kinichi Sakurai was born in Tokyo on 11 December 1912 and became Japan's most serious and productive amateur mineralogist. His financial income was derived from managing the family chicken restaurant, which he inherited from his grandfather [Colonel Sakurai?].

There is a story [perhaps apocryphal] that his interest in minerals began in elementary school, when a science teacher assigned the children to bring pyrite to school. Young Kinichi was ashamed that he couldn't fulfill this homework. Kinichi, trying to make amends for his failure, later astonished the teacher by bringing to school a whole collection of minerals that he had bought at a local mineral shop [Iwamoto], and the teacher, who didn't really know anything about minerals, didn't know what to do with this collection.

As a teenager in junior high school, his interest in minerals became serious, and he started hanging out at the Iwamoto mineral shop and attending meetings of a mineral club organized by Otokichi Nagashima [for whom nagashimalite was named]. Another early mentor was Yaichiro Wakabayashi [for whom wakabayashilitite was named; see previous section]. Nagashima and Wakabayashi introduced the boy to Prof. Teiichi Ito [for whom itoite was named] of the University of Tokyo, who allowed him access to the facilities of the mineralogy department.

In 1947 he published, together with Professor Ito, the third edition of Wada's *Minerals of Japan*. In 1950 he received his doctorate in mineralogy from the University of Tokyo, with his dissertation being based on the characterization of the new zeolite yugawaralite. Sakurai described four new mineral species, as primary author for yugawaralite (1952) and as coauthor for parasymplesite (1954), wakabayashilitite (1970), and kimuraite (1986). He was also the initial discoverer, providing the type specimens, of the species jimboite (1963) and native ruthenium (1974) but did not work on their characterization.

He was eighty years old when he died, on 6 October 1993. At that time his collection contained 90 percent of the species known to occur in Japan and more than fifteen thousand specimens. Sakurai received several honors during his lifetime: In 1965, Akira Kato [katoite] named the mineral sakuraiite [Cu-In-sulfide] for him, and the *Chigaku Kenkyu* [Geoscience Magazine] published a special Sakurai issue in his honor. In 1973, Kato published a book on his mineral collection—*Sakurai Kobutsu Hyouon* (Sakurai Mineral Collection). And in 1981, Hidemichi Hori named the mineral kinichilitite [Mg-Mn-Fe-tellurate] for him, thereby making Kinichi Sakurai one of only a small handful of people to have had two minerals named after their surnames and given names [Count Andor von Semsey and Toshio Sudo, being others that come to mind].

The NSM is located in Tokyo’s Ueno Park near JR Ueno Station and is open to the public. For information, including maps, see the museum’s Web page, http://www.kahaku.go.jp/english/.
Currently, the mineral display in the museum is limited. However, on 4 November 2005 the new annex to the NSM opened, creating the largest display area of any science museum in Japan. A new and permanent display of the mineral collection is scheduled to open in the annex in early 2007. It will contain four hundred specimens, 80 percent of which are from the Sakurai collection. Highlights of the display will include fifty-nine new species, a few of which are type specimens, including teineite, yoshimuraite, harmonite, henmilite, and kimuraite-(Y). Of course, fine crystals of classic Japanese minerals including quartz twins (Japan law) from the Otome mine, Arakawa and Ani mine chalcopyrites, topaz from Tanokamiyama and Hirukawa, Obira mine axinites, stibnite from the Ichinokawa mine, and others will also be on exhibit. Specimen labels and important information on exhibited minerals will be in English, Chinese, and Korean as well as Japanese, making it the largest multilingual mineral display in Japan. Other exhibits will include displays of the museum’s rock and fossil collections. The museum welcomes about a million people every year, with visitors exceeding that number in 2005.

Thirteen research scientists compose the Department of Geology and Paleontology of the NSM. Dr. Satoshi Matsubara and Dr. Ritsuro Miyawaki are the chief and senior curators of the mineralogy division, respectively.

Local Museums

Every Japanese town seems to boast a flashy museum or culture center, and these are often quite magnificent for the size of the town. Luckily for mineral collectors, a few of these innumerable museums are dedicated to the local minerals. We are unaware of a comprehensive list of such museums but we give here a small sampling based on what we have seen.

**Fossa Magna:** Jade, a gemstone closely associated with China and the ancient Aztec civilization of Mesoamerica, is a polycrystalline aggregate composed of either jadeite (a pyroxene) or nephrite (an amphibole). Of the two, jadeite is much less common, with notable occurrences in San Benito County, California; Mexico; Guatemala; Japan; Tibet; Kazakhstan; and the finest gem-quality from Myanmar (Burma).

In Japan, jadeite occurs in several locations (Chihara 1991, 1999), with the most significant in the high-pressure metamorphic rocks of the Renge Belt located around the city of Itoigawa, Niigata Prefecture, Honshu Island. Here, it is found along the Ohmi and Hime rivers where it is weathering from serpentinite bodies that are exposed along the steep mountainsides in the most northern of the Japan Alps. Jadeite boulders and cobbles are also found along the Oyashirazu shoreline where the Ohmi and Hime flow into the Japan Sea.

Numerous jadeite artifacts have been found in archeological sites in Japan (Terashima 1966) associated with ancient Jomon culture (dating from about 4000 to 1600 B.C.), arguably making Japan the oldest jadeite culture in the world (Chihara 1999). Some of the oldest and most common of these artifacts are carvings called *magatama*, which have the shape of a comma with a round hole through its larger end. The source of this jade was the Itoigawa area, but interestingly the use of jade seems to have died out around the end of the seventh century, and knowledge of the Itoigawa deposits was lost. Early archeologists and mineralogists thus assumed that jade found in Japanese archeological sites originated in China. Even Tsunashiro Wada is quoted to have said that jade had never been found in Japan (Bishop 1906; Chihara 1991).

The jadeite deposits of the northern Alps were rediscovered in the 1930s (Chihara 1971, 1991) and have subsequently been the focus of much research (yielding several
new minerals, including matsubaraite, named after Satoshi Matsubara). The deposits are a source of much local pride (exemplified by the many monuments and displays of jadeite in the small city of Itoigawa), although little of what is found is of gem quality. Itoigawa is also home to the Fossa Magna Museum, a modern (and quite large) museum dedicated to the geology and mineralogy of Japan, with a focus on the jadeite deposits of Itoigawa. It also has a very nice collection of contemporary worldwide minerals.

The museum published the book *New Minerals in Japan 1934–2000* (Miyajima 2000), detailing eighty-six species first described from Japan. At the end of the book, in the postscript, is an unexpected photograph: a calico cat named *Shira* (white), a stray cat that found its way into the museum and, sadly, died on the day the book was finished.

**Horai:** The little town of Horai in Aichi Prefecture has a spacious mineral museum that, apart from displaying a magnificent collection of local mineralogical treasures, undertakes educational programs for children and distributes information on collecting sites. There are some astonishing red pyroxmangites from the nearby Taguchi mine, and specimens of this mineral are on sale in the gift shop (of course, much smaller than the crystals on display!). The type locality of nakauriite, a rare pale blue copper mineral, is also nearby, and nakauriite is still collectible there, although now under a dangerous overhang in unstable serpentine. To get to the museum, take the Iida train line to Horai-cho and then the local bus that carries tourists and pilgrims to the foot of Mount Horaijisan, site of some famous Buddhist temples and Shinto shrines. The museum is near the foot of the steps leading up to the temples.

**Kuji Museum of Amber** (http://www.kuji.co.jp/): It may surprise many people to learn that Japan is host to significant deposits of amber. The Taneichi and Kunitan formations, which are 85 million years old, are host to the largest of the amber deposits. They are near the city of Kuji, Japan. Here, amber mining has taken place for at least several hundred years, and amber artifacts are known from archaeological sites as old as the Nara period (A.D. 710–794). In the city of Kuji is the Kuji Amber Museum, which has considerable information relating to the history of amber production as well as extensive exhibits of raw and carved amber.

**Kyoto University Museum:** What do the Departments and Schools of Forestry, Agronomy, Mineralogy, and Human and Environmental Studies at Kyoto University have in common? They all have formed mineral collections of one size or another during the last one hundred years. In a move to consolidate many of the university’s similar teaching and research collections, a University Museum was erected to house and curate these collections and to provide access to researchers and the public. Some of the finer mineral specimens are on display and are well worth seeing if you are near the campus. The museum is located on Higashioji Street just south of its intersection with Imadegawa Street on the northeast side of Kyoto. More detailed information can be found on its Web page, http://www.inet.museum.kyoto-u.ac.jp/index_e.htm.
Mineralogical Monuments

Sakura-Tenjin (shrine): Buried deep in a forest along a remote hillside in Kameoka is the small and haunting Cherry Tree Shrine (Sakura-Tenjin). In the middle of the grounds of this Shinto holy place, next to a suspicious furrow dug into the hillside, is a monument with a steel placard that explains that this is a site where the rare sakura ishi (cherry blossom stone) is found, but overzealous collectors have been a problem so please do not dig here.

Itogawa: In June, my wife, Monica, and I (JR) took a trip, guided by Kaz and Yukari Ito, to the source of Itoigawa jadeite along the Kotaki River. It took so much time to navigate the steep and difficult river bank that we were concerned we would not find the elusive jadeite. However, once we found our first boulder, it was easy to spot others in the river. After satisfying our curiosity (no collecting is allowed, or even possible without a crane), we started the long walk back to the nearest train station. Along the paved but remote access road to the site, we came across a nice little monument to this, the most important jadeite location in Japan. Several large boulders had been moved from the river and now composed the monument, along with a map showing the exact location of each and every jadeite boulder in the river. For anyone coming to see the jadeite, a stop at the monument (before exploring the river) is highly recommended.

Yugawara: A rock cliff beside the small Fudo Waterfall hidden in a bamboo forest in the Yugawara hot springs resort area in Kanagawa Prefecture is the type locality for the rare zeolite yugawaralite. Several picturesque Shinto shrines dot the rocks and overhangs in front of this waterfall. Among these shrines stands a large metal sign explaining that this place is the type locality for yugawara-fusseki (yugawara zeolite). The sign also states that the spot is protected by the town of Yugawara (a polite way of saying not to hammer on the rocks).

Ohsa: On a mountain in the town of Ohsa in Okayama Prefecture, not far from a large hang-glider port, stands a monument to the first find in Japan of the very rare mineral kosmochlor, the intense green chromium-dominant analogue of jadeite, first found in meteorites (hence the name). It occurred as microcrystals associated with uvarovite in a single boulder of rock embedded in the serpentine country rock. An explanatory petrology plaque at the monument even displays a magnified photo of a thin section under polarized light. A small three-sided house, fronted by glass, was built over the outcrop to protect it. Unfortunately, nothing is visible through the window—a collector appears to have tunneled into the outcrop around the protective house and carried off the kosmochlor-bearing boulder. (No, it was not us!) A few hundred meters away is another small shed, this one built to protect a large boulder of white jadeite that had been eroded out of an area of rodingite. Although this jadeite is of mineralogical interest, being very pure and close to end-member composition, it is not sufficiently compact for lapidary purposes, which is probably why it is still sitting there for hikers to see.
Mine Museums

At one time, about a thousand mines were worked in Japan. Most of them are now closed, but several are open to the public as museums and tourist attractions. We describe only a few here, not because we are prejudiced against the rest, but because these are the only ones that we have visited.

Ikuno: The Ikuno mine and the accompanying mine and mineral museums were described in detail in part 2 of "News from Japan" (Rakovan 2005a). The mine exhibit itself is quite extensive, even showing the first workings, which date back to the eighth century A.D. However, the real highlight is the exhibit of the famous Wada collection, certainly the finest collection of Japanese minerals in existence.

Sasaune pit: In ancient times, the Sasaune pit in the Fukiya mine, Takahashi City, Okayama Prefecture, produced a mixture of sulfides (mainly pyrrhotite) for refining copper and creating *bengara*, the fine red pigment used in traditional lacquered bowls, buildings, and Shinto shrines. The chemical process involved was simple: Piles of sulfide ore were allowed to naturally decompose into vitriols (a mixture of water-soluble metal sulfates), which were easily purified by decanting a water solution after all the insoluble impurities had settled out. After drying out the solution, the crystallized sulfates were burned at a high temperature to drive off sulfur dioxide and sulfuric acid, leaving a finely divided red powder of iron oxide (hematite), enhanced with a little copper oxide (cuprite). This powder was much finer than anything that could be achieved by mechanically grinding hematite or cinnabar, as had been done before the *bengara* process was invented.

One gallery of the Sasaune pit is open for underground visits. Tickets are sold for a token price at a hut outside the mine, and the caretaker there lends visitors hardhats. Inside the tunnels, several realistic-looking, electrically driven, life-sized models of miners in shogunate-era clothing are hammering and chiseling all day long. Nearby, a seventeenth-century *bengara* factory has been restored as a museum where the ore-processing procedures can be observed in detail. (Ask the locals to also show you the giant wooden phallus in a shrine to the gods of fertility!)

Shin-Otani: The Shin-Otani mine in the Tanba manganese mining district, Kyoto Prefecture, is now a museum open for underground tourism. Legend says that the Shin-Otani's minerals were first dug in A.D. 760 by the priest Yugeno Dokyo for medicinal use. More than eleven hundred years passed before, in 1902, they were first mined as manganese ore. Underground workings started in 1916 and continued for more than sixty years, with manganese dioxide production averaging just under 1,000 tons per year. Sadly, it was impossible for such a small operation to compete against the far larger manganese mines of Brazil, India, and Ghana, and the Japanese family who owned the mine gave it up in 1976. The poor mine laborers, who were mostly Korean and had no better job prospects in Japan, struggled to run the mine by themselves for a few more years, but it was economically hopeless, and the end came in 1982. One of the Korean miners, Mr. Jeong Ho Lee, decided to turn the Shin-Otani mine into a memorial to the many Tanba mining district laborers whose hard, dirty, unhealthy, low-paid, and thankless existence had been forgotten by the wealthy society of modern Japan. So was born the Tanba Manganese Memorial Hall, and its opening in 1989 even rated an article in the *New York Times* (international edition).

A fee of 800 yen ($7.50) is charged for admission to the mine and the neighboring museum. Dotting the steep hil-
side are about thirty adits, well-hidden among the cedar trees. One set of passages, about 300 meters long, just off the parking lot, has been strung with electric lights and floored with cement, so visitors can walk through without getting dirty. Several life-sized, realistic-looking models of miners crouch frozen in time, still carrying out all the basic mining procedures. Numerous informative signs (miraculously in English!) explain the history and the methods used.

The museum exhibits a comprehensive collection of manganese-deposit minerals from all over Japan, but with the exception of the pretty pink rhodochrosites, most minerals are a delight for species collectors, not a feast for the eyes (e.g., gageite, holdawayite, ribbeite, and wallkilldellite). Some species are for sale in the museum gift shop—I (AP) bought cymrite and caryopilite. Many old photos and newspaper articles about the lifestyle of the miners and the problems they suffered are also on display.

The mine and museum are open from 1 March to 14 December, except Tuesdays and the day after holidays. Visitors who cannot read Japanese road signs are better off taking public transportation rather than driving. Go to the bus stops just outside the main entrance to Kyoto train station and take the bus that leaves precisely at 10:00 A.M. to Shuzuzan. Pay 1,150 yen (about $10.50) when you get off at Shuzuzan, the end of the line, at 11:19 A.M. Three minutes later there is a local bus leaving for the nine-minute ride to Shimonaka. From there it is about a fifteen-minute walk to the Shin-Otani mine. If you miss this local bus, ask the bus station attendant to call you a taxi, which will charge about $15 to take you all the way to the mine. Take lunch with you, as there is no food at the museum, but they do have the ubiquitous Japanese coin-operated beverage machines with hot and cold drinks. A bus leaves Shimonaka at 4:08 P.M. for the return trip to Kyoto.

**Kiwada:** The Kiwada tungsten mine in Yamaguchi Prefecture is a bit hidden in the forest on the outskirts of Iwakuni city (where there is also an important American military base). In the mid-twentieth century this mine exploited the world’s richest tungsten ore, a massive skarn that ran up to 40 percent scheelite in some sections. When the mine was forced to close because of high operating costs, not because of a lack of scheelite, one of the mining company’s employees, Mr. Nagahara, bought the place from his employer specifically for the purpose of saving it for its historical and mineralogical value. During the summer months Nagahara operates a rock shop out of a big trailer near the mine entrance. A nearby pristine swimming hole under a waterfall is an added attraction. Permission to collect on the dumps can be obtained for about $20.

The underground part of the mine itself is open to tourist groups by appointment only for about $30 per person; as yet there are no special facilities or safety features in place for the general public. Visitors will be expected to don hard hats, lamps, and rubber boots and spend a few hours slogging through dark, wet galleries and climbing up vertical iron ladders between levels—not for the faint hearted! It is worth it, though, for the view of the incredibly large scheelite veins under ultraviolet illumination. Plans call for the eventual installation of better paths and lighting, with ultraviolet in some sections.

**Yozakura Ishi**

Cherry blossoms are so revered in Japan that there are words to describe many subtle aspects of their appreciation.
Yozakura is cherry blossom viewing at night when the moonlight adds to the idealistic beauty of the flowers.

In parts 1 and 3 of "News from Japan" (Rakovan 2005a, c), I reported on one of the more "romantic" and unique minerals found in Japan, sakura ishi (cherry blossom stones), from hornfels in Kameoka, Kyoto Prefecture. The origin of these unusual pseudomorphs (after cordierite-indialite intergrowths) is mineralogically very interesting and has been deduced through the study of pristine cordierite crystals found in similar hornfels from several other localities, including Daimonji Mountain in the Higashiyama (the eastern mountains of Kyoto City). In sliced rock sections the cordierites stand out as feathery white to gray phenocrysts in a black, fine-grained groundmass. Mieko Ono, a professor of Japanese language at Miami University (Oxford, Ohio), pointed out that these unaltered sakura ishi looked much like cherry blossoms in a moon-lit sky and must be yozakura ishi. An article about the formation of sakura ishi and yozakura ishi will appear in a forthcoming issue of Rocks & Minerals.

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