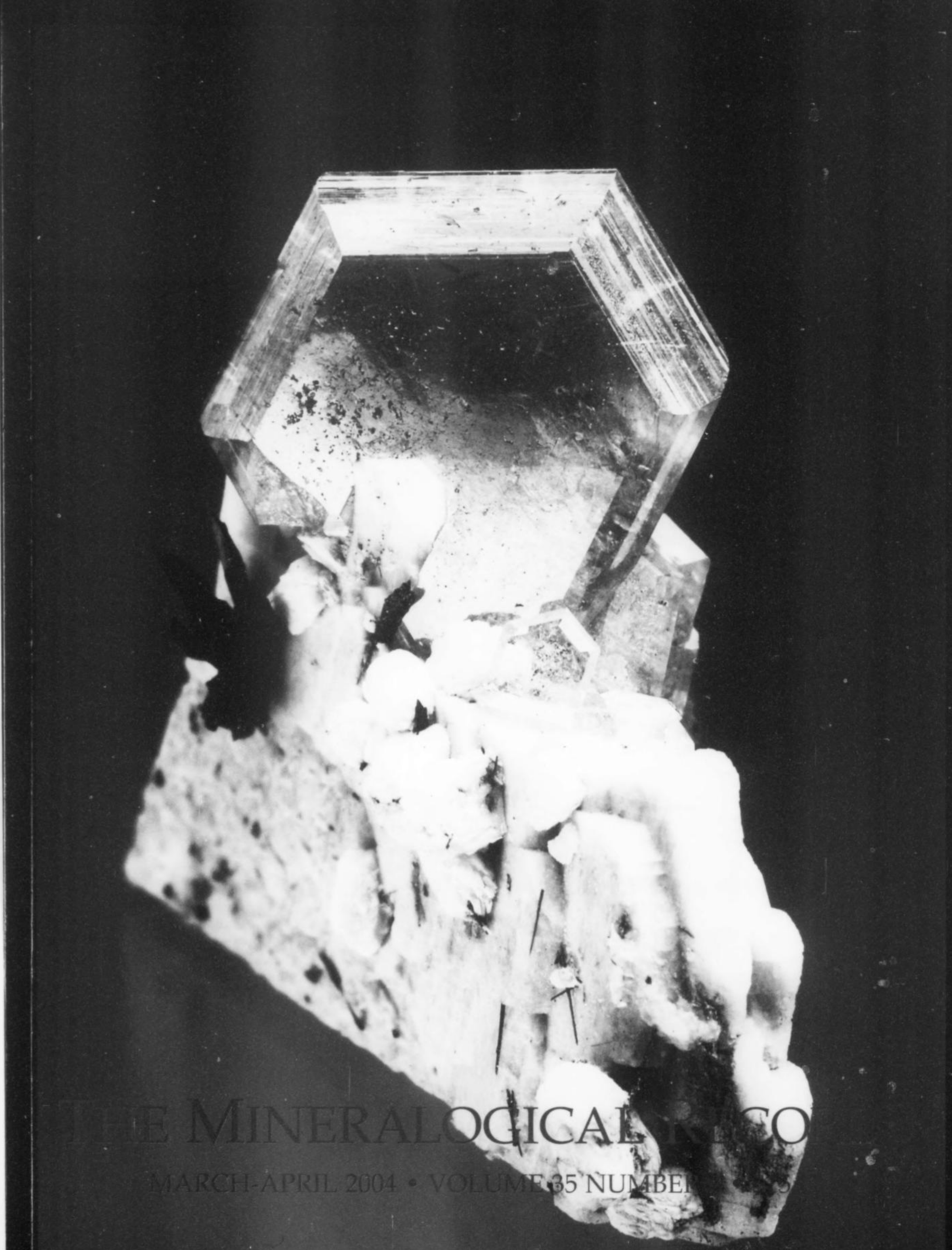

THE MINERALOGICAL RECO

MARCH-APRIL 2004 • VOLUME 35 NUMBE

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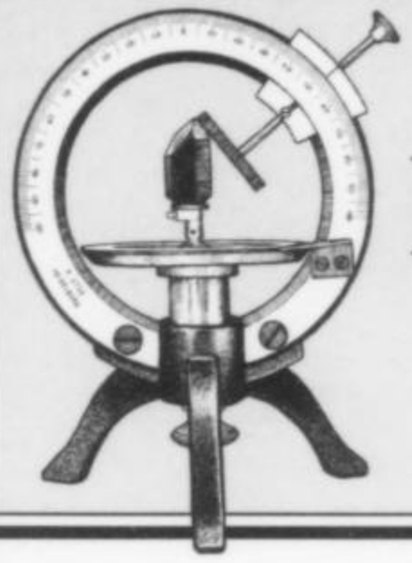

THE MINERALOGICAL RECORD

March–April Volume Thirty-five, Number Two

Articles

Columns

COVER: CATAPLEIITE on feldspar, 2.5 cm, from Mont Saint-Hilaire, Québec. Martin Zinn collection; photo by Jeff Scovil. For more on this famous deposit see the Mont Saint-Hilaire special issue, vol. 21, no. 4 (July–August 1990), still available for $12 + shipping (see p. 166).

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The Mineralogical Record
(ISSN 0026-4628) is published bi-monthly for $55 per year (U.S.) by Mineralogical Record, Inc., a non-profit organization, 7413 N. Mowry Place, Tucson, AZ 85741. Periodicals postage paid at Tucson, Arizona and additional mailing offices. POSTMASTER: Send address changes to: The Mineralogical Record, P.O. Box 35565, Tucson, AZ 85740.

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Guest Editorial

It's the Artifacts, Stupid!

What is the function of a public museum? Public museums were originally established to collect, store, study, and make available to scholars and the general public objects deemed worthy of preservation. These objects were of many sorts: historical, cultural, ("art" in the broad sense), "natural history" and scientific. These categories are not rigid, and there is great overlap among them; a collection of astronomical images partakes of all four.

Just as a library was thought of as a collection of printed material, museums were thought of as collections of artifacts. In recent years libraries have been forced, by the flood of material inundating them, to resort to microfilm, microfiche, and other bulk storage, for permanent retention, discarding the original print matter. This compressive process has been accompanied by much public controversy. Museums have always had space constraints, but they have never been as oppressed as libraries; no museum in the past has said that it had too many Vermeers, meteorites, or Lincoln memorabilia. But in the past quarter century many natural history museums have felt obligated to move from artifacts, however well displayed, to educational and "popular" presentations, which discount their natural artifacts in favor of artificially generated media experiences.

Originally this movement was well-founded: too many museums had too many dry-as-dust, catalog-type exhibits. Museums had felt that every species of bird that they owned, every kind of meteorite in their inventory, had to be on display, usually with scant explanatory material, or worse, with prosy didactic text that mystified the non-specialist.

To make their exhibits more meaningful to the general public, museums resorted not only to a reconfiguration and a more selective presentation, but also to the use of new technologies. By means of these technologies, not only birds could be shown, but how the bird wing operates; not only the lava, scoria, and ash from a volcano, but how a volcano functions. The museum was becoming more educational, certainly a desirable development. But eventually, with the concentration on the educational media, there came a "realization" that the artifacts themselves could just as well be dispensed with. Who needs an albatross with a six-foot wing span, when a beautiful film strip of the bird skimming the Pacific can be shown instead, perhaps also with the sound of the trade winds? Why show lumps of rock when Kilauea itself can be shown sliding its hissing, red-hot lava into the sea? Why indeed?

Because museums are the repositories where civilizations store their treasures. Because humankind has always preserved artifacts that it deemed important, that it has valued and treasured—things never to be parted with except perhaps as neolithic grave goods. Because that is the basic purpose of a museum: to preserve the artifacts, and to make available to the public as many of them as possible, couched in meaningful public displays.

Why should natural history museums feel somehow required to cease being natural history museums, and to become collections of media presentations? No art museum in the world feels any such compulsion. The Art Institute in Chicago feels no need to un-hang several of its magnificent Impressionist paintings to make room for a robotic diorama of Degas painting his ballet dancers. No Rubens masterpiece in the National Gallery will come down to make room for a video screen, a collection of push buttons, and an endless interrogatory menu.

Nor are art museums alone in refusing to replace their artifacts with technology. The great Native American collections in New York City and St. Joseph, Missouri will not replace their war bonnets, tomahawks, and bows and arrows with interactive gadgetry. The magnificent collection of astronomical instruments at the Adler Planetarium in Chicago is undoubtedly safe from similar intrusions.

(Lest the reader conclude that this is the diatribe of some anti-technology Luddite, know that the author worked for the National Security Agency from 1951 until 1980 and worked for the supercomputer firm Cray Research, Inc., until 1987.)

Our museums should continue to concentrate on the artifacts, not because of historical continuity, but because that is what their customers (the public) want to see. Most debate about what the public wants to see is based only on presumptions. Very few museum professionals ever go down into their halls while the public is also there, to see what people are really doing; such rare visits by the staff are usually to show a visiting fireman around, or to impress a dignitary. But you only have to visit a museum, as one of the general public, to see what is truly popular. The most popular venue at the National Museum of Natural History is the Gem and Mineral Hall, and the most popular exhibit in this hall is the Hope diamond. This is not an artificial imitation of the diamond, nor a film showing how it was cut or mined; it is the genuine article, and the American people love seeing it. The Museum has provided excellent explanatory text with the Hope, but this text is somewhat removed from the diamond, so that the visiting public can soak it in by seeing it from all sides.

One of the most popular displays at Mount Vernon is George Washington's spectacles; the reasons for this popularity defy simple explanations. Why is it so enchanting to visit Lincoln's home in Springfield, Illinois? How much astronomy can one glean from staring at a moon rock in the American Museum of Natural History on Central Park? Why do so many people, not themselves collectors, gaze at the amazing collection of coins in the National Museum of American History? The answers to these questions lie deep in the human psyche, but we do not need the answers in order to acknowledge that these fascinations exist. Why do people love museums? The answer is best put in a paraphrase: "it's the artifacts, stupid."

Finally, the question that constantly hovers over museums is: are they educational institutions? The answer is no; museums are extremely educational (one who has never visited a museum can

hardly call himself educated), but they are not educational institutions. The primary (and unglamorous) role of a museum is to be a repository. But as a repository, a museum must make what is deposited available to the public in as effective a manner as possible, and this manner can be very glamorous indeed: think of MOMA in New York or the Page Museum of La Brea Discoveries in Los Angeles. And concentrating on their main draw, their artifacts, does not mean that museums must forsake the use of technology. But technology should not devour the artifacts. How many times have we seen children, faced with an array of buttons providing options, push every button, then depart without looking at the display? How often have three of the buttons become defunct after two weeks of such use? Of course the children did not use the presentation as the designer intended; should the museum replace the children or the designer? If museums attempt to compete with Disneyworld or The Discovery Channel, they are doomed to failure. They can never have the managerial agility, nor the fiscal flexibility, of a Six Flags over Texas.

Though I believe that my observations apply to all museums, it is true that what provoked me to put them in writing is the recent Sand Creek massacre of the curatorial staff at the Denver Museum of Nature and Science (until recently, the Denver Natural History Museum). Entire departments are to be deprived of full-time professional management. What will happen to the collections of these departments? Exactly what has happened to the thousands of collections donated, over the years, by alumni to universities and colleges: they will be lost, forgotten, ruinously damaged by careless storage, embezzled from (ask Yale University), pillaged, junked. It won't happen overnight, but it will happen. Does anyone believe that a collection of Clovis artifacts can be locked up in their cases, and sit undisturbed forever? This degradation is analogous to what happens to libraries: dozens of abbey libraries have been fleeced of extremely valuable manuscripts by dealers who knew the market better than the Priors.

My special concern is the Denver Museum's great mineral collection, whose market value is surely well up into eight figures. It is clear that current management wishes to have as little to do with this collection as possible. How long will it be before the rhodochrosite wall is dismantled to make way for more modish presentations? What about the world-famous Breckenridge gold collection, itself alone worth millions? With no permanent professional curation, it would be better if the museum would face reality and sell the collection. This would be a tragedy for Denver, but at least the museum would gain some needed funds. Much more importantly, the specimens would be spared damage and destruction, and would go to institutions and collectors who really wanted them; no private collector who spent his own money would countenance the degradation of his purchases.

Lastly, a comment about Space Odyssey, the Museum's excellent new production. Meritorious as it is, we know that it will never approach the popularity of the National Air and Space Museum. Why not? Because the NASM has on display a Gemini capsule, a section of Skylab, and an astronaut's complete moon-walking suit (not to mention the Wright Brothers' Kitty Hawk flyer). It's the artifacts, stupid.

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Who We Are:

The Friends of Mineralogy (FM), formed at Tucson, Arizona on February 13, 1970, is a national organization which also supports local chapters where they are viable. It is open to membership by all. FM's objective is to promote, support, protect and expand the collection of mineral specimens and to further the recognition of the scientific, economic and aesthetic value of minerals and collecting mineral specimens.

FM helps produce locality indexes for specimen mineral localities and is co-sponsor, with the Tucson Gem & Mineral Society (TGMS) and the Mineralogical Society of America (MSA), of the annual Tucson Mineralogical Symposia. It also sponsors awards for best articles each calendar year in *The Mineralogical Record*, *Rocks & Minerals* and *ExtraLapis International* gives special recognition at the February Tucson Gem and Mineral Show for cases which help explain an aspect of mineralogy.

The Friends of Mineralogy is affiliated with the *American Geological Institute*, the *Mineralogical Society of America* and *The Mineralogical Record*, which provides FM space and publishes news of its activities from time-to-time. FM in turn supports *The Mineralogical Record* in various endeavors.

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FM Awards

The Friends of Mineralogy annually presents various awards at the Tucson Gem and Mineral Show. The awards are presented at the Saturday night banquet. The winners in 2003 were:

Best Article 2002, *The Mineralogical Record*, Jesse Fisher

Best Article 2002, *Rocks & Minerals*, Dan Kile

Best Educational Case, TGMS, 2003—**Individual**, Georg Gebhard

Best Educational Case, TGMS, 2003—**Institutional**, Virginia Tech

Werner Lieber Photo Contest—Professional, Saul Krotki

Werner Lieber Photo Contest—Amateur, Gene Reynolds

In conjunction with the awards for Best Article, FM presents a check for $200 to *Rocks & Minerals* and to *The Mineralogical Record*.

Educational Cases at the Tucson Gem and Mineral Show

The Friends of Mineralogy sponsors non-monetary recognition at the Tucson Gem and Mineral Show (TGMS) for cases which help explain an aspect of mineralogy. There is no restriction on the theme, but the case should have some special instructive feature. In keeping with the high standards of the TGMS, the case should be aesthetically pleasing and contain specimens worthy of the show. Two certificates are awarded, one for private collections and one for institutions, and the winners are honored at the Saturday night banquet and on a plaque in the FM case. Instructive cases help the hobby grow and underline its scientific basis. Exhibitors at Tucson, both individuals and institutions, are asked to consider seriously such a feature for their cases.

The Sclerometer

and the

Determination of the Hardness of Minerals

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After nearly 200 years, Mohs' ten-step hardness scale is still valid as a quick and approximate analytical method for mineral identification. The sclerometer was invented in the nineteenth century to give a more accurate measurement of mineral hardness, and was used until the beginning of the twentieth century. These instruments are today a long-forgotten witness to the epoch of classical mineral science and are among the rarest historical measurement devices in mineralogy. Today, hardness tests on ore minerals are only rarely employed, and are performed under the microscope to observe the indentation depth produced by a calibrated diamond point.

INTRODUCTION: THE DEFINITION OF HARDNESS

The hardness of a substance is not a universally defined, exact physical quantity. Its numerical value is a function of the hardness scale used for comparison and the method of measurement employed. In this respect, hardness differs from the other physical parameters of a mineral, for example the specific gravity.

Dana (1884) defined hardness as "the resistance offered by a smooth surface to abrasion." Mücke (1989) expanded this definition to "the resistance offered by a body to penetration, respectively the damage to its surface."

To measure the degree of hardness, therefore, it is necessary to bring into contact two bodies of differing hardnesses, until permanent deformation occurs in the softer one. The degree of resistance to the movement characterizes the hardness. It is therefore apparent that a mineral's hardness depends upon several of its physical characteristics, such as its elasticity, ductility, plasticity, brittleness, power of cohesion, and crystal structure.

In the measurement of hardness one differentiates between methods to determine **scratching hardness**, **drilling hardness** and **cutting hardness**, and the semiquantitative method of determining **indentation hardness**. In the history of mineralogy the scratch method has been most commonly employed, whereas the drilling and cutting methods hit a dead end. During the first half of the 20th century the indentation method was developed as a diagnostic aid in microscopic examination of ore minerals; today it is rarely used in mineralogy.

EARLY HISTORY

In his *Traité de la Lumière* (1690), the Dutch physicist Christian Huygens (1629–1695) pointed out that a difference in difficulty of scratching a calcite cleavage with a knife-point could be noticed depending on whether the scratch was made on the long or short diagonal axis. The fact that this observation was made at such an early time is witness to the exactitude of the methods of these early experimentalists.

This differential hardness is not commonly observed in the mineral kingdom, but neither is it rare. Technically the phenomenon is termed a vectoral anisotropy on a mineral surface (from the Greek *aniso* = different and *tropos* = property). The best known example is kyanite, whose older name "disthene" (from the Greek *dis* = two and *stehnos* = power) refers to the fact that the hardness is markedly less when measured across a crystal face in a direction parallel to the *c* axis versus perpendicular to it.

It was the famous Swedish natural scientist Carl von Linné (1707–1778) who first declared the hardness of a mineral to be an important diagnostic characteristic. However, he did not clearly

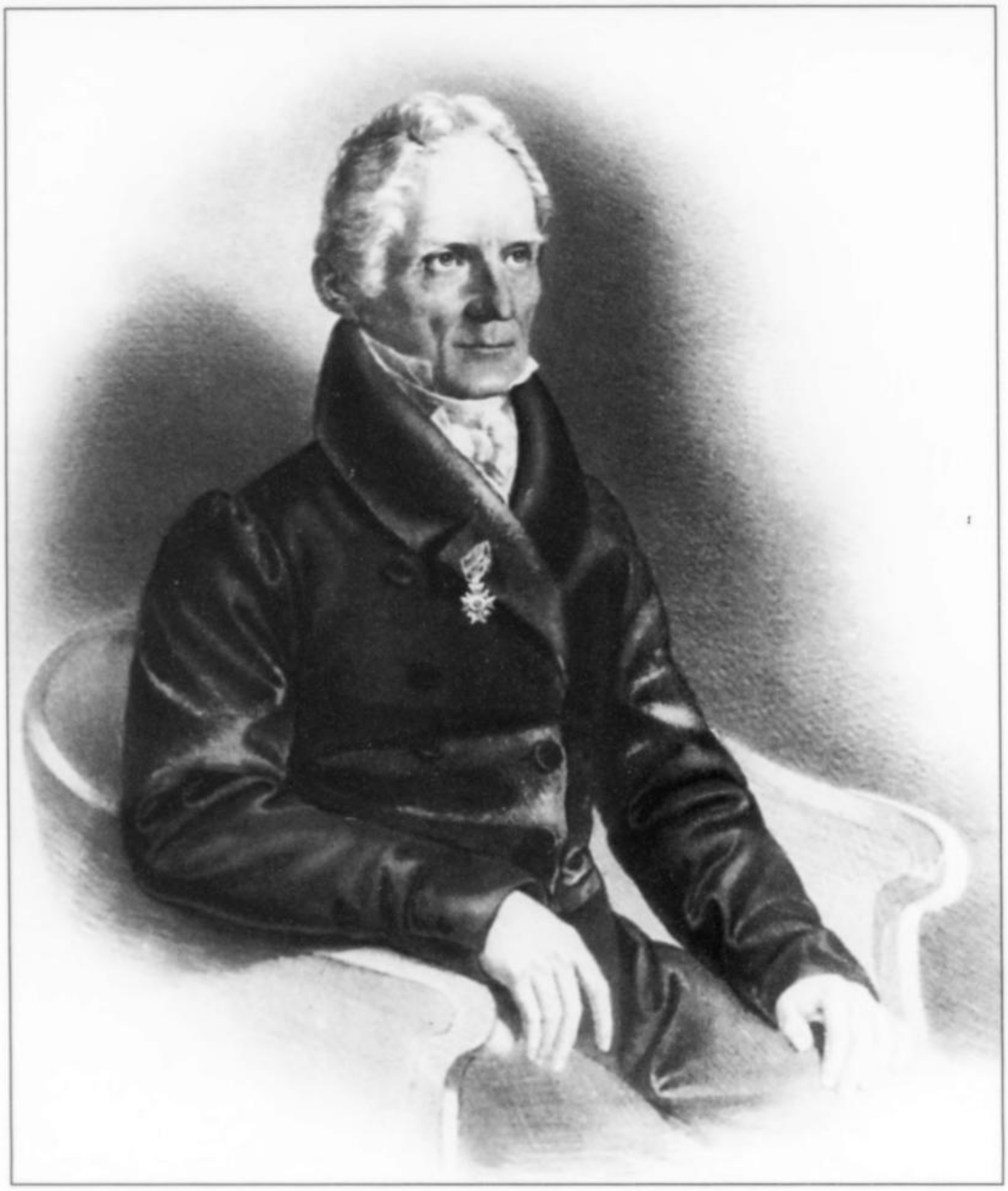

Figure 1. **Friedrich Mohs (1773–1839) devised the ten-step hardness scale for quick determination of minerals.**

distinguish hardness from other essential physical properties of minerals.

HARDNESS SCALES

To determine the relative hardnesses of minerals, hardness scales were developed, initially with the idea of defining equal hardness intervals between points on the scales. The first such scale was developed by the Freiberg mineralogist and geologist Abraham Gottlob Werner (1749–1817). In his work on the "external characteristics of minerals" (1774), Werner used the criteria discernible by the senses, such as color, fracture, crystal form, streak, transparency, tenacity, coldness, weight, smell, taste and hardness, to lay a theoretical foundation for classifying minerals. He proposed a six-step hardness scale:

1. **Diamond-hard**, scratches an iron file
   (Examples: diamond, corundum)
2. **Quartz-hard**, can be filed with difficulty
   (Examples: garnet, quartz)
3. **Feldspar-hard**, can be filed
   (Examples: feldspar, pyrite)
4. **Half-hard**, can just barely be scratched by a knife
   (Examples: sphalerite, pyrite)
5. **Soft,** can be easily scratched by a knife
   (Examples: chalcopyrite, galena)
6. **Very soft**, can be scratched by a fingernail
   (Examples: gypsum, chalk)

This first hardness scale was still very unreliable because the testing implements themselves (file, knife and fingernail) were not standardized and could vary in hardness.

The French genius René Just Haüy (1743–1822) proposed a system that was more reliable, in that he used one mineral to scratch another to determine the relative hardness. In 1801 he introduced a four-step hardness scale:

1. Substances that scratch quartz
   (Examples: diamond, corundum)
2. Substances that scratch glass
   (Examples: quartz, peridot, euclase, axinite)
3. Substances that scratch calcite
   (Examples: diallage, lazulite, apatite, harmotome)
4. Substances that cannot scratch calcite
   (Examples: talc, gypsum, mica)

Friedrich Mohs (1773–1839) was Werner's successor in the Mineral Chair at the Freiberg Mining Academy. While he was still curator at the Johanneum in Graz, Austria, he refined Haüy's hardness scale, eliminating glass from its illogical place in the system.

In his *Versuch einer Elementar- Methode zur naturhistorischen Bestimmung und Erkennung der Fossilien* (1812), Mohs first introduced the ten-step hardness scale that is still in use today:

1.Talc
2. Gypsum
3. Calcite
4. Fluorite
5. Apatite
6. Feldspar
7. Quartz
8. Topaz
9. Corundum
10. Diamond

Mohs assigned numbers to the various hardnesses, laying down the rule that a mineral can scratch all minerals with lower hardness numbers than its own. Because of the widespread availability of its reference species, the Mohs hardness scale was soon in universal use.

Hardness-determination kits were constructed, consisting of cardboard containers with samples of the ten reference minerals. These are still found in practical use today. Usually the corundum and diamond samples are mounted on wooden handles to facilitate performing the scratch test.

For a long time a small hardness kit was displayed at the museum in Graz, Austria, alongside Mohs' personal contact goniometer; the kit was said to be his original prototype. Research has since proven, however, that the kit is not the original one used by Mohs (Postl, letter 2000).

The Mohs hardness scale permitted a quick comparison of the relative hardnesses of various minerals. The results, however, were rendered somewhat vague by three complicating factors:

(1) The possibility of vectoral hardness anisotropy has already been mentioned. The example of kyanite shows that a mineral is indeed capable of scratching itself. The hardness of a kyanite crystal face in the long direction is 4–5 on the Mohs scale, and in the perpendicular direction it is 6–7. This fact has a particular economic consequence in the cutting of diamonds. The word "diamond" originates from the Greek *adamas* = invincible. The diamond possesses a *maximum* hardness of 10, but one could not manufacture cut diamonds from the rough were it not for differences in its hardness in various directions. Experienced diamond cutters take advantage of this fact.

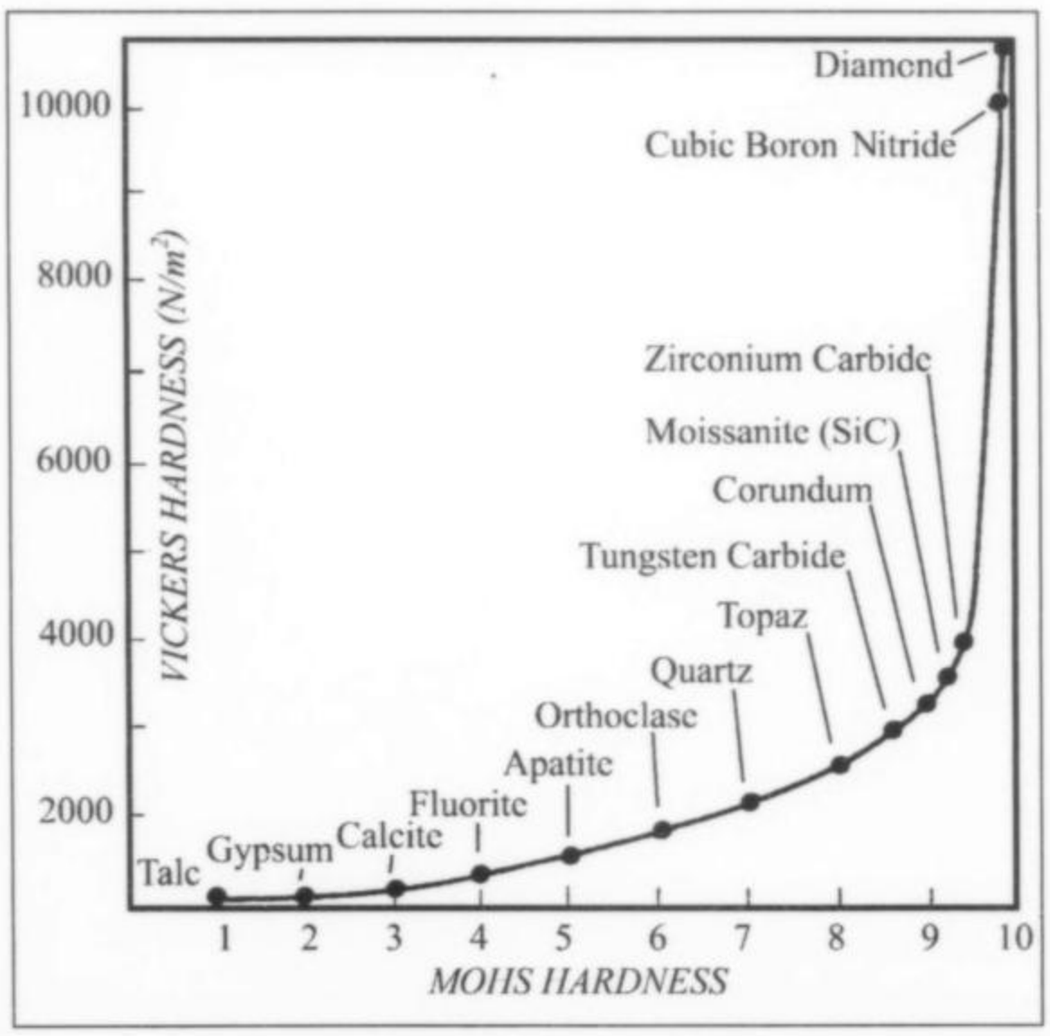

Figure 2. **Correlation between Mohs hardness and Vickers indentation hardness.**

Table 1. **Collation of hardness data of Mohs and cutting hardness of Rosiwal. Note the hardness variations of different faces of the same mineral (Rosenbusch 1924). (standardized to corundum = 1000 and to quartz = 100) (Malzahn 2000)**

Mohs Hardness	*Mineral*	*Test Plane*	*Corund. = 1000*	*Quartz = 100*
1	Talc	Aggreg.	0.62	0.59
1.5	Gypsum	[001]	0.64	0.61
		(010)	0.37	0.37
2	Halite	(001)	1.24	1.18
		(111)	1.42	1.35
3	Calcite	(0001)	3.63	3.44
		$(10\bar{1}0)$	2.90	2.74
		$(10\bar{1}1)$	2.02	1.91
4	Fluorite	(100)	3.20	3.05
		(111)	3.01	2.83
5	Apatite	(0001)	3.48	3.30
		$(10\bar{1}0)$	5.48	5.19
6	Orthoclase	(100)	29.2	27.7
		(010)	27.1	25.7
		(001)	18.1	17.2
		[100]	39.2	37.2
7	Quartz	(0001)	105.5	**100**
		$(10\bar{1}0)$	91.0	86.3
		$(10\bar{1}1)$	77.4	73.4
8	Topaz	(001)	91.4	86.6
		(110)	127.5	121
9	Corundum	average	**1,000**	949
10	Diamond	—	90,000	85,300

(2) The second important flaw in the Mohs scale results from the vastly different intervals between the individual hardness steps. To help the situation, J. F. Breithaupt (1791–1873), a geologist at the Freiberg Mining Academy, proposed a 12-step scale in 1836; however, it was never accepted. He inserted so-called "talcmica" between gypsum (hardness 2) and calcite (hardness 3), and scapolite between apatite (hardness 5) and feldspar (hardness 6), retaining the remainder of the Mohs scale. Later, Rosiwal (1896), using the cutting method, and Vickers (1925), using the indentation technique, clearly showed that the intervals between the steps of the Mohs scale are unequal (see Fig. 2 and Table 1).

(3) The third important problem with the Mohs scale was demonstrated in 1831 by M. L. Frankenheim (1801–1869), a physicist from Breslau, Germany. Frankenheim extensively studied the hardnesses of various faces on the same crystal. He scratched the appropriate faces freehand with needles made not only of tin, zinc, lead, gold, silver, copper, and iron, but also of topaz and corundum, noting the relative difficulty of scratching the various

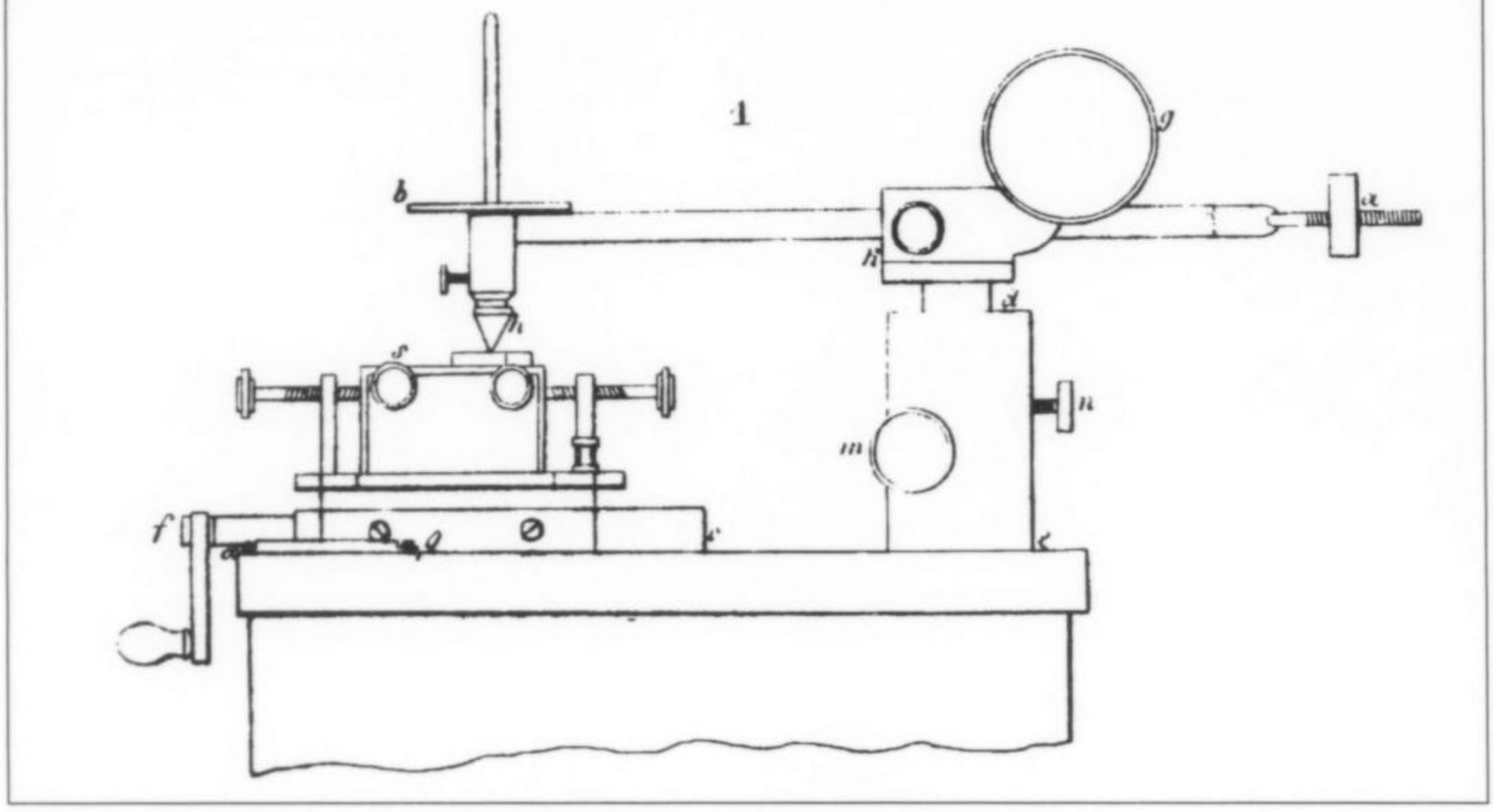

Figure 3. **Scratch sclerometer of Franz (1850).**

faces of the crystal with the metallic needles. In spite of the obvious deficiencies of these experiments, Frankenheim proved that distinct and consistent hardness differences can exist between various faces on one crystal. It is obvious that experiments with different edges, faces, corners, and cleavage surfaces on a given substance would lead to differing results.

For the sake of completeness it should be mentioned that in 1912 C. Lane proposed a six-step hardness scale with only dark minerals as the reference species:

1. Graphite
2. Stibnite
3. Galena
4. Iron
5. Niccolite
6. Magnetite

He reasoned that when a darker, softer mineral is rubbed against a harder white or colorless one the dark mineral will leave a distinctive streak. Generally the color of the powdered mineral comprising the streak is more diagnostic than the macroscopic body color of the mineral itself. (This, of course, digresses from the topic.)

Crystallochemically, a mineral's hardness is a function of its crystal structure, the mineral's chemical composition, and the size of the atomic or ionic radii. Most minerals have a hardness between 2 and 6 on the Mohs scale; most of the harder minerals are anhydrous oxides or silicates.

THE SCRATCH SCLEROMETER

It is not surprising that early attempts were made to construct a hardness-measuring apparatus that gave precise and consistent results, relying less on human observation—one that, in other words, could provide exact rather than approximate measurements. This instrument was named a *sclerometer* (from the Greek *skleros* = hard). With a scratch sclerometer, one attempts to scratch the substance being tested with a point or blade.

Professor A. Seebeck (1805–1840) of Berlin built the first "very simple instrument" in 1833, probably by himself. Unfortunately he did not provide any drawings of his instrument. To a horizontal wooden base, he fastened two perpendicular columns that carried a horizontal measuring arm on bearings. On one end of the arm there was a lower attachment on which was mounted the point or blade to be used to make the scratch. The opposite end of the arm, when not weighted, served solely as a counterweight. The lever arm was marked with a linear scale, upon which various sliding weights could be placed. The crystal face to be tested was placed under the scratch needle. The crystal was mounted on a slide which was mounted, in turn, on a second board that rode on a track and could be moved back and forth in a parallel direction.

Seebeck's method differed from those of all other later experimenters. He produced a deep scratch by applying a heavy weight, and then gradually reduced the weight until no scratches were discernible under magnification and uniform illumination. Seebeck's instrument allowed, for the first time, the quantification of hardness.

In 1850, Seebeck's unrefined instrument was substantially improved by R. Franz (1827–?), whose innovations also found application in later instruments. The new instrument (see Fig. 3) was produced by Rühe, a Berlin instrument maker. Its most important innovations were that (1) the crystal holder was mounted on a circular plate with degree markings so that the horizontal direction and vectoral difference in hardness was measurable; (2) the base of the crystal holder was no longer moved by hand but by a screw mechanism, allowing uniform movement under the scratch point; (3) the various weights were placed on a small pan directly over the scratch point; and (4) the height of the balance beam was adjustable by means of a screw mechanism, and an eccentric disc served to restrain the beam when in an unweighted condition.

The construction principles of Franz were adopted almost unchanged by the Berlin mineralogist H. Hirschwald (1849–1928). A type of blowpipe and a type of goniometer are named for Hirschwald (Burchard 1994, 1998); in the case of the sclerometer, however, precedence is given overwhelmingly to Franz. The similarity of construction between the instruments of Franz and

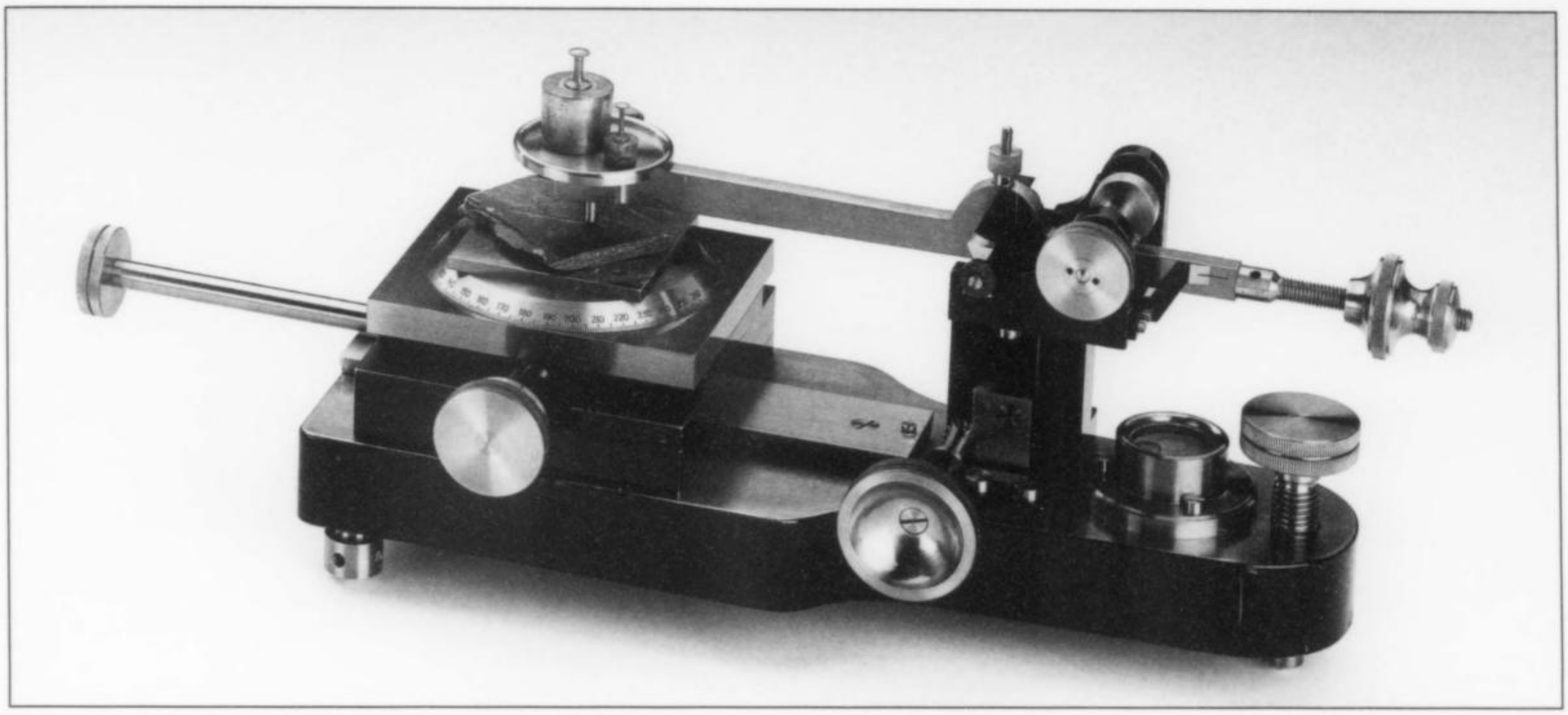

Figure 4. **Hirschwald sclerometer, unsigned but certainly by R. Fuess, Berlin-Steglitz, ca 1920, ex Harry von Eckermann laboratory.**

Hirschwald extends even to small details, for example in the eccentric disk used to restrain the beam. The object holder was mounted on a slide mechanism that, by means of a crank, could be easily moved to a new offset parallel track; the attempt is repeated with progressively heavier weights until a distinct scratch is left. In its 1905 catalog, the firm of R. Fuess, Berlin-Steglitz, lists a Hirschwald sclerometer (see Fig. 4) for a price of 320 Marks.

An ingenious sclerometer of the Franz (Hirschwald) design (see Fig. 5) eliminated the need to incrementally add weights. It was built by the firm of Richard Heiser, Berlin Lichterfelde, an instrument maker not known to have built any other mineralogical instruments. According to O. Medenbach (personal communication, 2000):

> The balance beam is weighted with the hanging weight [P1]. On the other end of the beam the assisting weight [P2] rolls with a constant weight but variable distance from the main bearing. By means of the pull rod, a small carriage rolls on two guide rods, holding the assisting weight P2 frictionless by means of two steel points. The weight produced by this means is read off on the calibrated scale. By calibration to zero (P2 completely to the right), the balance beam is adjusted by

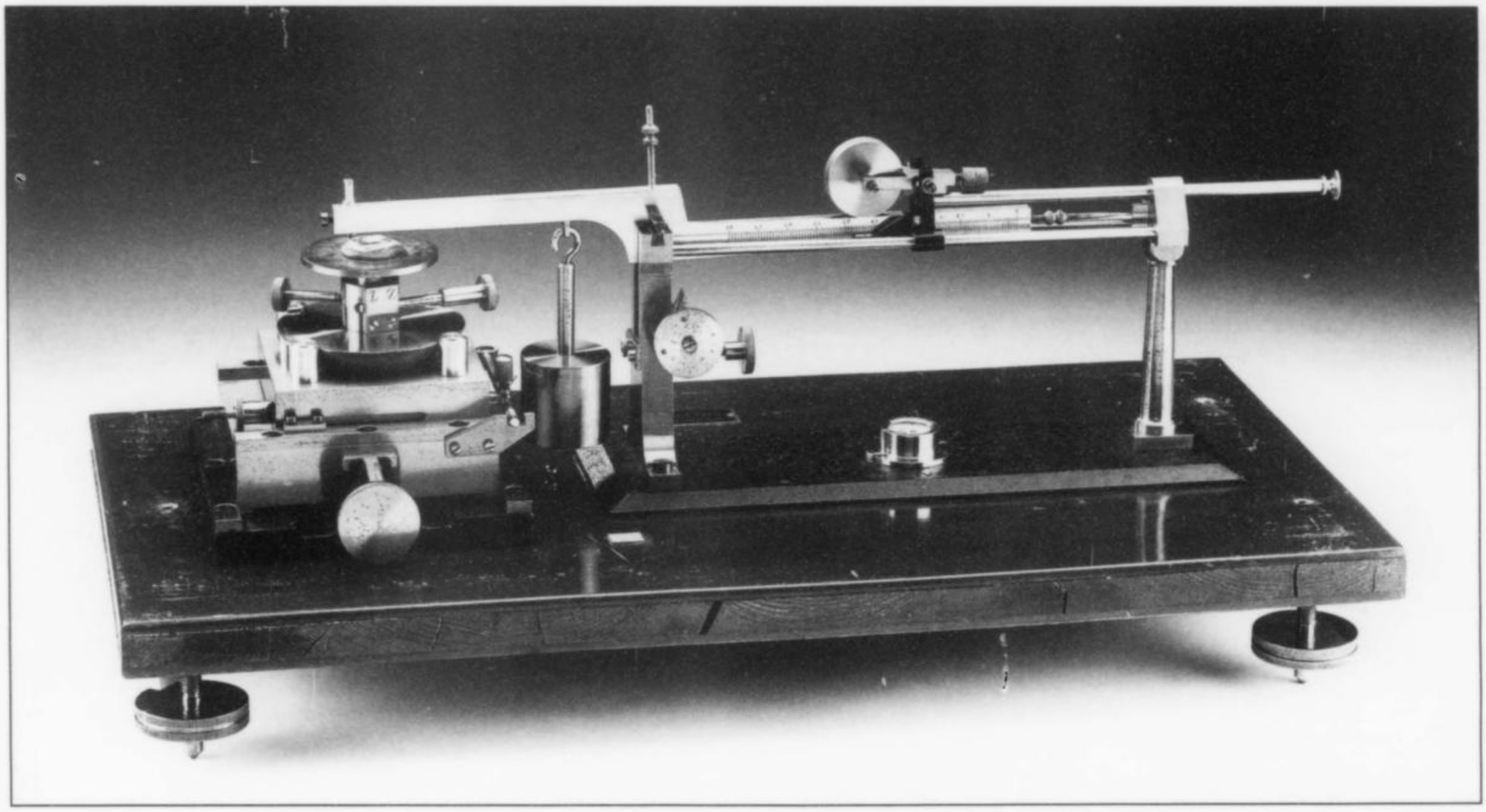

Figure 5. **Improved Franz sclerometer with an ingenious design of sliding weights. Signed "Richard Heiser, Berlin- Lichtenfelde," ca 1910. Herb Obodda collection.**

Figure 6. **Scratch sclerometer with rolling weight system by Grailich & Pekarek. Signed "Voigt & Hochgesang, Göttingen," 1896.**

means of a small milled screw on the carriage of the assisting weight P2. Shifting P2 left, in the direction of the main bearing, produces a counterweight that increases proportionally to the scale value.

On a second apparatus that Franz presented in 1850, the principle of measurement was different. The apparatus was manufactured by Etter, an instrument maker from Bonn. In this machine the horizontally mounted crystal face stays stationary and the test point traverses across it. To accomplish this, the shell holding the diamond or steel point is mounted on a holder that has wheels and moves along tracks in a single direction. The holder is connected by a strong cord to a bowl that serves to contain the draught weights. The holder is subjected to gravitational force by means of a pulley that puts the bowl in a vertical position, and that force is used to overpower the resistance to scratching. The scratch point can be loaded with ring-shaped weights, and thus the depth of penetration in the test substance can be varied. Sand is added to the draught bowl until the holder connected to the cord begins to roll. Through variations of the draught weights and added weights, the force necessary to scratch the material can be achieved and measured.

It remained for two mineralogists from Vienna, J. Grailich (1829–1859) and F. Pekarek, to design a sclerometer that was to become the most widely accepted in 1854. The two scientists retained the rolling principle of Franz, but, like Seebach, they chose a stationary scratch point across which the test sample could be moved. Tutton (1922) described this type of sclerometer:

> It consists of a horizontal goniometer-circle divided directly into single degrees, with the crystal-adjusting apparatus carried immediately above it and terminating in a little tabular support on which the crystal can be cemented. The non-rotatable basal table and central axis cone for the independently rotatable circle and crystal-holder is mounted on the three wheels rolling on three corresponding rails. The traverse is brought about by laying a convenient weight in a pan connected by a cord with the goniometer table, and passing over a pulley. The fixed tripod table which carries the rails is also fitted with a spirit level, and a vertical column rises from it near the edge, which carries the balance beam, to the end of one arm to which the scratching point is attached. Two alternative points are given . . . one is of hardened steel and the other is of diamond. It is carried at the end of the balance beam which comes over the center, a little pan for the reception of weights being arranged immediately above it, in order that the scratching may occur with a given pressure. The other arm of the balance carries an adjustable counterpoise for the weight of the pan and scratching point. An adjustable stop is arranged to prevent the point from cutting too deeply into the crystal. In order to provide for crystals of different sizes the supporting column of the balance is adjustable for height, by sliding in an outer pedestal column.

Grailich and Pekarek's scelerometer was offered by the Göttingen factory of Voigt and Hochgesang at a price of 220 Marks (see Fig. 6). In 1910 the company was acquired by the mechanical workshop of Steeg and Reuter in Homburg near Frankfurt, and the apparatus was offered again, this time for 225 Marks.

The workshop of R. Fuess, Berlin-Steglitz, listed a modernized version (see Fig. 7). If equipped with a centering and adjusting device (such as is known from goniometers), the instrument cost 280 Marks; without the device, it cost 220 Marks.

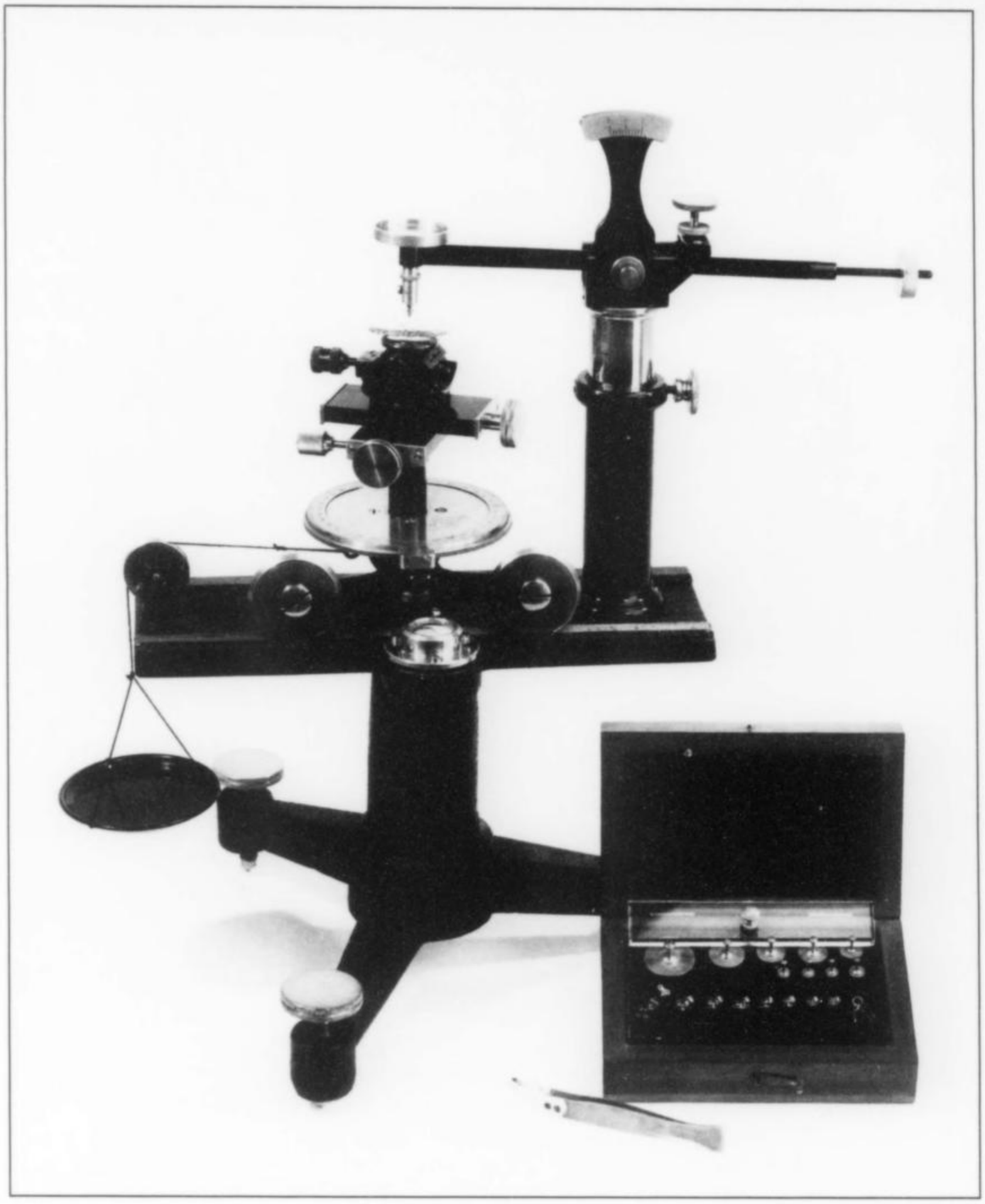

Figure 7. **Modernized scratch sclerometer with rolling weight system, signed "R. Fuess, Berlin-Steglitz," ca 1930, Herb Obodda collection.**

All of these instruments made possible a precise measurement of the force needed to scratch a particular crystal face. In this context the 1873 treatise of Franz Exner (1849–1926), proposing the so-called "hardness curves," should be mentioned. In the explanation of Tutton (1922):

> A drawing of the crystal face is then made, and lines drawn from the center of it along each experimental direction, of a length proportional to the observed hardness, their terminations being arranged so as not quite to reach the boundary lines representing the crystal face. These terminations of the lines are then joined by a curve, the Curve of Hardness. Such a curve will exhibit the symmetry of the system. For instance, the curve of hardness of the face {111} of calcite perpendicular to the optic axis is a three-leaved rosette, with maxima 120° apart, and minima at a half way position. (see Fig. 8)

In 1883 the geologist F. Pfaff (1825–1886) of Erlangen proposed a modified method and a new scratch sclerometer (see Fig. 9). This apparatus was built by Reiniger, the university's instrument maker, and offered for sale at 50 Marks.

A scratching blade is mounted at the base of a vertical rod that penetrates a sliding carriage which may be moved back and forth horizontally. This slide is connected to a pull rod and may be driven

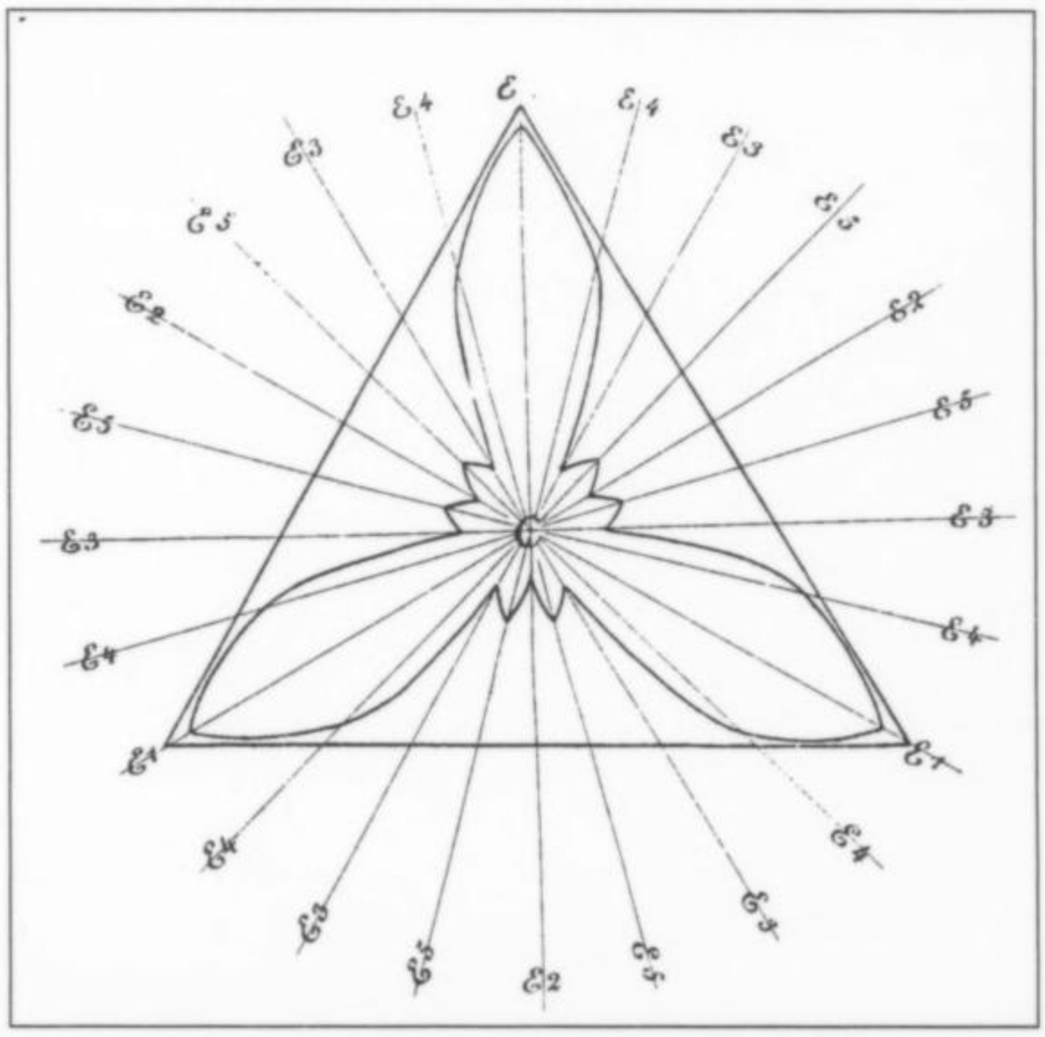

Figure 8. **Curve of directional hardness of one face of calcite. (Pfaff 1883b)**

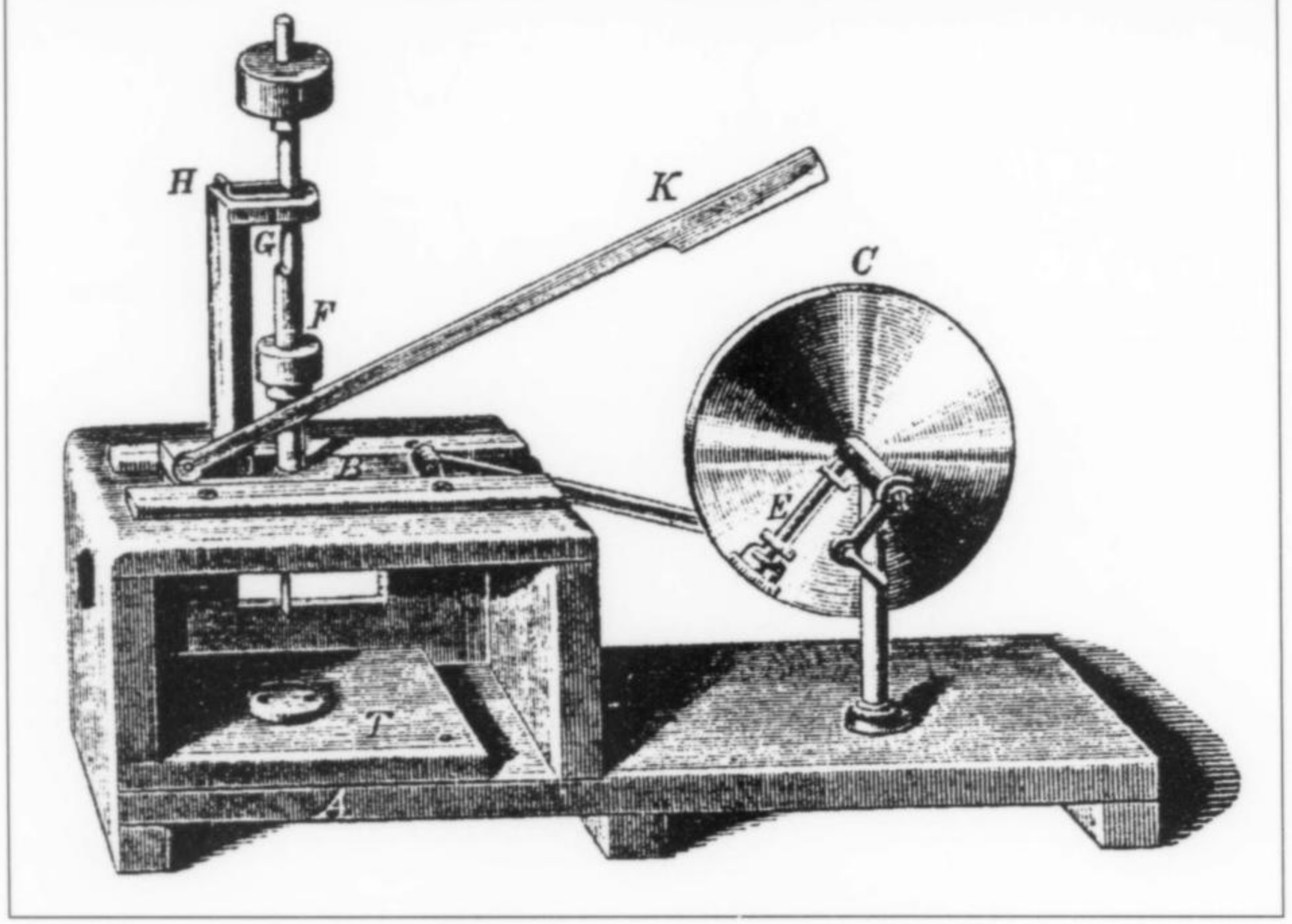

Figure 9. **Scratch sclerometer of Pfaff (1883b). Note the defunct Wollaston goniometer utilized as a hand crank.**

manually by a cranking device. (It is interesting to note that for the latter a defunct Wollaston goniometer was utilized.) By means of a simple mechanism, the blade is lowered to the test sample in one direction of horizontal movement only—that is, either back or forth. Pfaff advises the use of a constant weight, an equal number of movements (generally more than 100), and a constant length of movement of the scratch blade across the test sample. According to Tutton (1922), "the hardness is then considered to be inversely proportional to the weight of the dust thus removed." Pfaff's research is mainly noteworthy for its investigations of the relative hardnesses of isomorphous minerals.

In 1910, A. L. Parsons of Toronto came up with yet another construction principle for the scratch sclerometer. He mounted the scratch point underneath a horizontal brass beam that is slightly flexible. The test sample is not mounted horizontally but on a wedge with an obtuse angle. The test sample is then moved in one direction underneath the scratch point, and the lever is progressively elevated, the pressure increasing until scratching can be observed. The vertical dislocation of the flexible beam is monitored with a micrometer screw. Obviously this experimental arrangement is hampered by a variety of problems. This instrument was offered for sale by the Heidelberg mechanical workshop of P. Stoe for a price of 80 Marks.

At about this time, scientists at Harvard University examined in great detail the problems surrounding the determination of hardness in minerals, including the problems of hardness-testing opaque sulfide minerals in polished section under the microscope. In 1916, J. Murdoch published results which he obtained using a microscope sclerometer designed by L. C. Graton and constructed at the university's geophysical laboratory. Murdoch used a Sharp's no. 10 sewing needle as a scratch point, but the results were unsatisfactory.

In a preface to a report by S. B. Talmage (1924), Graton states that Talmage had "resurrected the old instrument and discovered that results varied not because of hardness variability in the minerals but because of easy dulling of the scratching point." Consequently, Talmage replaced the sewing needle with a calibrated diamond crystal. This crystal was attached at one end of a graduated horizontal beam carrying a sliding weight and balanced by a counterweight on the other end. The lever was mounted on a vertical column which was clamped to the horseshoe foot of the microscope. It was adjustable for height and could be rotated vertically. After focusing the test object with the microscope optics, the diamond point was swung on top of it. The sample was then moved in one direction by means of the stage micrometer underneath the scratching point. Increasing the weight resulted in broader furrows. The width of the scratch marks could be compared with two gauge marks embedded in the microscope ocular. By varying the weights on the scratching point, congruence of width could be achieved. It was evident, however, that these techniques would prove to be cumbersome.

THE DRILL SCLEROMETER

F. Pfaff invented not only the scratch sclerometer, as previously mentioned, but also the very first drill sclerometer. His description, *The mesosclerometer, an apparatus for the determination of mean values of hardness of crystal faces*, was published in 1883. In principle, the instrument measures the depth to which a rotating diamond point penetrates the substance to be tested. The "mesosclerometer" is most suitable for examining minute crystal faces, and Pfaff thought it quite adequate for demonstrations in university lectures.

The apparatus is depicted in Figure 10, which retains the notations of Pfaff. A base plate (A) carries a crank handle (R) and a cog wheel (B). When a suitable transmission gear is used, the horizontal disk (D) on a vertical rod may be spun at high speed. The test sample is cemented to the disk with sealing wax. Above the sample there is a vertical drill rod sliding freely within the collars H and K. The rod terminates in a diamond point and is

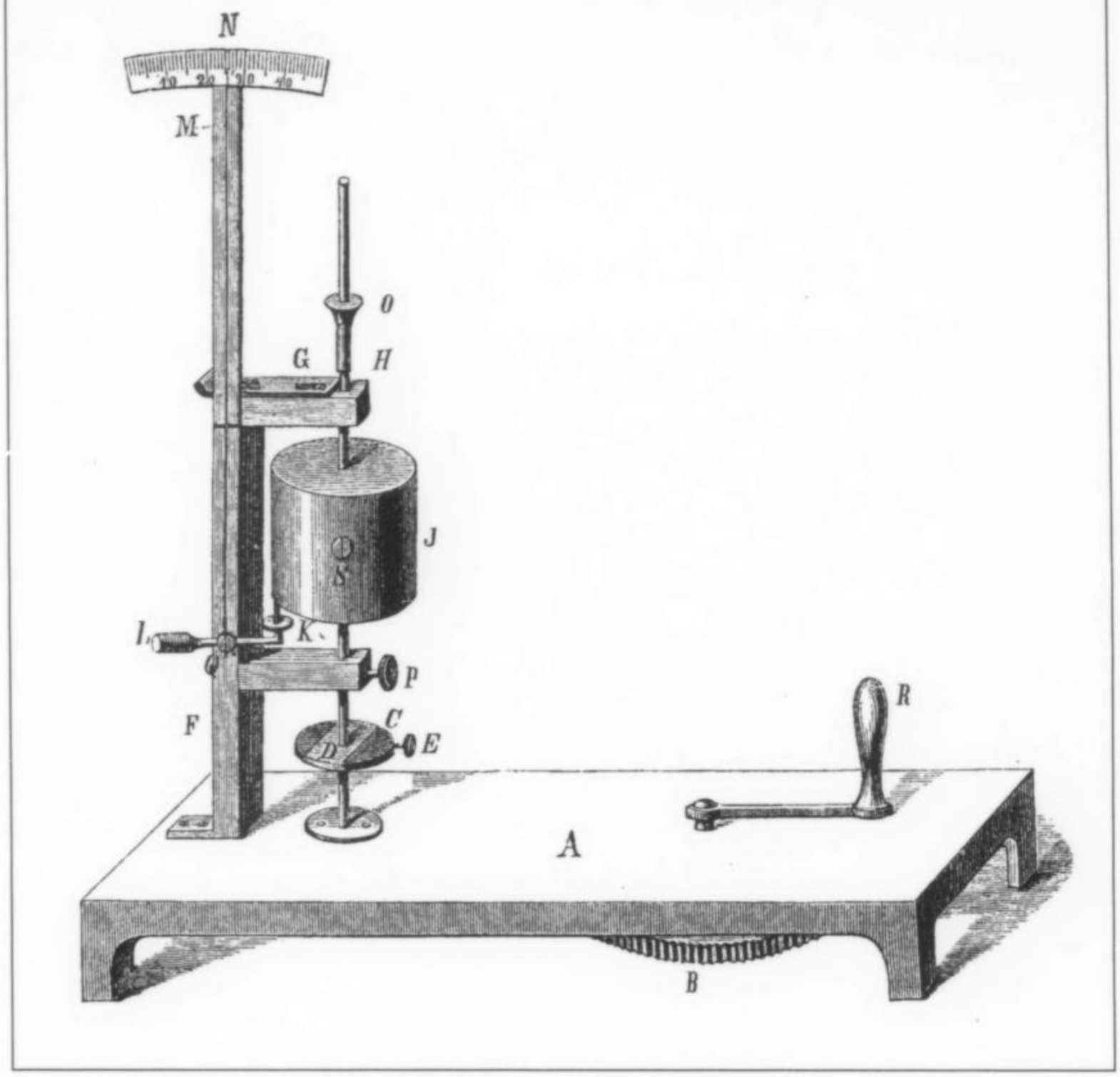

Figure 10. **Drill sclerometer by Pfaff (1883a).**

loaded by some heavy weight (J). A notch in the bearing of the drill rod prevents it from turning around its own axis. When the experimenter turns the crank handle steadily, the test sample is rotated underneath the diamond point, which drills into the sample. The depth of penetration is indicated to an accuracy of 0.0067 mm on the scale (N) by a sensing lever device. Alternatively one may count the number of turns required to achieve a predetermined drill depth. The advantage of these procedures is the fact that one can do without the time-consuming process of weighing the drill dust. Pfaff does not mention the maker of his mesosclerometer, but it is safe to assume that it was somebody in the workshop of the University of Erlangen.

In 1898, T. A. Jaggar further improved the drill principle of Pfaff. His microsclerometer is a highly complex precision instrument which is connected to the horseshoe foot of a Fuess no. 1 petrographic microscope (see Fig. 11). The extremely complicated mechanical gears are again driven manually by a hand crank. Contrary to the operation of Pfaff's mesosclerometer, the diamond point itself is rotated. Precise data concerning the number of turns and the variation of load weights may be recorded. The depth to which the drill has penetrated is determined with the aid of a glass micrometer and the microscope's optical system. This apparatus was built by Sven Nelson of Cambridge, Massachusetts, but unfortunately the original instrument seems to be lost. The authorities of the Harvard University Collection of Historical Scientific Instruments have put it on their watchlist.

CUTTING HARDNESS

All polishing methods of hardness determination measure the resistance offered by a particular mineral or substance to abrasion. The Vienna geologist A. Rosival (1860–1913) pioneered this process by utilizing a certain quantity and grain size of a pulverized abrasive up to the point when it became ineffectual on the test sample. The loss of weight of the sample is inversely proportional to its hardness.

In 1924, Rosenbusch compiled a table (see Table 1), arbitrarily setting the cutting hardness of quartz at a level of 100 and that of corundum at 1000. On that table one can immediately recognize the exceptional position of diamond (90,000), as well as the vastly differing intervals between the individual steps of the Mohs scale.

Measurements of cutting hardness may be of great value in the identification of minerals in thin and polished sections. A polished rock section composed of different mineral grains with differing hardnesses will show some relief, and the dividing lines between adjoining particles will indicate the relative hardnesses of the minerals concerned. The experienced microscopist, by minutely lowering or raising the microscope tube or stage, can discern hardness differences.

INDENTATION HARDNESS

During the first half of the 20th century the determination of hardness was revived, mainly in metallurgy and ore mineralogy. The indentation hardness of minerals is sufficiently characteristic to be used as a diagnostic tool; to measure it, a hard object under a known load is pressed into the surface of the substance to be tested.

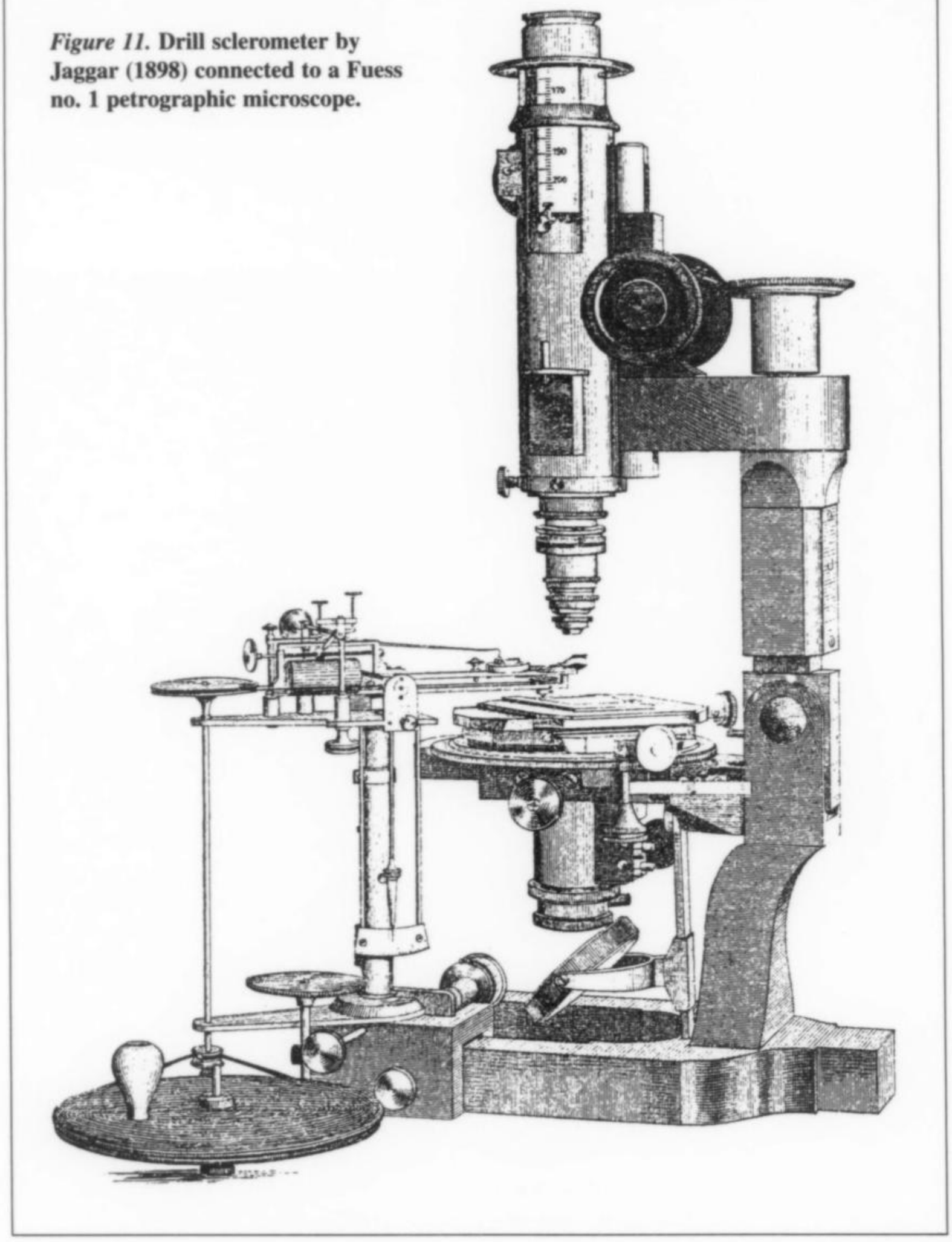

Figure 11. **Drill sclerometer by Jaggar (1898) connected to a Fuess no. 1 petrographic microscope.**

Various indenting methods have been designed in which the form of the indenter ranges from spherical (Brinell method) to conical, and from an elongated pyramid (Knoop method, 1939) to an equilateral pyramid. From the load, the length of time elapsed during the experiment, and the size of the indentation remaining after the removal of the indenter, the mean hardness is determined.

The International Mineralogical Association (IMA) insists on relevant hardness data whenever a new ore mineral is sent to it for approval, and for this purpose the Vickers method is most commonly employed. The Vickers apparatus, invented in 1925 by the British Vickers Works, uses an equidimensional diamond pyramid for an indenter. This is fixed on the objective of a microscope in such a way that the apex of the diamond will press down on a predetermined location on the thin section or polished section. For the identification process a constant pneumatic load of 100 grams and a constant time period of 15 seconds is employed. After the indenter is removed, the test sample shows a hollow pyramid with a square base. Both diagonals are measured by a micrometer test plate provided in the microscope ocular. These distances are proportional to the depth of indentation. The VHN (Vickers hardness number) is calculated and quantified with the aid of a table. By standardizing the configuration of the diamond indenter, the load, and the time, the experimental approach serves as a quantitative method that can be operated universally. The results may be reproduced, and individual biases and sources of error may be eliminated to a large extent. However, the results of the distance measurement may be distorted by the effects of cracking, bulging, elastic deformation, or anistropy of hardness, or by invisible minerals and inclusions underlying the surface of the test sample.

CONCLUSION

Over a period of approximately one hundred years—between 1833 and 1933—various sclerometers were designed with ingenuity, expertise and skilled craftsmanship. These instruments were manufactured by only a few select mechanical workshops, mostly as one-of-a-kind items or in very limited editions. Today they have

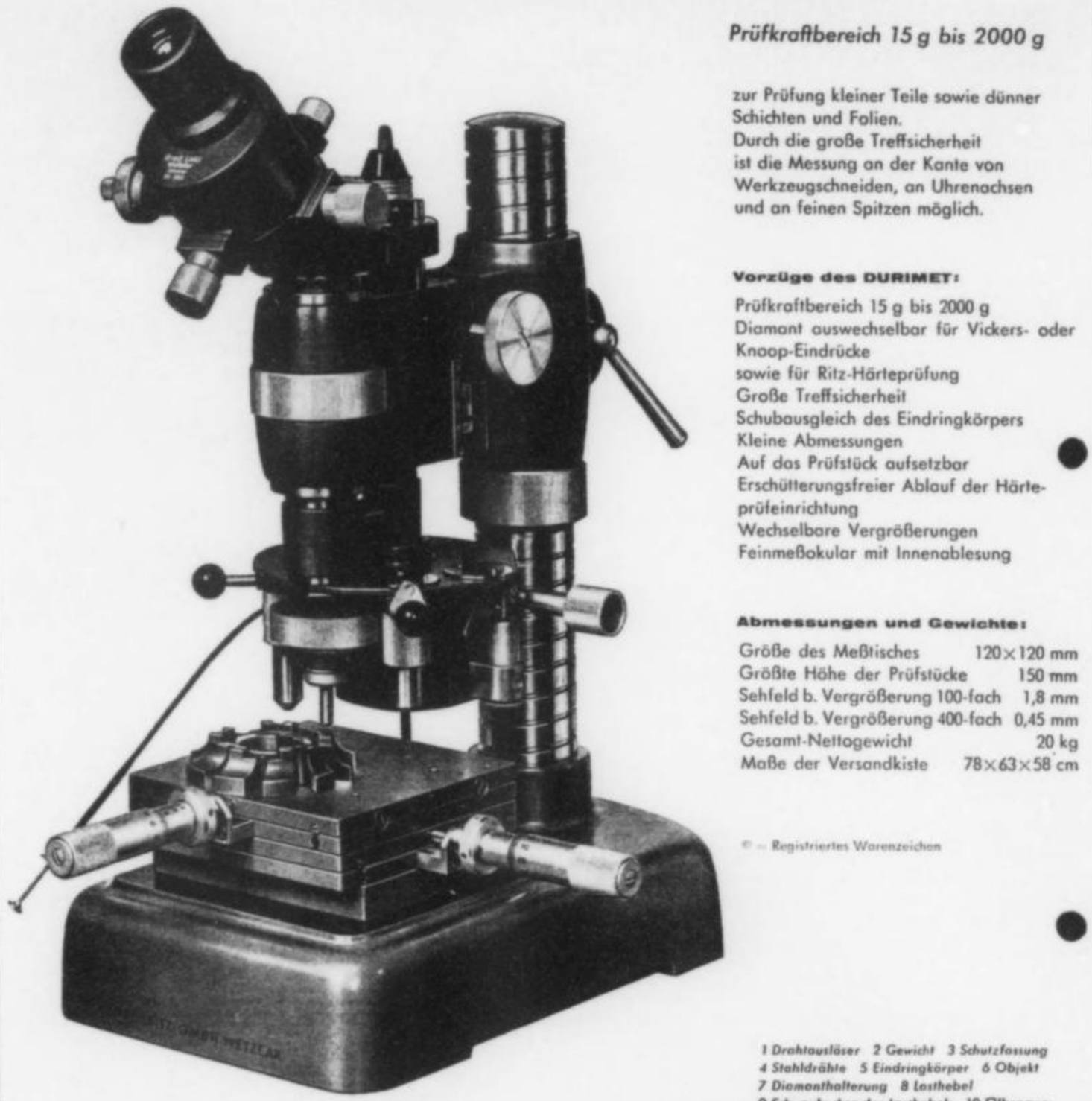

Figure 12. **Indentation sclerometer utilizing the experimental arrangement of Vickers (Durimet company specifications).**

almost faded into oblivion, hardly even recognized as mineralogical tools. Sclerometers, like goniometers and blowpipe kits, are important material witnesses of the age of classical mineralogy. Furthermore, they are extremely rare and are in high demand by collectors of scientific instruments. The writer has seen only seven historic sclerometers within the last twenty years, four of which are pictured in this article. It seems very likely that the total remaining number of historic mineralogical sclerometers in the world does not exceed one hundred.

ACKNOWLEDGMENTS

The author is indebted to Paul Kubath for the excellent photographs. Olaf Medenbach cleaned and restored some of the original instruments with great enthusiasm and was of great help in obtaining some hard-to-get references; he also reviewed and augmented the manuscript. My good friend Herb Obodda was kind enough to translate the German text, and gave permission to publish some of the photographs of instruments in his collection. Thomas Moore refined and edited the final text.

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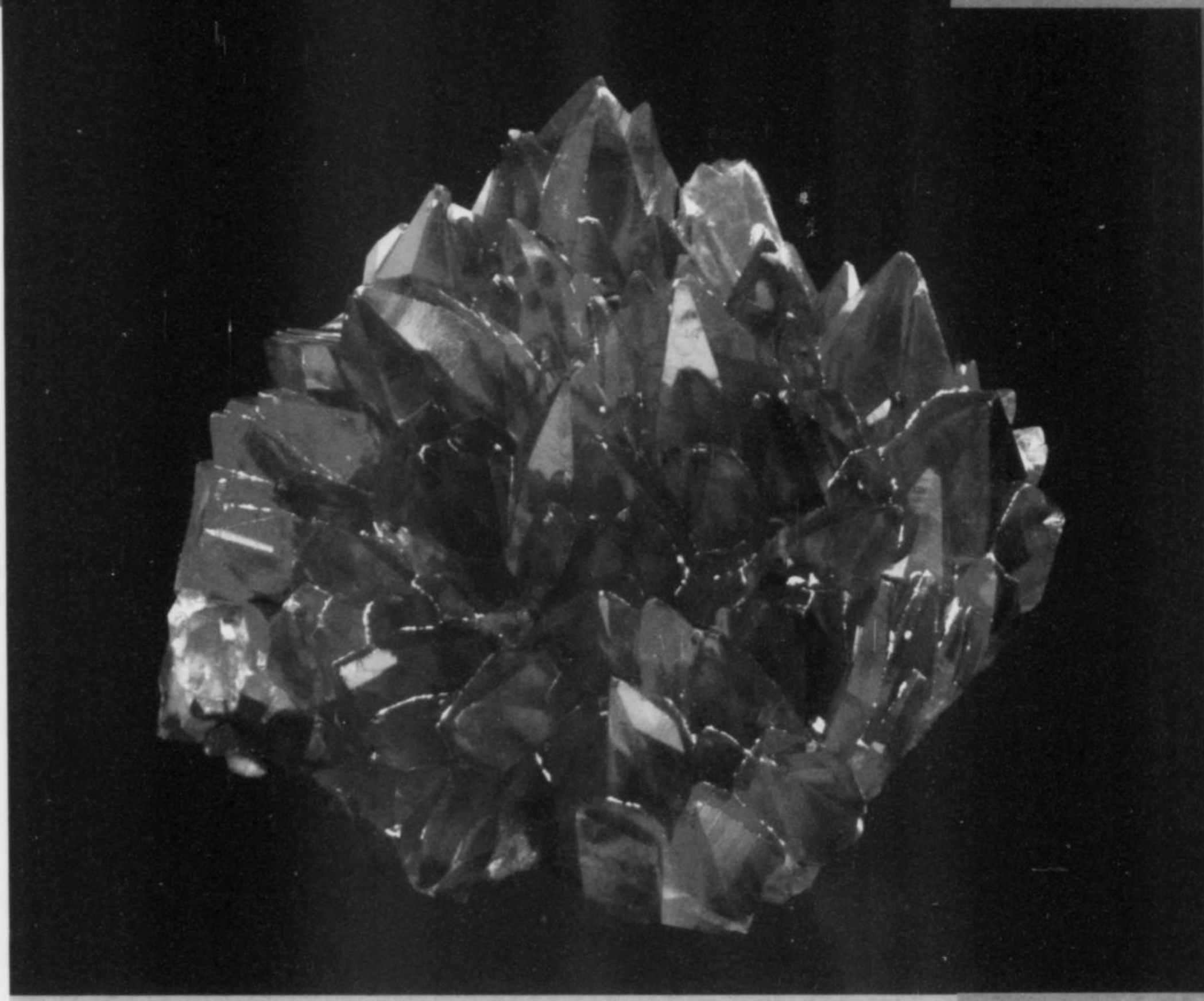

Rhodochrosite, 3 inches wide, from the N'Chwaning mine, Cape Province, South Africa. Jeff Scovil photo.

Rhodochrosite, Quartz and Tetrahedrite, Porcelain Pocket, Sweet Home Mine, Alma, Colorado. Come see the spectacular collection of Sweet Home Mine specimens displayed at the new Colorado School of Mines—Geology museum, Golden, Colorado. Photo by Jeff Scovil

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Recent Discoveries
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The Jeffrey mine in Asbestos, Québec, Canada, is world-famous for beautiful crystals of orange, pink and green grossular; vesuvianite crystals of many colors, as well as violet manganoan vesuvianite; and well-terminated crystals of prehnite and pectolite. It is also the type locality of spertiniite and jeffreyite. The locality is now closed to collecting, but in the last seven years there have been several isolated discoveries of significant and beautiful specimens.

INTRODUCTION

The Jeffrey mine in Asbestos, Québec, Canada, is a huge chrysotile mine which began operating in 1879. The mine is world-famous for beautiful crystals of orange grossular (see the cover of the *Mineralogical Record*, Vol. 24, No. 1); vesuvianite crystals of many colors, as well as violet manganoan vesuvianite; prehnite in prismatic, pyramidal and pseudo-cubic crystals and in globular form; and pectolite in well-terminated, white, translucent crystals. It is also the type locality of the rare minerals spertiniite (named in honor of the discover, one of the authors, FS) and jeffreyite, first collected by one of us (FS). Only six very small specimens of jeffreyite exist. Five of them, weighing a total of five grams, are preserved in the collection of one of the authors (FS), and the remaining one is no. CNMMC48740HT in the collection of the Canadian Museum of Nature in Ottawa, where the species was characterized.

Figure 1. **The Jeffrey mine in 1996. The arrow shows the location of the vesuvianite discoveries. Photo courtesy of JM Asbestos Inc.**

During the 1970's and 1980's, specimens from the Jeffrey mine were fairly abundant on the mineral market, and the mine became famous particularly for its lustrous, gemmy orange grossular crystals. Unfortunately, the market for asbestos has been in crisis for several years, and the Jeffrey mine's ore production has been greatly reduced; consequently, good mineral specimens are no longer being found in such quantities as they once were. However, a few lucky discoveries have occurred during the last few years. Specimens from these discoveries, described below, may turn out to be the last major mineral specimens which will ever emerge from this very distinctive twentieth-century locality.

LOCATION AND GEOLOGY

The town of Asbestos is about a two-hour drive east of Montréal. The mine, which borders the town, is an open pit about 2 km in diameter and about 350 meters deep, exploiting a cylindrical orebody of asbestos (chrysotile). This orebody measures about 600 x 900 meters in the horizontal plane, and dips about 65 degrees to the southwest. From south to north, its constituents are pyroxenite, serpentinized dunite and serpentinized peridotite, terminating at a steeply inclined wall of slate which is reinforced by holes with steel cables. The degree of serpentinization varies from 75% to 100%. The economically valuable asbestos-fiber deposits occur in the serpentinized peridotite; the quantity of useful fibers in the dunite is too low to be profitable. The famous grossular garnets are found in fractures in red syenite and in the albitites and rodingites which are included in the dunite and peridotite. The vesuvianite crystals are found in a large rodingite dike enclosed in the dunite. Very large dumps surround the mine. Many details are provided in a recent article by Spertini (2001); other information on the mine and its minerals can be found in Grice and Williams (1979), Amabili and Miglioli (2000) and in the book by Bancroft (1984).

DISCOVERIES FROM 1996 TO 1999

At the end of 1996 and during the first months of 1997, several good specimens of orange grossular were collected when active workings at the mine crossed a rodingite vein famous for hosting these classical garnets (workings are benched, and this vein is only crossed by a bench at intervals of several years). The average quality of the new grossular specimens is high, and there are some excellent individual pieces. However, the number of specimens produced is much lower than it was during periods in the seventies when the vein was crossed, as a consequence of the reduction in mining volume. One of the new pockets (actually a series of fractures in the rocks) produced a few spectacular specimens with large and clear crystals of very deep orange (almost red) grossular associated with acicular green diopside crystals, surpassing in beauty most specimens from the previous decade. This pocket yielded only five good cabinet specimens and two miniatures (plus some lower-quality specimens), which were collected by a miner operating a power shovel. All of the material collected from this pocket was sold by the miner to our friend Jonathan Levinger (a well-known collector and mineral dealer in Montréal) in August of 1997. One of us (MA) saw the material the same day, and would now like to thank Jonathan for letting him have (after a couple of years) the best small-cabinet (6.6 cm) specimen and the best

Figure 2. **The Jeffrey mine in June 2003. The bottom of the pit is already flooded to a depth of about 300 feet. Amabili photo.**

miniature (3.5 cm). These are world-class specimens, crystallized all around, with gemmy rhombic-dodecahedral grossular crystals measuring up to 2.5 cm on green diopside crystals. The other specimens were sold at the 1997 Denver show and are now in important private collections.

A memorable discovery was made at the mine on July 5, 1998, during a collecting day organized by the Club de Minéralogie d'Asbestos. On that day a few club members found the best pink grossular garnets ever collected at the mine. The lustrous, transparent crystals are floaters, or rest on green diopside or white albitite matrix. Such matrix is unusual for Jeffrey mine grossular, which is almost always found on dark syenite matrix (although some extraordinary orange grossular garnets on white albitite were found around 1972). Two of the authors (MA and FS), digging in the albitite rock, collected good specimens of pink grossular on green diopside; however, the pocket that made the day memorable was found in a large rock by a former Jeffrey miner, who immediately sold to one of us (MA) a large number of the pieces he had collected. The grossular of this pocket is very deep pink, and the crystals are up to 1.5 cm—much larger than the other nice pink grossular crystals collected on the same day and in the following weeks. These garnets are associated with a mineral of the wollastonite group, as masses of white fibers (the crystals were enclosed in these soft, fibrous masses, and thus were protected from damage during blasting and collecting). Other associated species on these pink garnet specimens are diopside, prehnite and (in only one specimen) apophyllite, as a single, sharp, cream-colored crystal of 2.7 cm. The material sold briskly on the local and international markets, although there were fewer than 15 specimens of very high quality. Pink grossular crystals from the Jeffrey mine are extremely rare: no more significant specimens of this type have been collected since July 1998.

Unfortunately, in July 1998 most of the miners were dismissed from their jobs, and the asbestos production of the mine was greatly reduced. Since then it has become very difficult to find interesting specimens at the mine, although during the summer of 1999 a few very good specimens of white, colorless, or pale pink grossular crystals with green cores were collected. In the best pieces, there is a very bright green spot in the middle of each face of each crystal; the aesthetic effect created by these emerald-green spots regularly arrayed on the shiny crystals is really wonderful. The average size of the crystals is about 4 mm, but a single crystal 9 mm across is preserved in the collection of one of us (MA). In some specimens the grossular crystals are associated with cream-colored globular prehnite. Similar specimens were found in the past, but they are extremely rare, and not comparable in quality to those found in 1999. At the Denver show of 1998, Moore (1998) observed two older thumbnails of this kind of bicolored grossular from the Jeffrey mine; he described the "dreamy" effect that comes from seeing the green through the pinkish orange exterior. Most of the new specimens are small, but one measures 10 x 20 cm. During the same period, a few specimens of pale pink grossular crystals associated with prehnite were collected. The best of these crystals are a little larger than 1 cm, and are so transparent that the green diopside matrix showing through them makes them seem to have green inclusions.

Only rarely at Asbestos do diopside crystals reach significant dimensions when associated with grossular garnet crystals. In the few known specimens of this type, the grossular crystals rest on, and are partly penetrated by, elongated green diopside crystals.

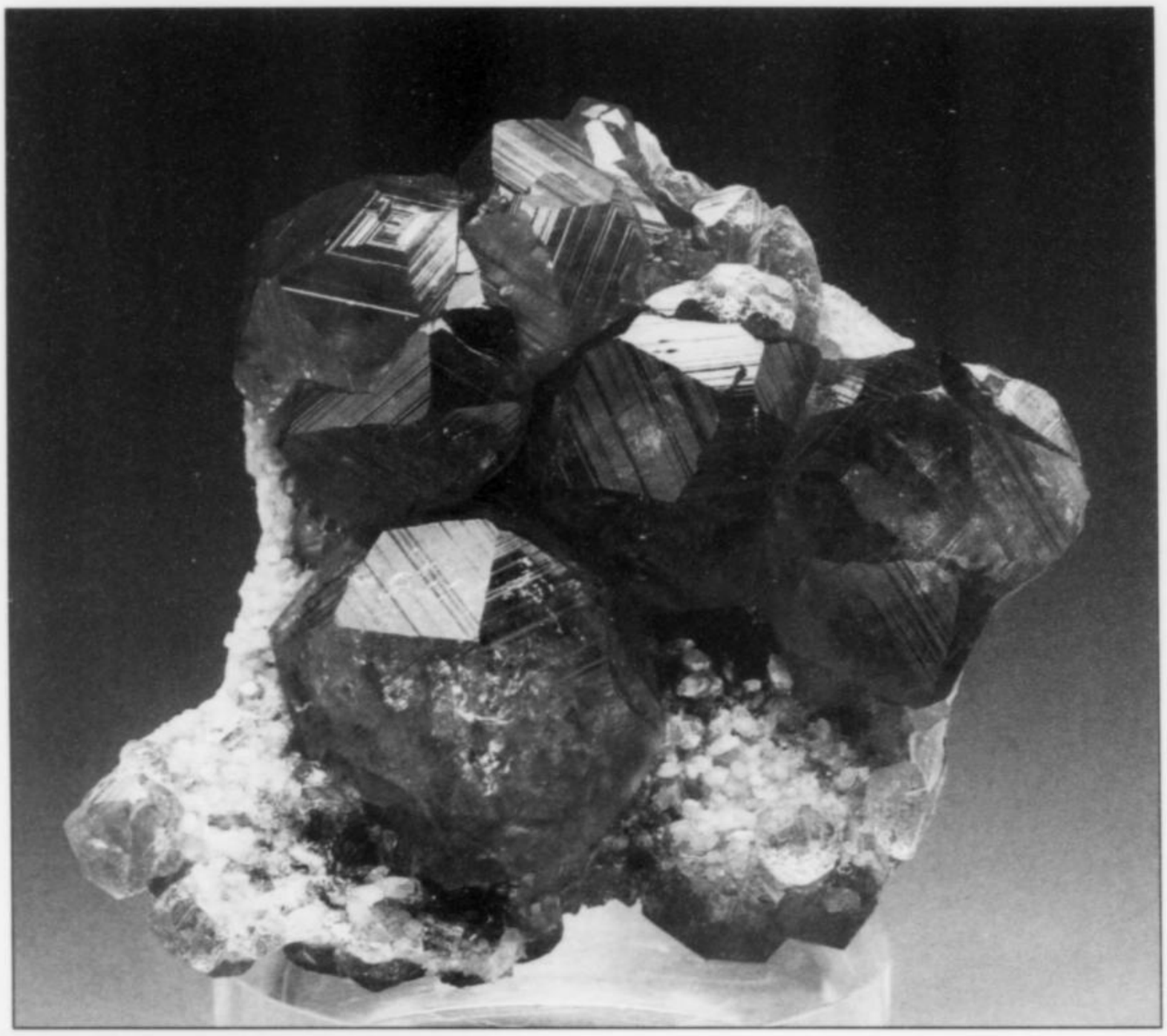


Figure 3. **Grossular crystals with diopside, 4 cm, from the Jeffrey mine, Asbestos. Amabili collection; Appiani photo.**

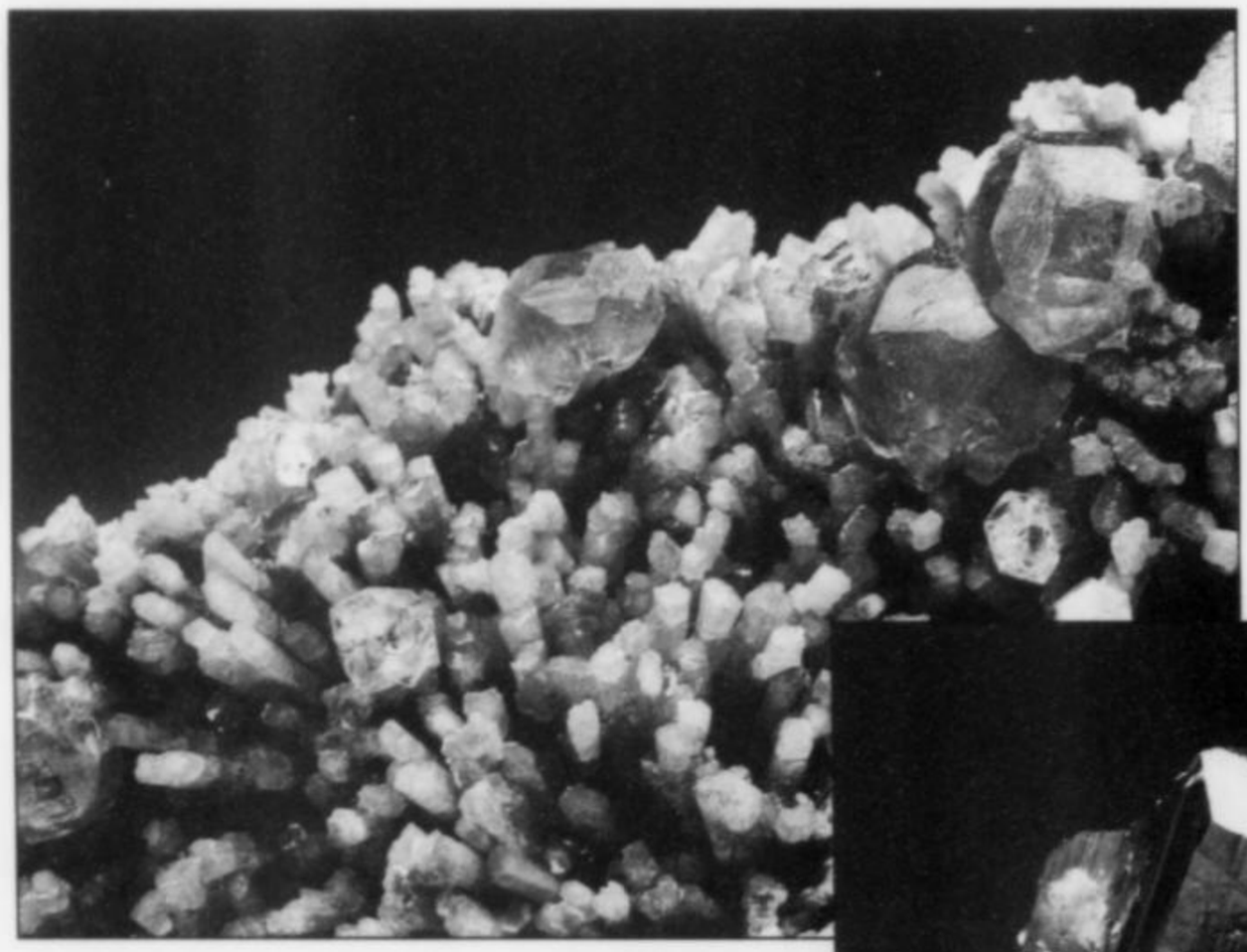


Figure 4. **Grossular crystals on diopside, view as shown = 9 cm wide, from the Jeffrey mine, Asbestos. Amabili collection; Appiani photo.**

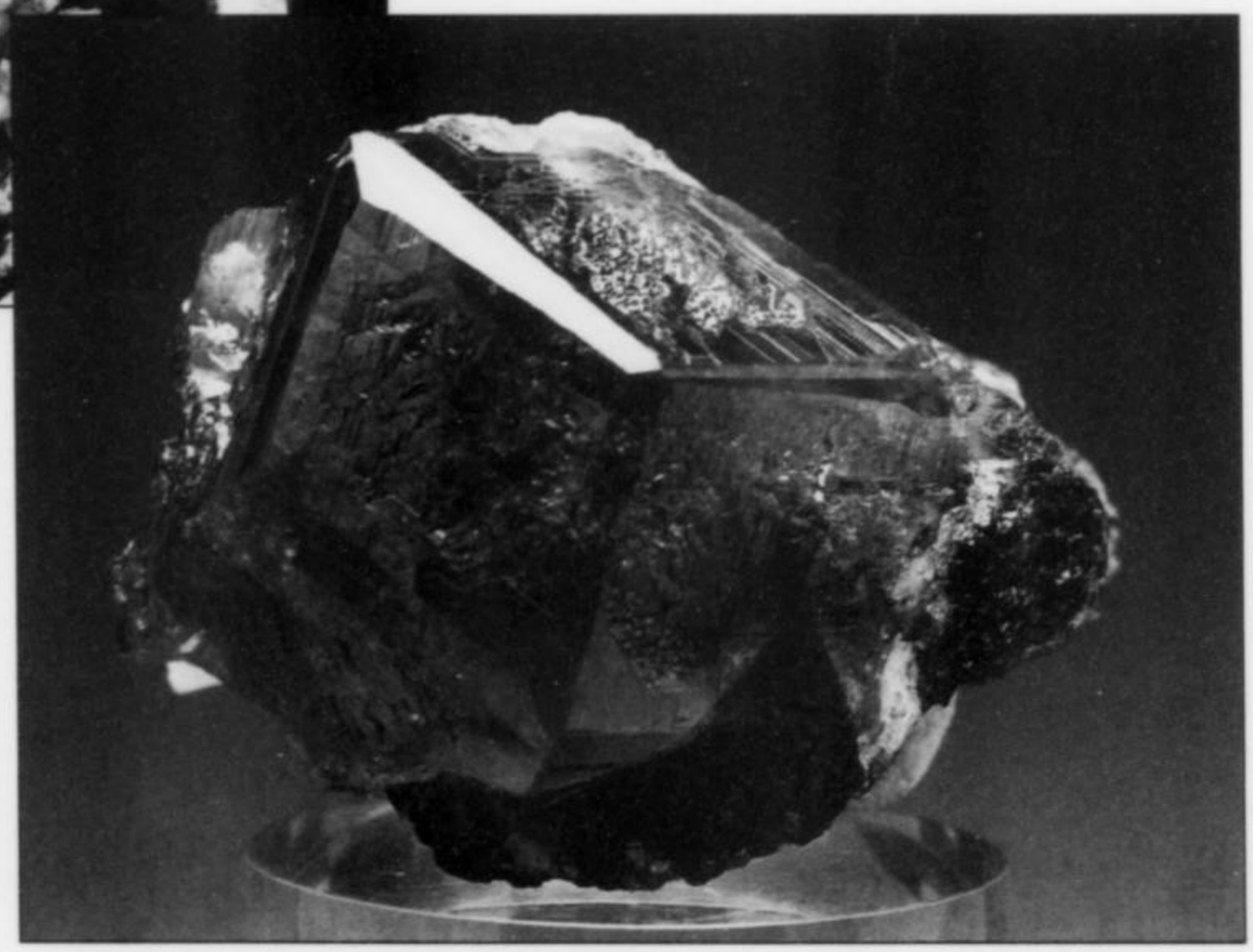


Figure 5. **Huge transparent grossular crystal on matrix, 4.2 cm across, from the Jeffrey mine, Asbestos. Amabili collection; Appiani photo.**

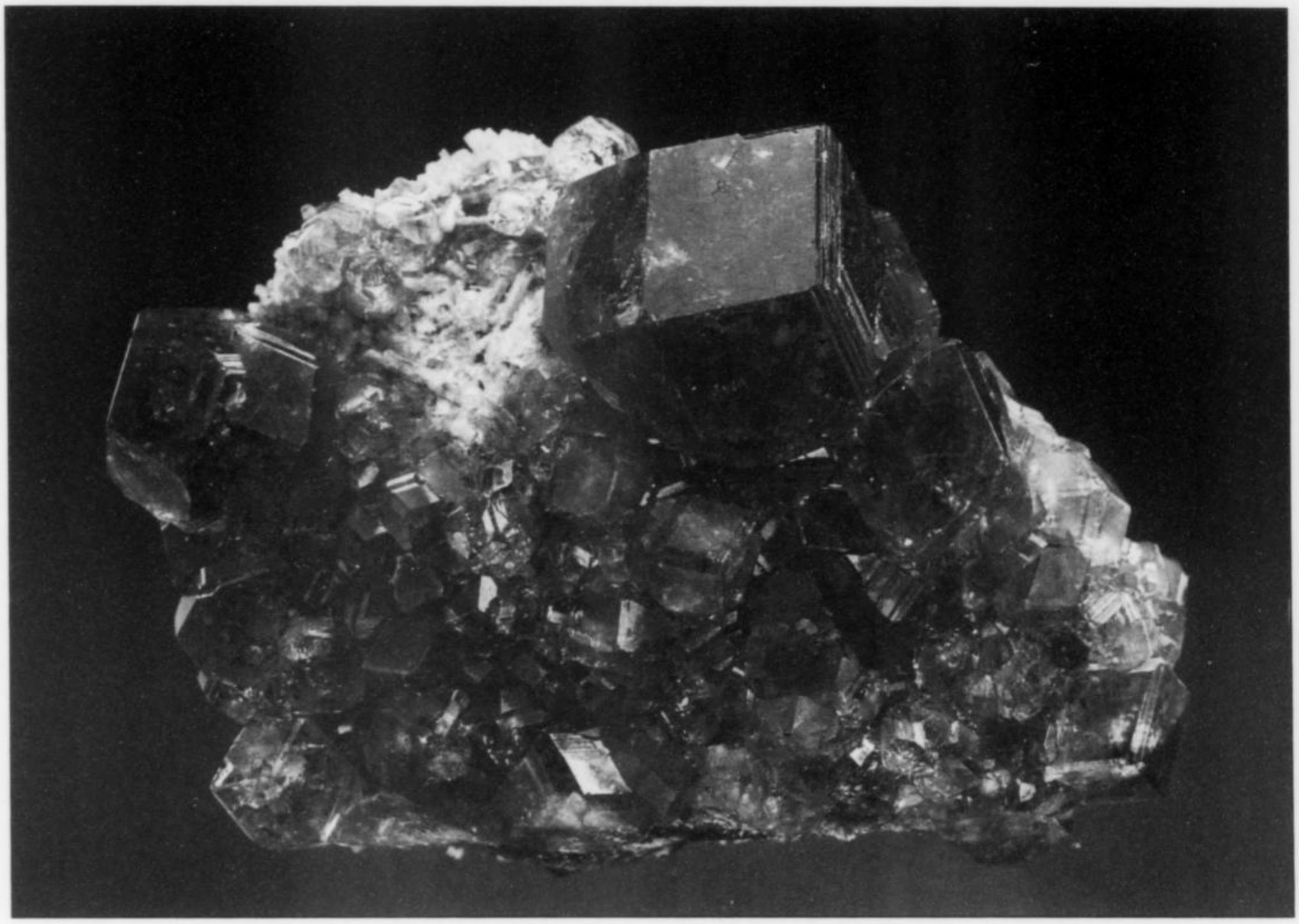


Figure 6. **Grossular crystals on diopside, 6.6 cm wide (largest crystal = 2.5 cm), from the Jeffrey mine, Asbestos. Amabili collection (ex J. Levinger collection); Jeff Scovil photo.**

One of the best specimens was found in the mine dumps in May of 1999, when a mineral collector cracked open a large rock containing a cavity of 17 x 40 x 50 cm lined with green diopside crystals, some with orange grossular garnet crystals perched on their terminations. This discovery has been described in the *Canadian Rockhound* by the lucky collector (Roy, 2002). The best specimen collected is truly outstanding: it measures 7.5 x 15 cm, and displays 14 orange garnets up to 1.4 cm individually. This specimen recently entered the collection of one of us (MA).

DISCOVERIES FROM 2000 TO 2003

The only remarkable specimens found in 2000 are some very nice clusters of cream-colored, pseudocubic prehnite crystals to more than 1.3 cm on edge, associated with acicular white diopside crystals. In July 2001, a small pocket found at the bottom of the pit during mining produced some good specimens, including two miniatures with bright orange, trapezohedral grossular crystals to 2.1 cm with green diopside needles. Large trapezohedral crystals of grossular are less common than large rhombic-dodecahedral crystals at the Jeffrey mine.

At its birth in 1994, the Club de Mineralogy d'Asbestos obtained permission from the mine management to organize six collecting excursions to the mine between May and October each year (usually on the first Sunday of the month), and during these trips in 2002 the Club found that collecting was once again good. After 2001, because of the instability of the ground in most of the pit, the collecting area was restricted to a small safe zone in the upper east portion. In 1978 and 1988 there had been some important discoveries in this zone, at the mine's former 2440 level: purple, pink, yellow and green vesuvianite crystals were found in a rodingite

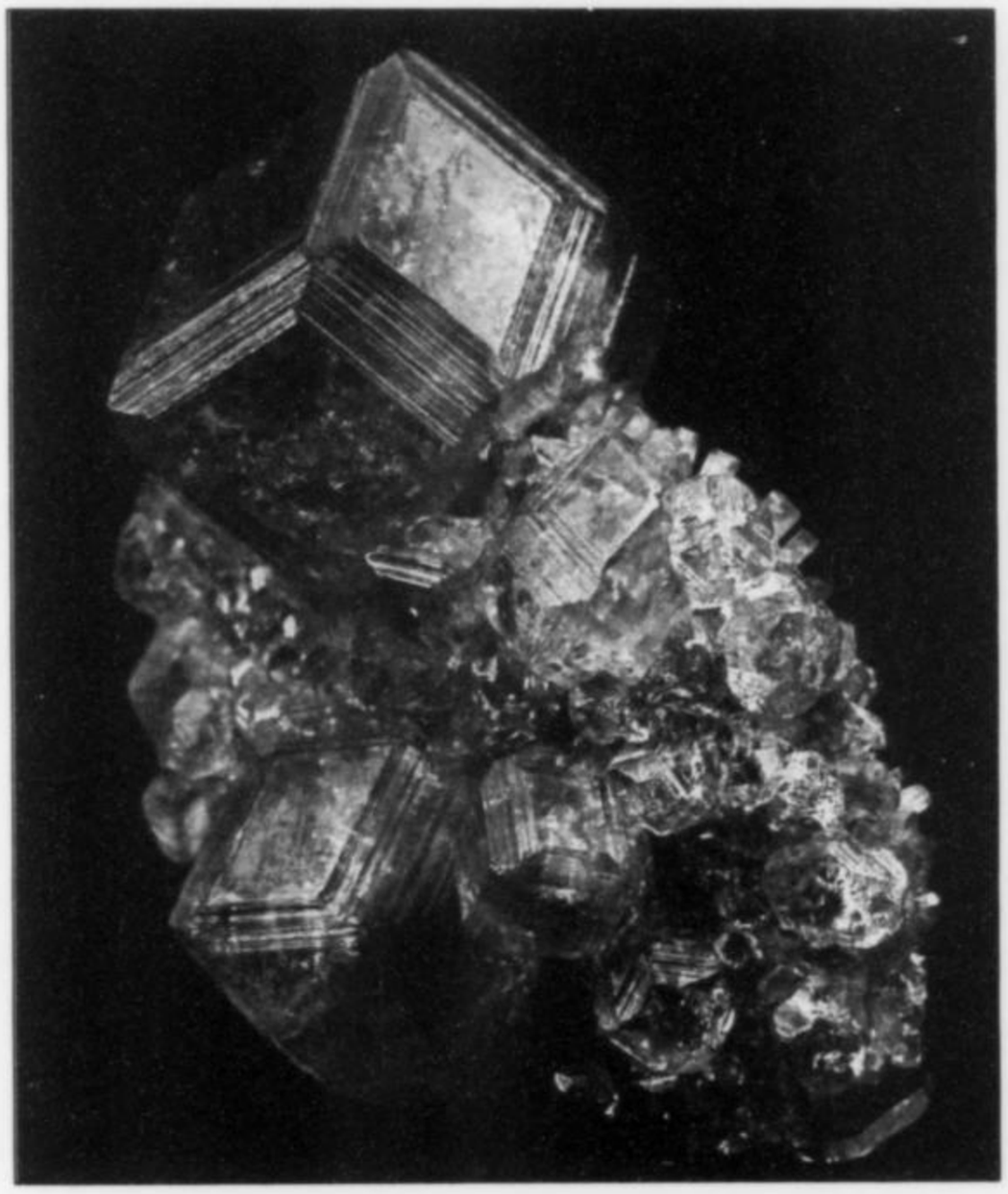


Figure 7. **Grossular crystals on diopside, 5 x 7 cm from the Jeffrey mine, Asbestos. Back of the specimen shown in Figure 8. Amabili collection; Miglioli photo.**

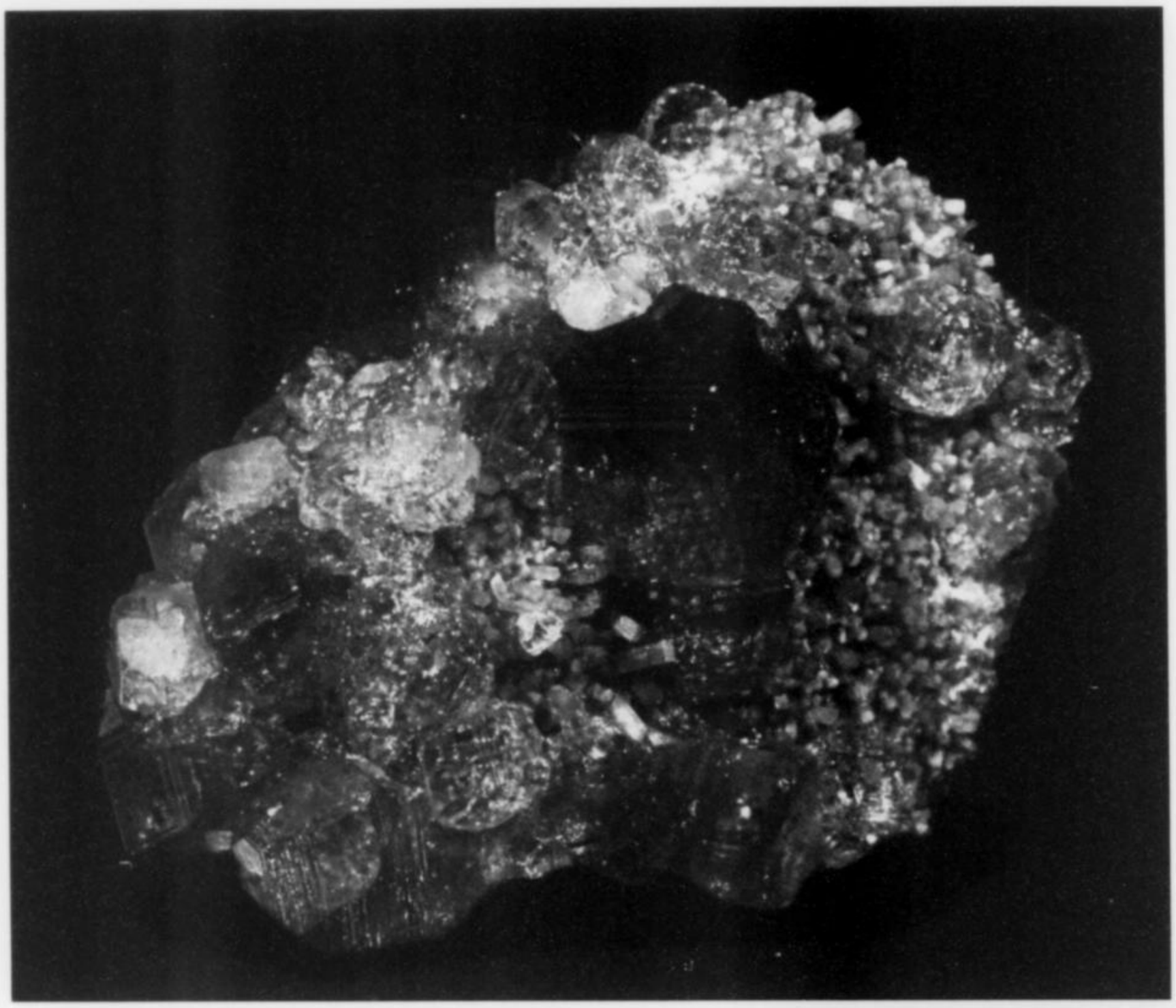


Figure 8. **Grossular garnets on diopside, Jeffrey mine, Asbestos. Dimension 5 x 7 cm; largest crystal 2.5 cm. Amabili collection; Miglioli photo.**

dike included in the serpentinized dunite parallel to the huge shear zone that marks the south-east limit of the orebody (traces of purplish acicular crystals of vesuvianite were reported from this dike during geological mapping as early as 1950). During the 1980's this fine vesuvianite enhanced the fame of the Jeffrey mine: the best purple, pink and multicolored vesuvianite specimens collected then from the 2440 level are among the world's best for the species. In 1988, when the mine was last expanded, the roots of this dike were covered over, and it is only because of sliding of the ground that part of the dike had become accessible once again in 2002. The exposed section, immediately beside a secondary mine road, is a safe, easy site for digging.

During the May 2002 excursion, in awful weather conditions, some nice clusters of pink and purple, transparent crystals of vesuvianite were found. The best specimens have crystals with very shiny pink terminations and transparent, pale-green prism faces. In fact, during each visit in 2002 there were interesting discoveries, which inspired the enthusiasm of the collectors. A few spectacular, deep green crystals (the color can vary between emerald and dioptase-green) of chromian vesuvianite up to 4.4 cm long and almost 1 cm wide (now in the collection of MA) were found in July and August. The best specimens are single, loose, translucent crystals, some with small gemmy areas. Deep green vesuvianite specimens are extremely rare, and those collected in 2002 are probably the best ever found. They were collected from small vugs in a thin, emerald-green vein of massive vesuvianite embedded in the main, pale-green vesuvianite vein.

The excursion on August 25, 2002 proved especially lucky for

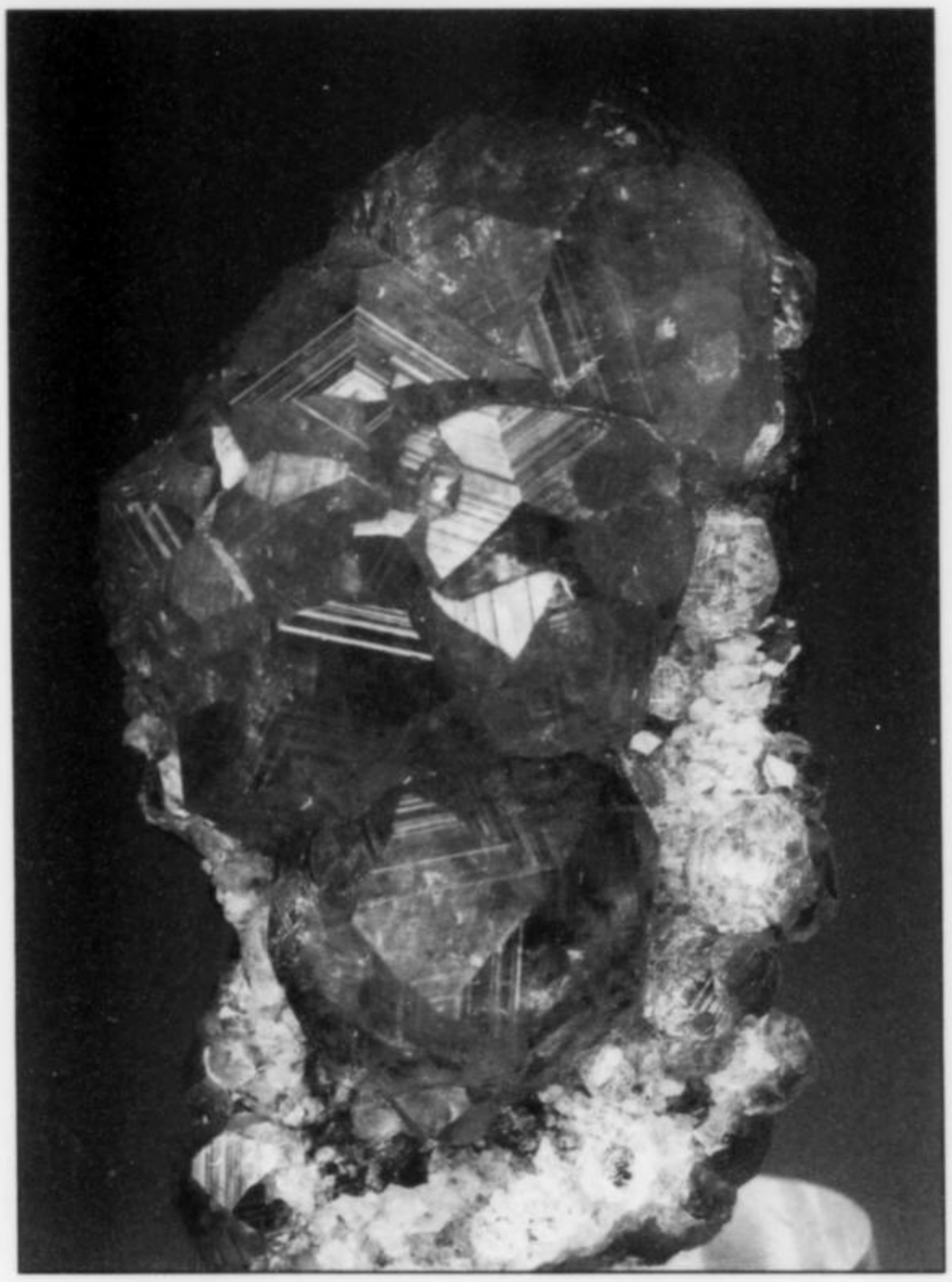


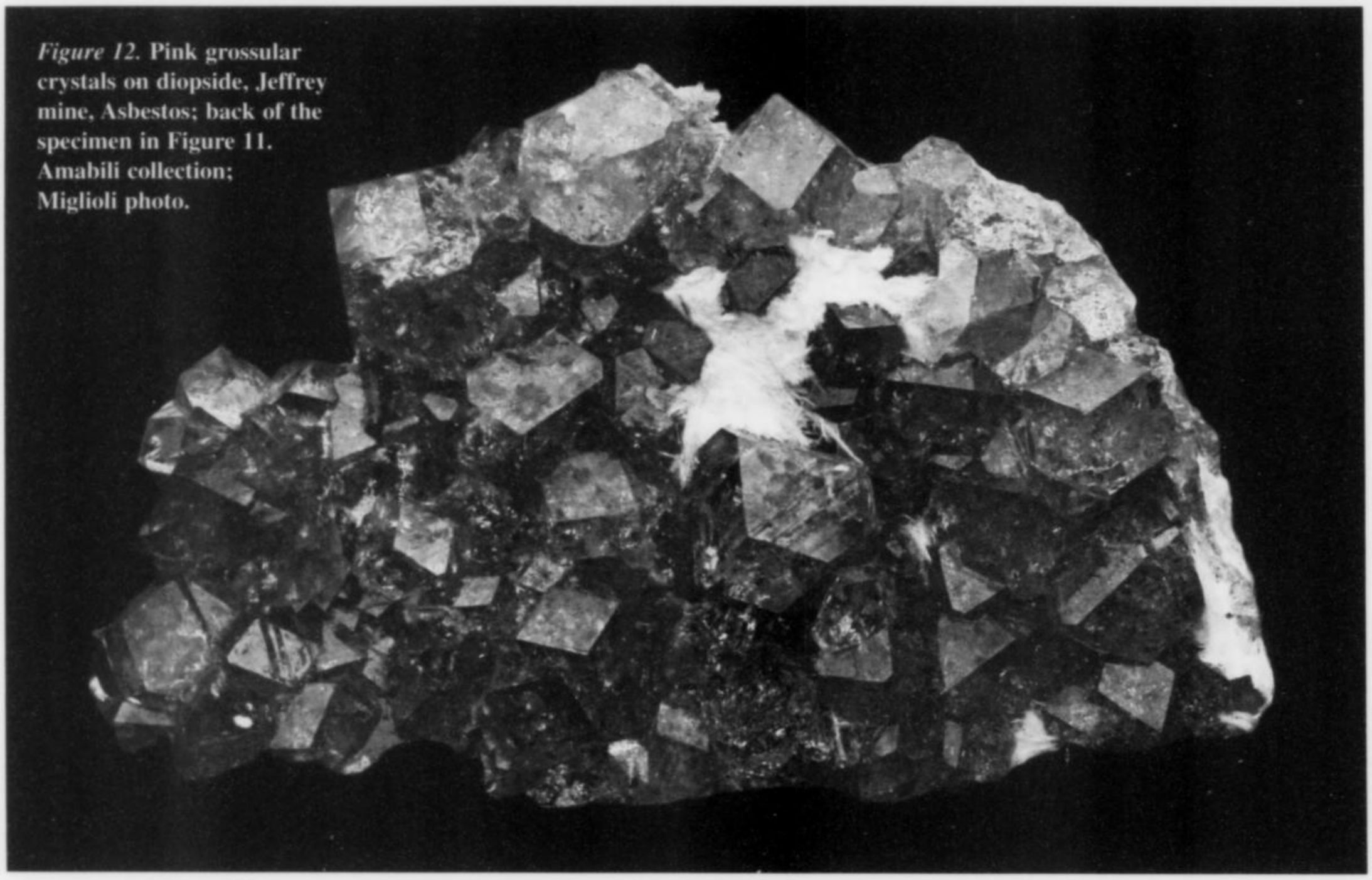
Figure 9. **Grossular crystals with diopside, 5 cm tall, from the Jeffrey mine, Asbestos. Amabili collection; Appiani photo.**

Figure 10. **Transparent grossular crystals with emerald-green cores; picture area about 4 x 6 cm, from the Jeffrey mine, Asbestos. Amabili collection; Miglioli photo.**

Figure 11. **Pink grossular crystals on diopside, 3 x 5.5 cm with crystals up to 1 cm, from the Jeffrey mine, Asbestos. Amabili collection; Miglioli photo.**

two collectors who recovered from a large pocket more than 100 specimens of yellowish green vesuvianite (some crystals having purple cores), including a cluster of doubly terminated crystals to 3 cm long and 1 cm wide individually. The specimens are of thumbnail, miniature and cabinet size; the largest measures about 25 x 35 cm. The pocket in the green vesuvianite vein was filled with fine granular vesuvianite, and the collected specimens are virtually floaters. In the following weeks, some miners collected more top-quality specimens in the same area by using a power shovel, until the management of the mine decided to bulldoze over

Figure 12. Pink grossular crystals on diopside, Jeffrey mine, Asbestos; back of the specimen in Figure 11. Amabili collection; Miglioli photo.



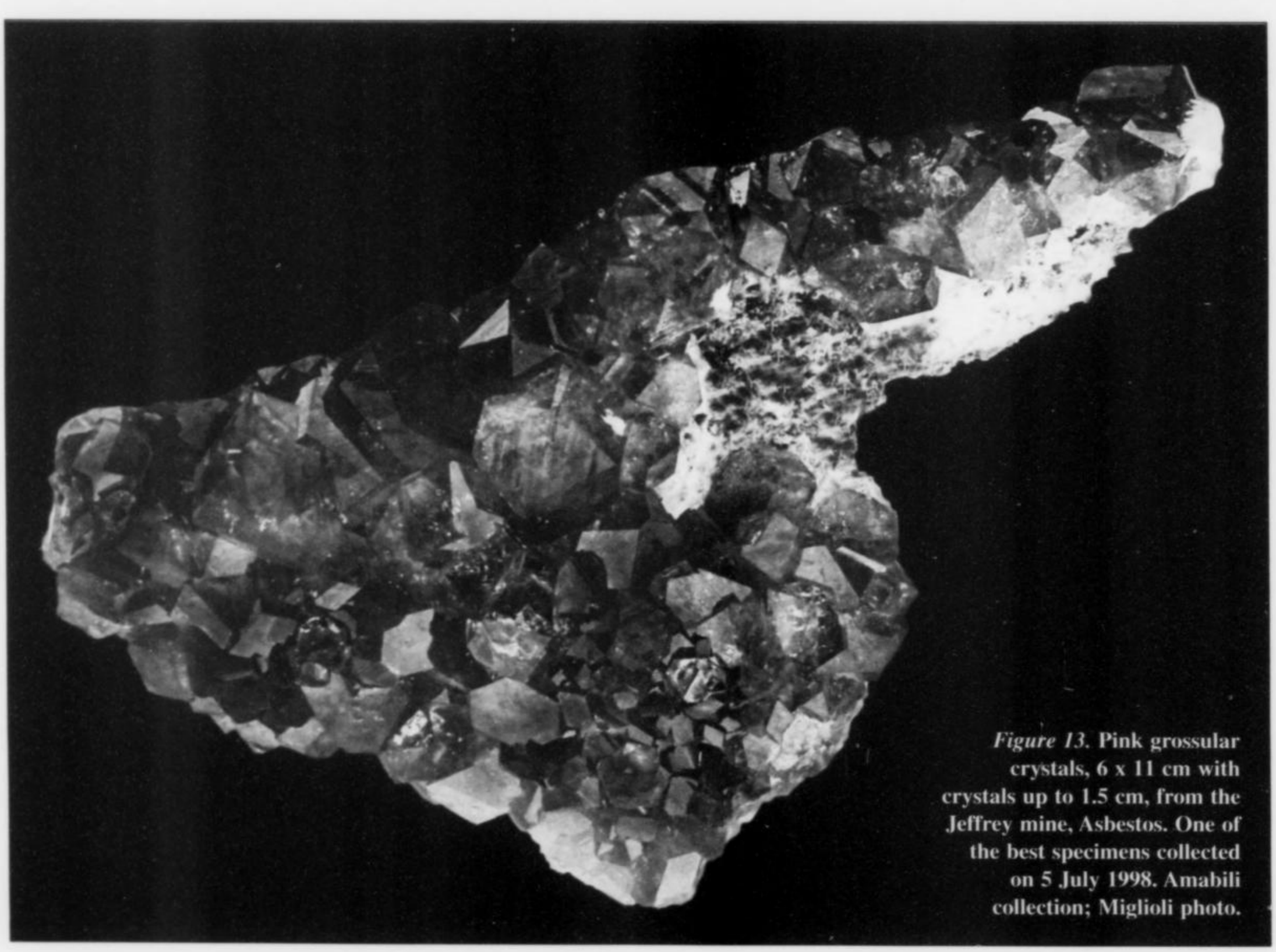


Figure 13. Pink grossular crystals, 6 x 11 cm with crystals up to 1.5 cm, from the Jeffrey mine, Asbestos. One of the best specimens collected on 5 July 1998. Amabili collection; Miglioli photo.

Figure 14. **Emerald-green vesuvianite, 4.4 cm long, from the Jeffrey mine, Asbestos. Amabili collection; Appiani photo.**

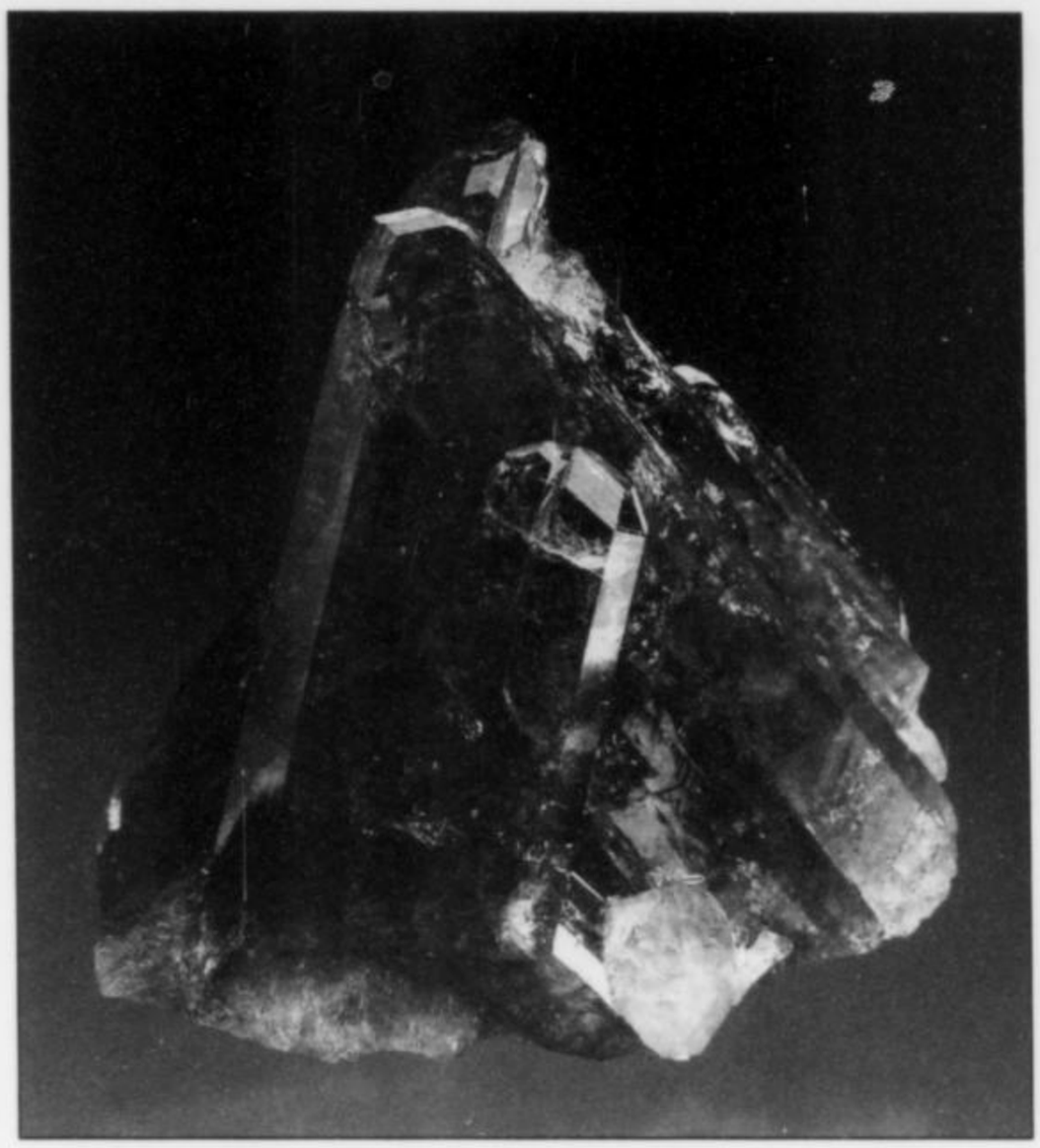


Figure 15. **Emerald-green vesuvianite, 2.6 cm tall, from the Jeffrey mine, Asbestos. Amabili collection; J. Scovil photo.**

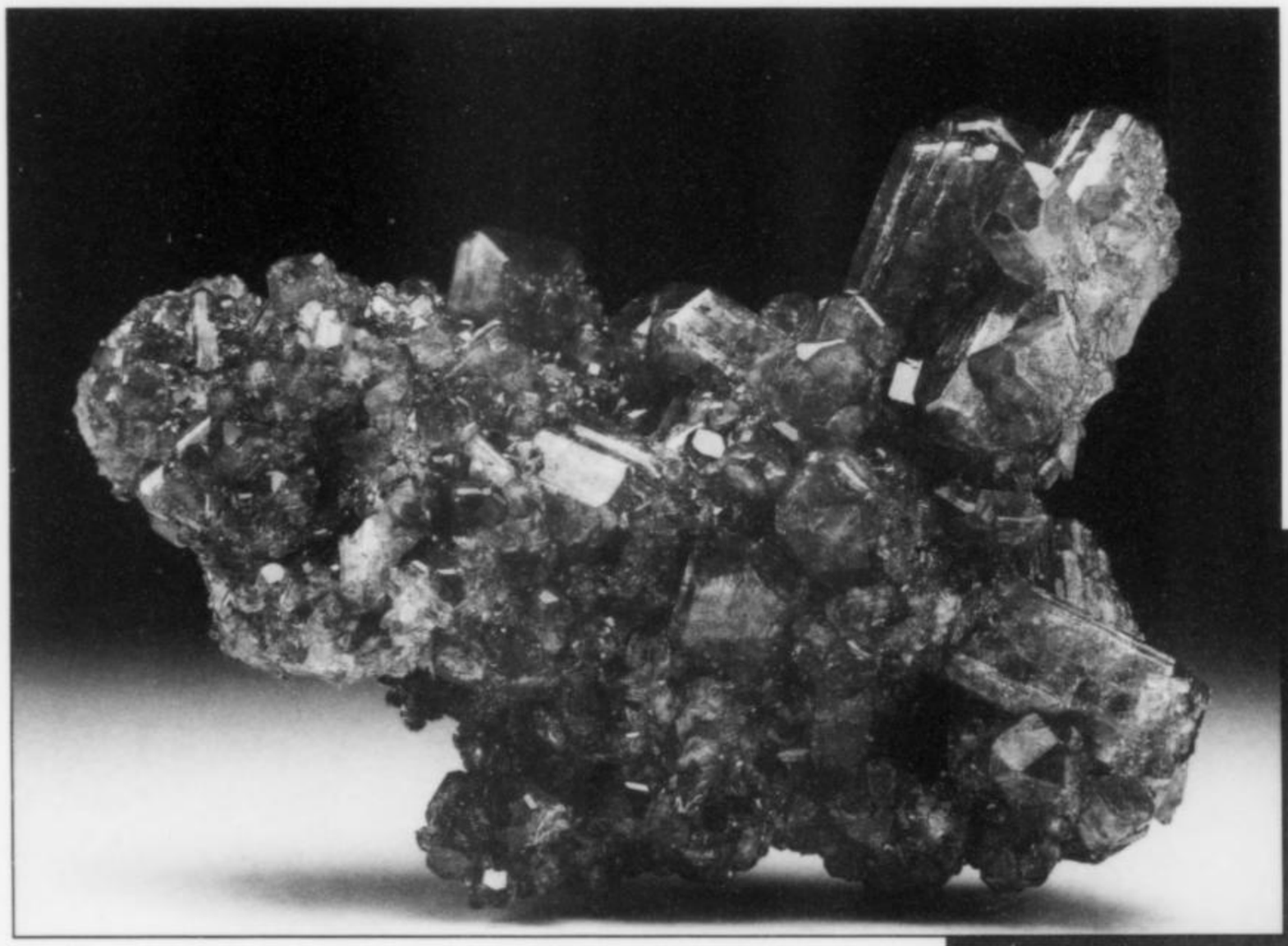


Figure 16. **Cluster of "violet cup" vesuvianite, 10 cm wide, from the Jeffrey mine, Asbestos. Amabili collection; Appiani photo.**

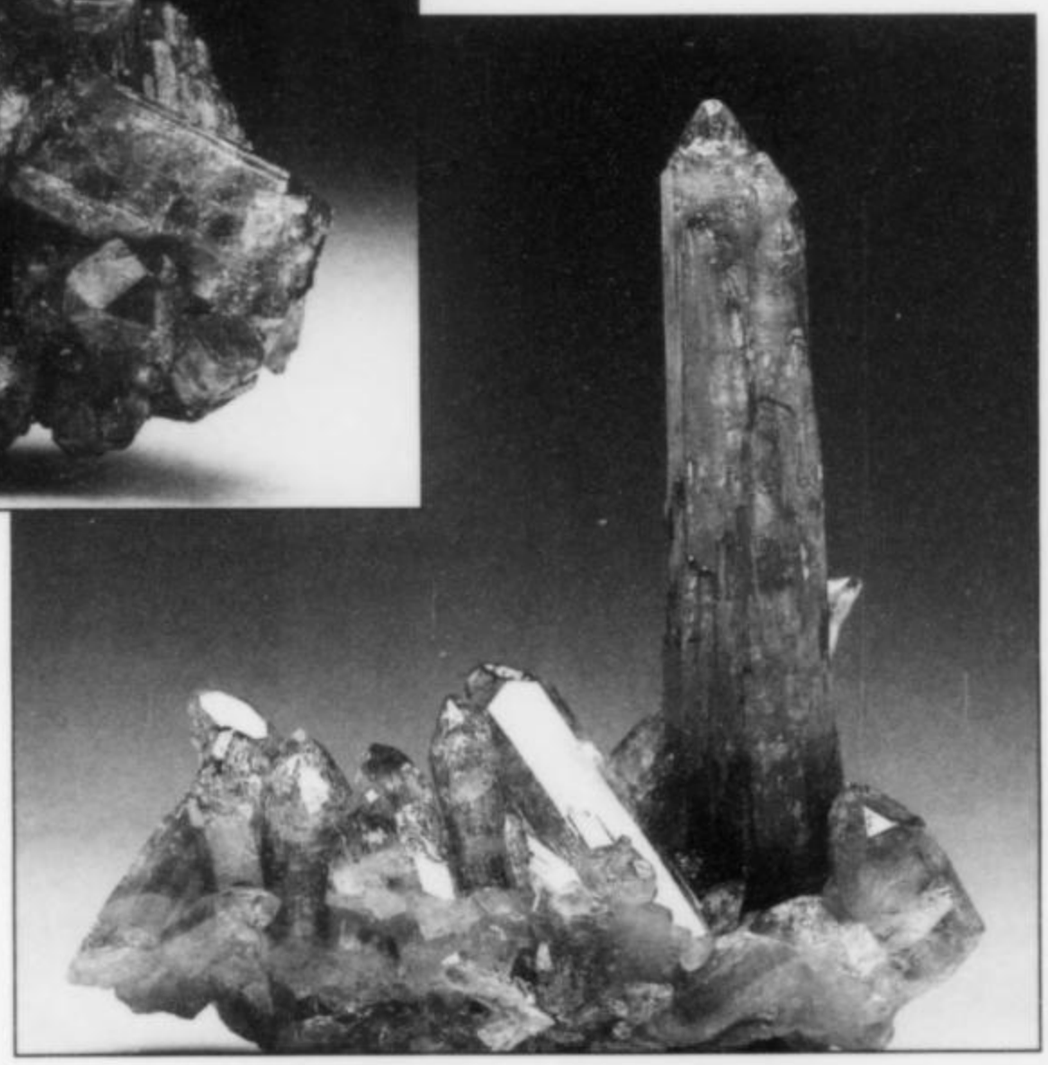


Figure 17. **Green vesuvianite crystals to 4.2 cm tall, from the Jeffrey mine, Asbestos. Amabili collection; Appiani photo.**

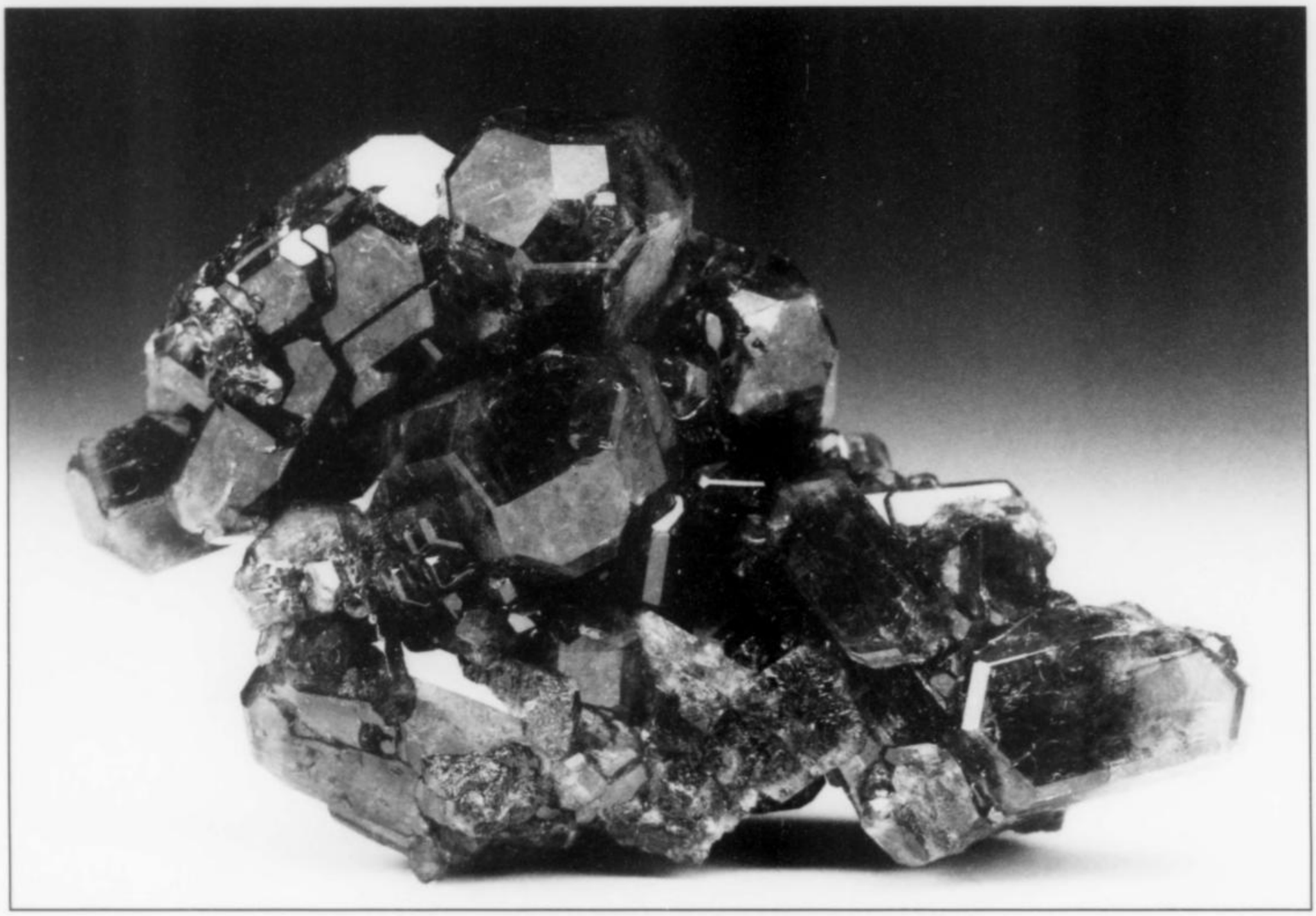


Figure 18. **Deep violet vesuvianite, 6 cm, from the Jeffrey mine, Asbestos. Amabili collection; Appiani photo.**

Figure 19. **Multicolored vesuvianite, 12.6 cm wide, from the Jeffrey mine, Asbestos. Amabili collection; Appiani photo.**

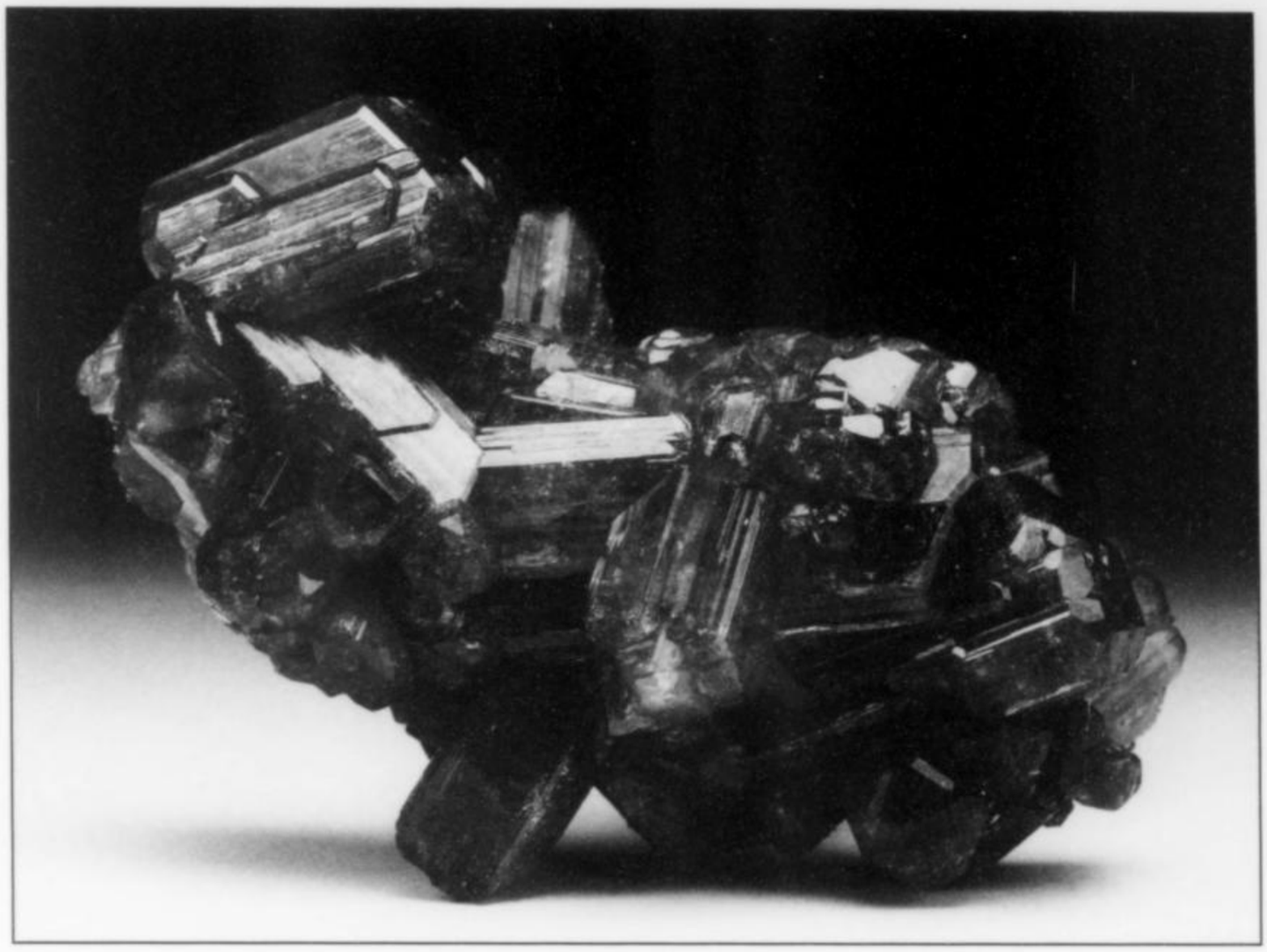


Figure 20. **Cluster of "violet cup" vesuvianite, 7 cm, from Jeffrey mine, Asbestos. Amabili collection; Appiani photo.**

the collecting site. A few of the specimens collected—for example, a spectacular 12.6-cm cluster of partially gemmy, purple-yellow-green vesuvianite crystals, with a very sharp 1.4 x 1.6 x 6-cm multicolored crystal with modified flat termination rising from it (MA collection)—are surely among the best vesuvianite specimens ever found at the Jeffrey mine. Prismatic, pale green vesuvianite crystals with deep purple, extremely shiny, flat terminations are classic for this locality but have always been rare—they are familiarly called "purple-cap" vesuvianite. Our favorite specimens of this type are those collected by one of us (FS) in 1978, and a few collected in September 2002, including a spectacular 8 x 10-cm specimen crystallized all around, with crystals (some doubly terminated) up to 3.4 cm, in the collection of one of us (MA).

Also during these weeks of intense collecting between August and September 2003, specimens showing forest-green vesuvianite crystals with pointed terminations were found; some are elegant clusters and isolated crystals up to 4.5 cm long. The same collecting area produced a 6-cm group of remarkable deep amethyst-colored vesuvianite crystals. It is very surprising that the morphology and the color of vesuvianite vary so dramatically in the specimens from the Jeffrey mine, considering that all the specimens have been collected in the same area, which is only about 40 meters long. Pockets only a few centimeters apart can contain crystals of different forms and/or colors. The vesuvianite is accompanied rarely by transparent, colorless diopside in tabular crystals to more than 1 cm, and by small, black needles of groutite or small prisms of manganite. Small masses of native copper and chromite found in the same zone may show small blue spots of spertiniite on the copper, but are never directly associated with vesuvianite. Grossular garnets have never been found in this collecting area, although they are found at many other sites in the mine.

A large number of newly collected vesuvianite specimens were sold at the Tucson show in February 2003. An exhibit of some of the best specimens (grossular and vesuvianite) collected at the Jeffrey mine in the last few years was presented by one of us (MA) at the 2002 Munich show, where it was noted by Bill Larson (2003).

Vesuvianite specimens were also found in the spring and summer of 2003, but in much smaller numbers than in the previous year, and only three or four specimens from these most recent discoveries are of very high quality. However, some interesting specimens showing associations of tabular diopside crystals, and a 4-cm group of deep-green chromian vesuvianite crystals with beautiful pointed terminations, must be mentioned.

PRESENT MINING STATUS

For the past several years, the decline of the asbestos market precluded planning for any major expansions of the Jeffrey mine pit. Indeed, open-pit operations have become more and more limited because of several negative factors: there is almost no space for further lateral expansion, since houses already exist almost on the lip of the pit; the present workings are unstable; and it is too expensive to remove the huge quantity of overburden above deeper levels of the plunging orebody. The reduction in ore output during these recent years has had to be compensated for by taking ore from stockpiles.

In 1996 new underground workings were sunk into the richest portion of the orebody, and this portion of the mine was scheduled to go into production sometime between 2003 and 2004. However, because of financial problems, development of the underground workings was suspended in 2002, and there are currently no plans to go forward with it.

In October 2002 the Jeffrey mine was closed, reportedly because the mining company had gone bankrupt. A NASA contractor made an arrangement with the mine management to reopen the mine for four months to obtain asbestos for the space shuttle (seals on the shuttle are made with asbestos of special quality from the Jeffrey mine), but in April 2003 the mine closed again and there are now no signs that it will reopen in the foreseeable future. When mining ceased, so did the pumping of water from the bottom of the pit; by July 2003 the pit was flooded to a depth of almost 100 meters, and the best collecting areas for grossular garnets were underwater.

COLLECTING

Collecting by the public has always been forbidden on the mine property. Nevertheless, special guests, university students and

Figure 21. **The location of the vesuvianite discoveries during the excursion of July 6, 2003. Amabili photo.**

scientists were admitted quite regularly and were escorted around the mine by staff members. Workers, despite being officially forbidden to collect minerals, began collecting assiduously in the 1960's, when the demand for mineral specimens (mainly grossular) created a lucrative market.

For 25 years the mine management maintained a "mineral site," freely accessible to the public, close to the mine installations. During many of these years one of us (FS) supplied the site with specimens every time some interesting mineral occurrence showed up in the mine. Rocks of potential interest for collectors were trucked to the site instead of to the mine dumps, and the operation made countless visitors happy. Today the site is still open, but no new material has been added to it for a long time.

The only way to receive permission to collect in the mine itself has been to join the mineralogical club of Asbestos and to take part in its summer excursions to the mine. Since the open pit is now closed, it is not clear whether collecting excursions by the club will be allowed in the future; the last such excursion took place in August 2003. Since there is now widespread slumping in the open pit, the directors of the mineralogical club of Asbestos decided to stop collecting at the mine because the risk is too high. It is unclear whether collecting at the Jeffrey mine will ever be possible again.

ACKNOWLEDGMENTS

We wish to thank the former miners of the Jeffrey mine who collected with great skill the wonderful specimens that make this locality world-famous. Among them, we thank in particular Alain, Denis, Michel, Normand, Réjean, and Renè, who spent collecting days with us at the mine and have contributed so much to our collections with their discoveries. We wish to thank also our friends Celestin, Claude, Daniel, Jonathan, Marc, Natalia, and Paul-Émile for contributing so much to the development of our Jeffrey mine collections. The wonderful photographic work of Roberto Appiani and Jeffrey Scovil and the editorial help of Tom Moore are also acknowledged.

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TOURMALINE with QUARTZ floater, 5.5 inches, from the Pederneira mine, Brazil.
From Stuart Wilensky, May 20, 2002; ex D. Trinchillo.

Clara and Steve Smale

COLLECTORS

PHOTO BY STEVE SMALE

Aragonite
from Cicov hill in the Czech Republic

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New discoveries have recently been made at the well-known aragonite occurrence at Cicov Hill, near Horenec, near Bilina, Czech Republic. Development work at the locality between 1990 and 1995 has yielded loose gemmy crystals of aragonite to record sizes.

INTRODUCTION

Aragonite from Cicov Hill (pronounced "Chee-choff"), near the town of Horenec which is near the larger town of Bilina ("Spitzberg near Horschenz near Bilin" in older German literature) is known throughout Europe. Fine crystals several centimeters long may be seen in most major mineralogical museums, although their locality is usually given incorrectly as "Bilin." These crystals were found abundantly during the 19th century and have been investigated by many researchers. Hibsch (1934) summarized the literature up to his time; the majority of subsequent publications deal only with historical aspects. After 1934 the locality fell into oblivion for many decades, but the surprisingly rich recent discoveries allow an updating of information about aragonite from Cicov Hill.

LOCATION AND GEOLOGY

The aragonite locality, situated about 70 kilometers northwest of Prague, lies in the southern part of the Ceske Stredohori Mountains, which are composed of Tertiary volcanic rocks. The area is well-known for many classic occurrences of zeolites, and as a famous source of red pyrope ("Bohemian garnet") transported from original peridotitic xenolites into the alluvial deposits where they are found.

In the region south of Bilina, olivine foidites (a feldspathoid-rich volcanic rock) and olivine basalts with associated volcanoclastic rocks and subvolcanic breccias prevail, whereas the central and northern parts of the Ceske Stredohori Mountains are composed of felsic igneous rocks. Abundant carbonate occurrences south of

Figure 2. **Cicov Hill near the town of Horenec, south of Bilina in the Czech Republic (formerly in the Kingdom of Bohemia). Michal Filippi photo.**

Figure 1. **Location map.**

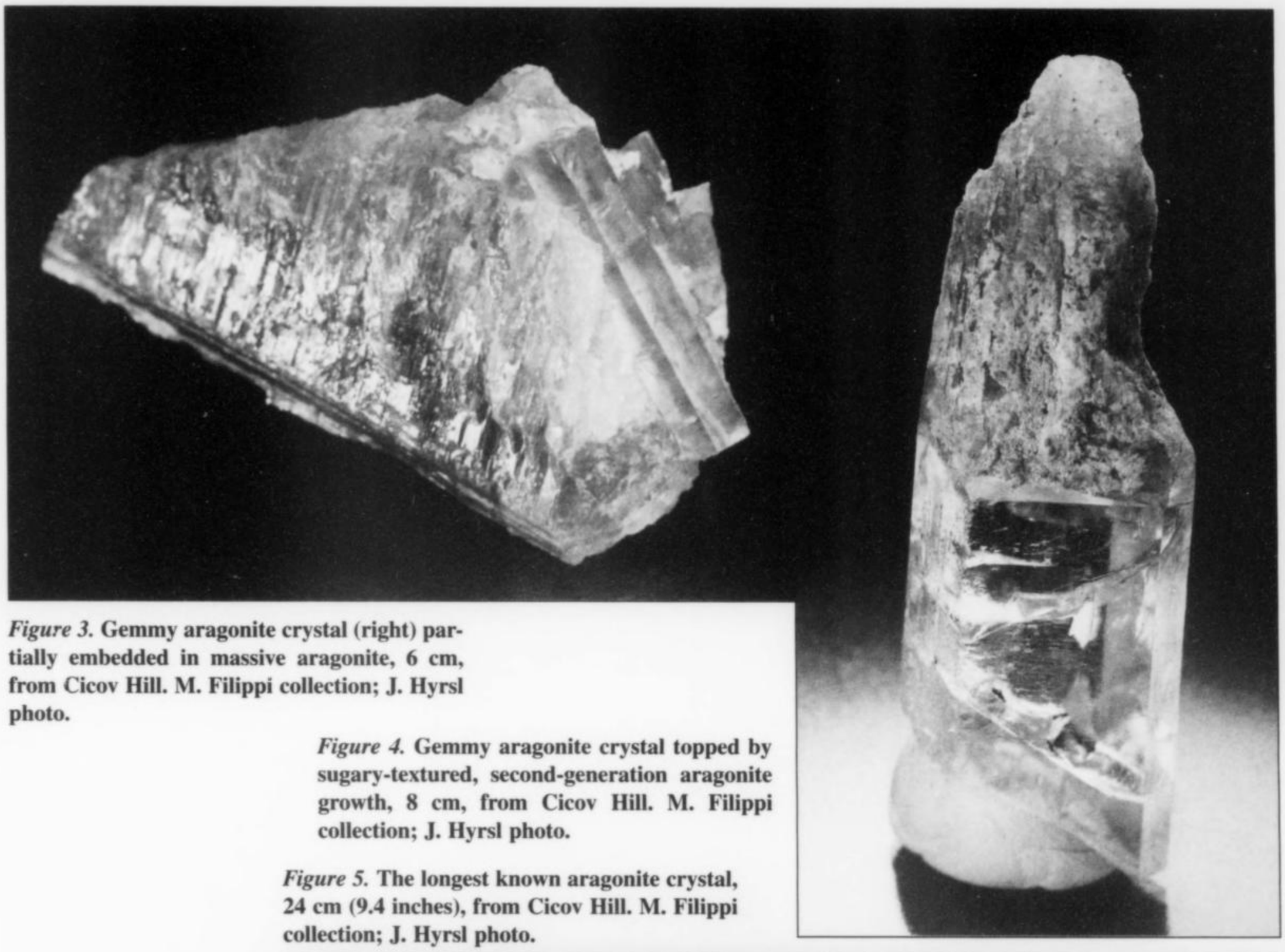
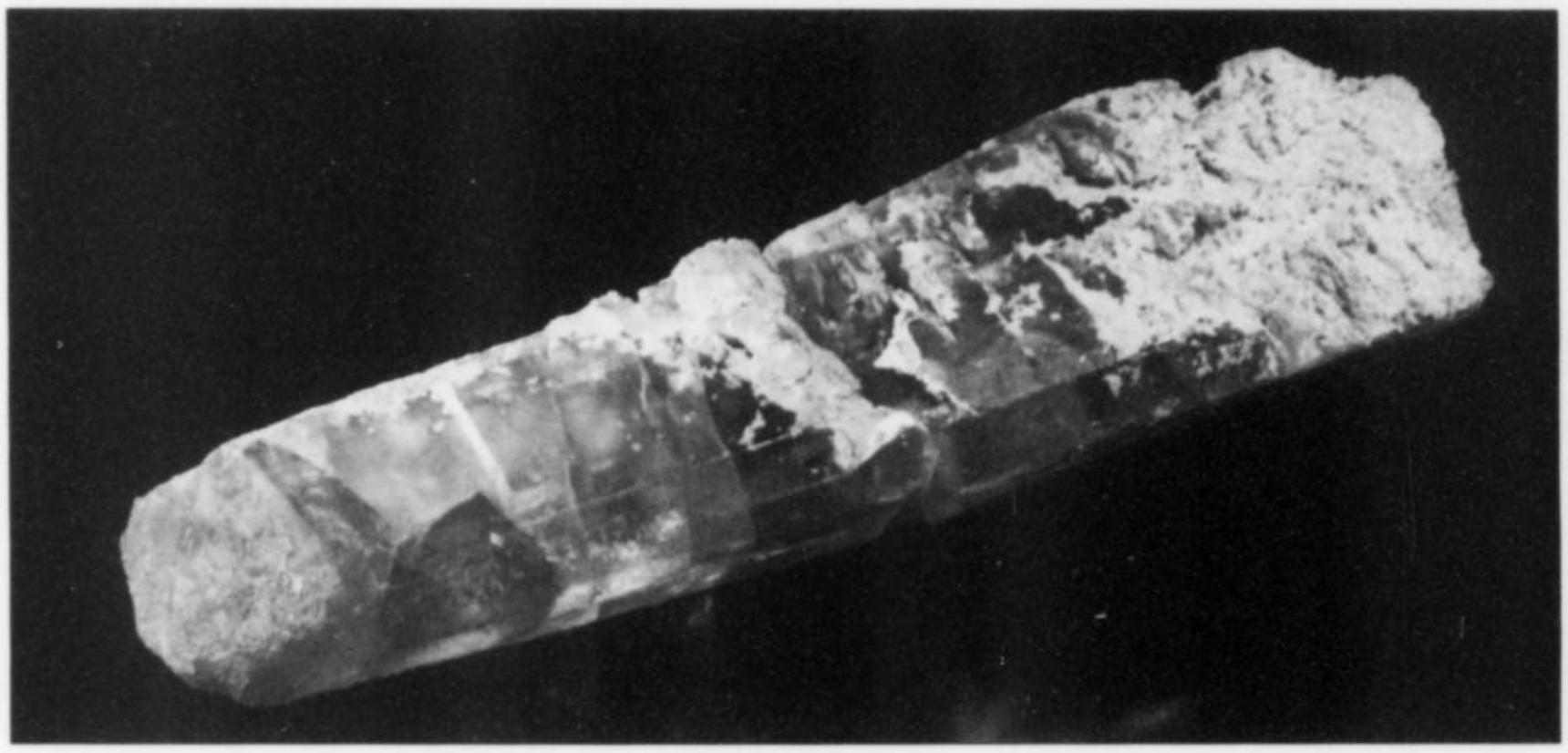


Figure 3. **Gemmy aragonite crystal (right) partially embedded in massive aragonite, 6 cm, from Cicov Hill. M. Filippi collection; J. Hyrsl photo.**

Figure 4. **Gemmy aragonite crystal topped by sugary-textured, second-generation aragonite growth, 8 cm, from Cicov Hill. M. Filippi collection; J. Hyrsl photo.**

Figure 5. **The longest known aragonite crystal, 24 cm (9.4 inches), from Cicov Hill. M. Filippi collection; J. Hyrsl photo.**



Bilina are products of the metamorphosis of hydrothermally deposited minerals. The most common carbonates in these occurrences are calcite and aragonite. The Bilina area differs from all other areas in the Ceske Stredohori Mountains in that no minerals of the zeolite group are found associated with the carbonates. A quarry at Vsechlapy near Teplice, about 20 km north of Cicov, has yielded nice specimens of pale purple columnar aragonite. Another good locality is a quarry at Stribrnik Hill near Merunice, 3 km north of Cicov, which recently has yielded small, perfectly developed aragonite crystals, and interesting acicular aragonite crystals in geodes up to 15 cm across (Filippi, 2001).

The village of Horenec lies about 10 km south of Bilina and about 10 km north of Louny. The main aragonite occurrences are concentrated in Cicov Hill (at an elevation of 477 meters), about 300 meters west of the village. The central part of the hill is composed of picritic leucitite (Hibsch, 1934), whereas the marginal areas consist of basaltic volcanoclastic rocks. Aragonite occurs as fissure fillings in the rock. The fissures, striking roughly north-south, are particularly well exposed on the eastern and southern sides of the hill. The precise locations of historical finds are not known, because they were not described in detail. However, a small abandoned quarry on the northeastern slope and several small, old pits scattered mainly on the northern slope could be the principal places where fine aragonite crystals were found in the past.

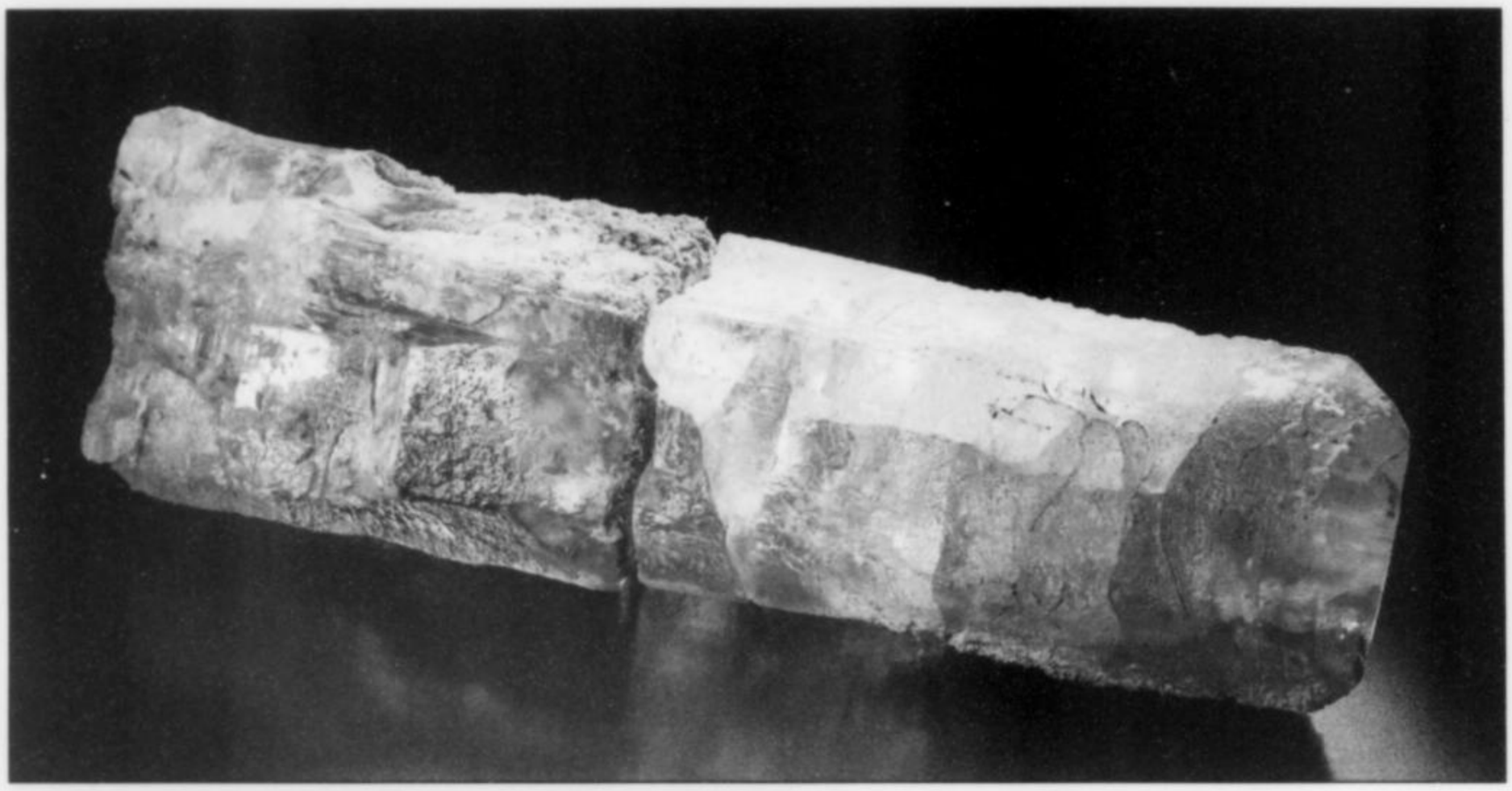


Figure 6. **Large, broken aragonite crystal, 17 cm, from Cicov Hill. M. Filippi collection; J. Hyrsl photo.**

Since 1951, Cicov Hill has been a protected area; because some rare *thermophilous* plants occur there, mineral collecting has been strictly prohibited. Moreover, the absence of natural rock exposures makes mineral prospecting difficult. However, after an agreement was reached with the owner of the property around the hill, one of us (MF) was able to explore the hill thoroughly during 1990–1995. The mapping of aragonite fragments on the surface led to the selection of seven promising sites. At five of them, trenching revealed rock fissures filled with aragonite. The trenches were dug to depths of about 2 meters, at which point the aragonite veins narrowed and the rock became too compact to be dug by hand.

Newly dug specimens generally equal historical examples in quality, and the crystals reach more than twice the recorded sizes of

Figure 7. **Aragonite crystal showing twinning lines, 6.5 cm, from Cicov Hill. M. Filippi collection; J. Hyrsl photo.**

Figure 8. **Etched aragonite crystal, 5 cm, from Cicov Hill. M. Filippi collection; J. Hyrsl photo.**

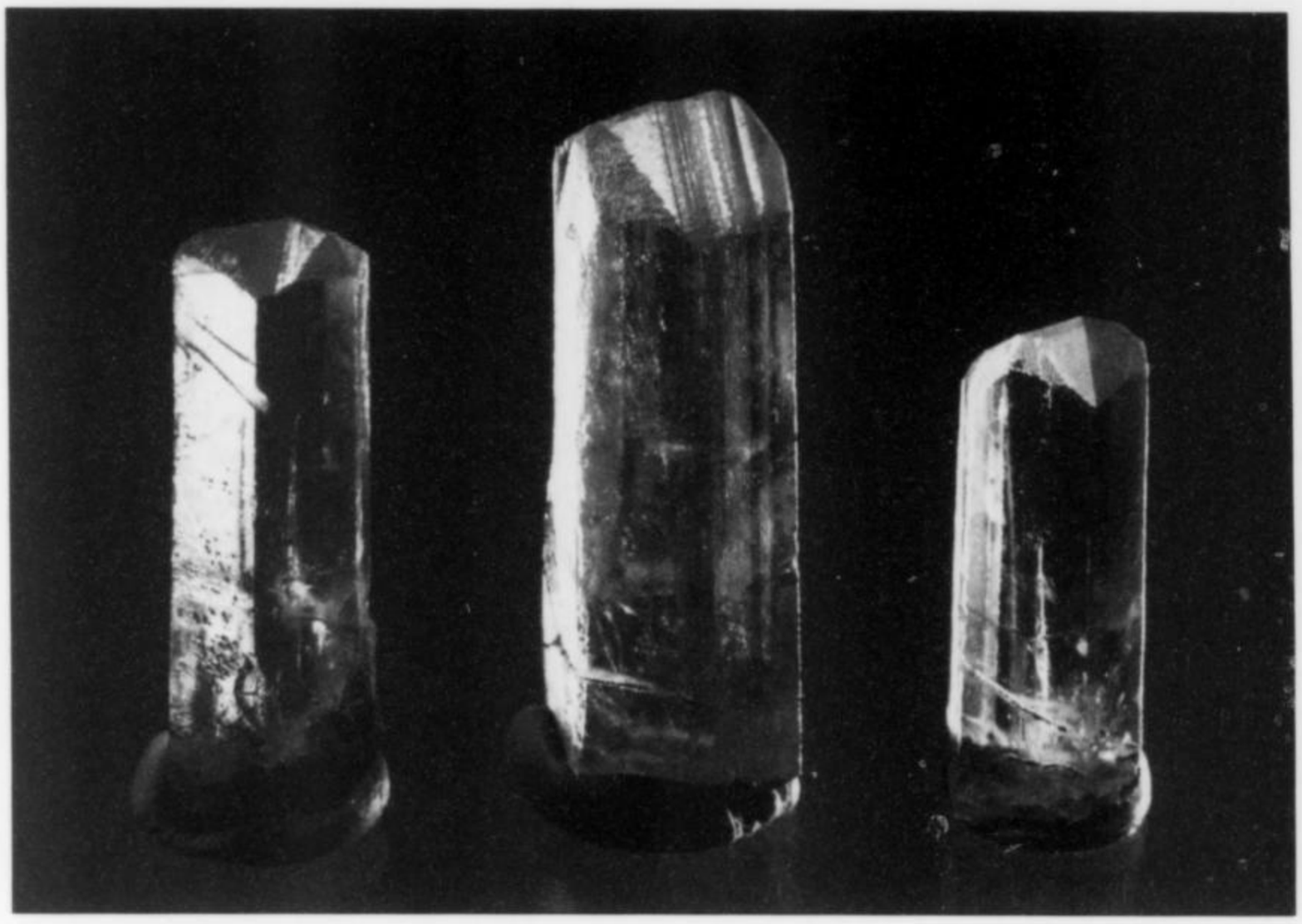


Figure 9. **Gemmy, twinned aragonite crystals to 4.5 cm, from Cicov Hill. M. Filippi collection; J. Hyrsl photo.**

earlier ones. The new crystals also exhibit a great variety of crystal forms. Since our exploratory work ended in 1995, only small, cracked fragments of aragonite have been recovered from the fields around the hill; these fields are now being used as pastures, so further new discoveries of aragonite seem unlikely.

ARAGONITE HABITS

Previous works on aragonite from this occurrence concentrate primarily on describing the forms of the aragonite crystals. The newly recovered specimens exhibit not only a variety of crystal forms, but also a surprisingly large variety of aggregate growth habits.

Compact (massive) aragonite is found most commonly; it occurs as monomineralic veins or lenses in the rock, which are covered by soil. The veins are typically up to 10 cm wide, rarely up to about 30 cm. The vein filling has a massive to roughly columnar structure, and when cavities are present, a few crystal forms are developed. The largest fragments of massive aragonite reach 10 cm^3.

Well-developed aragonite crystals in massive aragonite are quite rare, and were only briefly mentioned in previous works. They measure up to about 5 cm, and occasionally protrude into cavities from the massive aragonite in which they are embedded. More commonly they are found after breaking loose from the massive material.

Rough columnar aragonite aggregates are composed of rough, sub-parallel columns. The loose aggregates are crumbly, because they are only partially cemented by younger carbonate depositions.

Fan-shaped aragonite aggregates are quite common in veins. They are composed of long, tubular columns and of crude crystals arranged into fans up to 30 cm in size. These aggregates are unfortunately rather crumbly, and therefore cannot be extracted and preserved intact.

Large, slightly corroded aragonite crystals have been found only rarely in the widest veins, where enough free space in massive aragonite was present to permit their growth. Single, mostly broken crystals were found lying loose in fine-grained, yellow to rust-red clay. The crystals were probably detached by local microtectonic movements during the final phase of vein development. Most of them are also thinly coated by secondary calcite, which can be removed mechanically or in a diluted hydrochloric acid. The crystals generally range up to 15 cm in length, but the largest ones approach 25 cm. The prismatic faces are well-developed, but partially corroded by organic acids present in the soil cover. The terminations are not well-developed.

Crystals of this type quite often have gemmy interiors which yield excellent material for cutting (Hyrsl, 1996). Faceted aragonite gems from Horenec are by far the largest in the world and are very beautiful. Stones exceeding 100 carats have been cut, and even larger facetable pieces of rough exist in a private Czech collection.

Smaller, perfectly developed aragonite crystals are also rare. Totally transparent second-generation crystals to 10 cm were found in a single cavity in one vein; such crystals have not been described in previous literature. The crystals are sharp, and well terminated, although their terminations are covered by a still later generation of gray, cloudy aragonite, in some cases porous. The second generation of aragonite forms irregular masses (without crystal faces), and prismatic crystals terminated by {011}. Perfect etch figures are present on some of these well-developed crystals. Some crystals from the upper parts of the veins (below the topsoil) are so deeply corroded that their original forms have given way to new, bizarre shapes.

Aragonite in calcite veins was discovered only in one outcrop covered by topsoil, south of Cicov Hill. Aragonite in columnar to fan-shaped aggregates up to several cm wide fills spaces between thin calcite veins. The calcite is yellow to greenish, and coats fissures up to 1 cm wide in the rock.

Parallel fibrous aragonite aggregates fill small fissures (up to 1 cm) in the rock. Aragonite of this habit is typically white and weathered. The fibers are oriented perpendicular to the fissure walls. This habit is more typical of aragonite from other localities in the Ceske Stredohorori Mountains.

MINERALOGICAL DESCRIPTION

Aragonite specimens of all mentioned types are mostly wine-yellow, much more rarely colorless or greenish. The refractive indices of Horenec aragonite are $n_x = 1.530$, $n_y = 1.682$, $n_z = 1.684$, with a very high birefringence of 0.154. It has a strong yellow fluorescence in both shortwave and longwave ultraviolet light, with a long-lived phosphorescence (Hyrsl, 1996); the fluo-

rescence is stronger in yellow zones of the crystals than in colorless zones.

A typical aragonite specimen of the compact type (the most widespread) was studied by several methods. Differential thermal analysis (DTA) confirmed that the material is practically pure aragonite. The CO_2 content was more precisely determined by the manometric method. The value $CO_2 = 43.87$ % was recalculated as 99.47 % of $CaCO_3$. The remaining 0.53% is probably mostly Sr or Mg compounds, as has been reported by previous authors (Hibsch, 1934). The X-ray diffraction analyses are in good agreement with data for aragonite (JCPDS 5-453).

The crystallography of the Horenec aragonite has been studied by many authors, and more than 33 crystal forms have been described (Kaspar, 1957). Illustrations are shown in Goldschmidt (1913–1923). However, only six crystal forms are common and characteristic for the locality. Columnar prismatic crystals of the "casket-like" shape—sometimes called the "Horenec type"—are by far the most common. These crystals show {010} most prominently, and are modified by {110} and a low prism, {011}; they are commonly contact twinned on {110}. Frequently the forms {010} and {110} are equally well developed, so that the crystals have a pseudohexagonal outline. Very rarely, cyclic contact twinning of three to five individuals creates characteristic pseudohexagonal columns. Most of the crystals are polysynthetically twinned on (110); the twinning is visible as lamellae on the crystal terminations. It is typical of Horenec aragonites that smaller crystals display more crystal forms than larger ones.

ASSOCIATED MINERALS

Most of the papers dealing with Horenec aragonite do not mention any associated minerals. **Opal** was found as spherical nodules up to 20 cm in size. Its color is brownish to yellowish and it commonly contains thin veinlets of gray **chalcedonic quartz**. **Calcite**, as noted above, is the only mineral known to occur with aragonite in veins. **Hornblende** is abundant as black, highly lustrous crystals in the basaltic rock. Green to yellow-green **olivine** was found as highly altered grains and aggregates in the rock. Some earlier authors mentioned small spheroidal **pyrite** concretions and **gypsum** occurring in the Mesozoic sediments intruded by the basaltic rocks.

Fragments of silicified tree trunks were very rarely found in the fields near Horenec. The most interesting documented find was made to the northeast of Cicov Hill (Dvorak, 1997). The fragment is about 60 x 120 cm in size and is a brown to black silicified mass, the wood partly replaced by yellow-green opal, chalcedony and pure quartz.

ACKNOWLEDGMENTS

The authors would like to express their thanks to Dr. L. Turanova and Dr. J. Turan from the Geological Institute, Faculty of Natural Sciences, Comnenius University, Bratislava (Slovakia) for performance of DTA and manometric analyses. The research was supported by the project No. CEZ: Z3-013-912.

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What's New in Minerals

NOTE: These show reports are sometimes necessarily delayed because of publishing schedules, special issues, etc., but we feel they have great value nevertheless as documentation of what and how much came out and who had it at the time. Many of the specimens discussed will continue to circulate between dealers for months or years to come. Furthermore, in cases where the very best specimens from a find come out first and do not later reappear on the market (having sometimes become a part of important collections), it is useful to have a record of what they looked like for later comparison and correct perspective in the evaluation of subsequently found specimens. This collection of show reports is quite long—a fact which should be cause for rejoicing. The remarkable length is further evidence that we are indeed still enjoying what I have characterized before as a "golden age" of mineral collecting.

WEW

Costa Mesa Show 2003 — by Tom Moore

[May 16–18]

Try new things, I always say, and the Costa Mesa show (in fact, southern California in general) was very much a New Thing for me, and thus it was cheerfully and expectantly that I accompanied Wendell Wilson to Marty Zinn's Costa Mesa hotel show, with its dealers' rooms and well-mineralized ballroom clustered compactly about the downstairs lobby of the Costa Mesa Holiday Inn. On its little triangle of urban ground surrounded on all sides by roaring freeways, the hotel becomes, for those three days in May, a welcoming crystal-oasis; business seemed brisk enough, and Jeff Scovil seemed happy to be relieved of his usual duties as show reporter. Several visits to the private collections of Los Angeles-area mineral people, and to some of the city's museums (particularly the temporary exhibit of amazing gemstones at the nearby Bowers Museum) helped make the trip one of the more enjoyable New Things I have done lately—despite all the driving, or creeping, or missing essential exits, on those notorious 14-lane L.A. freeways. Even my fiercest memories of German Autobahns seem dreams of innocence by comparison.

For a relatively small show, Costa Mesa had substantial numbers of What's-New items to offer (as my devastated budget attests). To begin close to "home," let's consider first the excellent clusters of **amethyst** crystals from an outcrop of Precambrian gneiss in the Kingston Range, San Bernardino County, California. According to the specimens' handler, John Seibel (of *Seibel Minerals*, P.O. Box 95, Tehachapi, CA 93581), this locality has been known for many decades to California field collectors, but it outdid itself in March 2003, when John Miatech dug about 40 large crystal groups (John Seibel himself taking out a few more in April) from a very large pocket. The transparent, medium-lustered amethyst crystals are typical prisms to 7.5 cm long, ranging in color from pale to deep purple, the more deeply colored crystals having occurred near the pocket's center. Some individual crystals are color-zoned: pale at the bases, rich purple near the terminations. Great plates weighing up to 90 pounds were recovered; John's stand in the ballroom at Costa Mesa was graced by about a dozen very handsome cabinet-sized specimens.

James and Yolanda McEwen of *Lehigh Minerals* (jim@lehighminerals.com) had a little stock of loose, thumbnail-sized crystals of **magnetite** from a discovery made in 2002 in the Iron Springs district, Iron County, Utah. According to Jim, a bucketful or so of the singles and small floater groups were collected, with individual crystals to 3.5 cm. The magnetite crystals are deeply striated

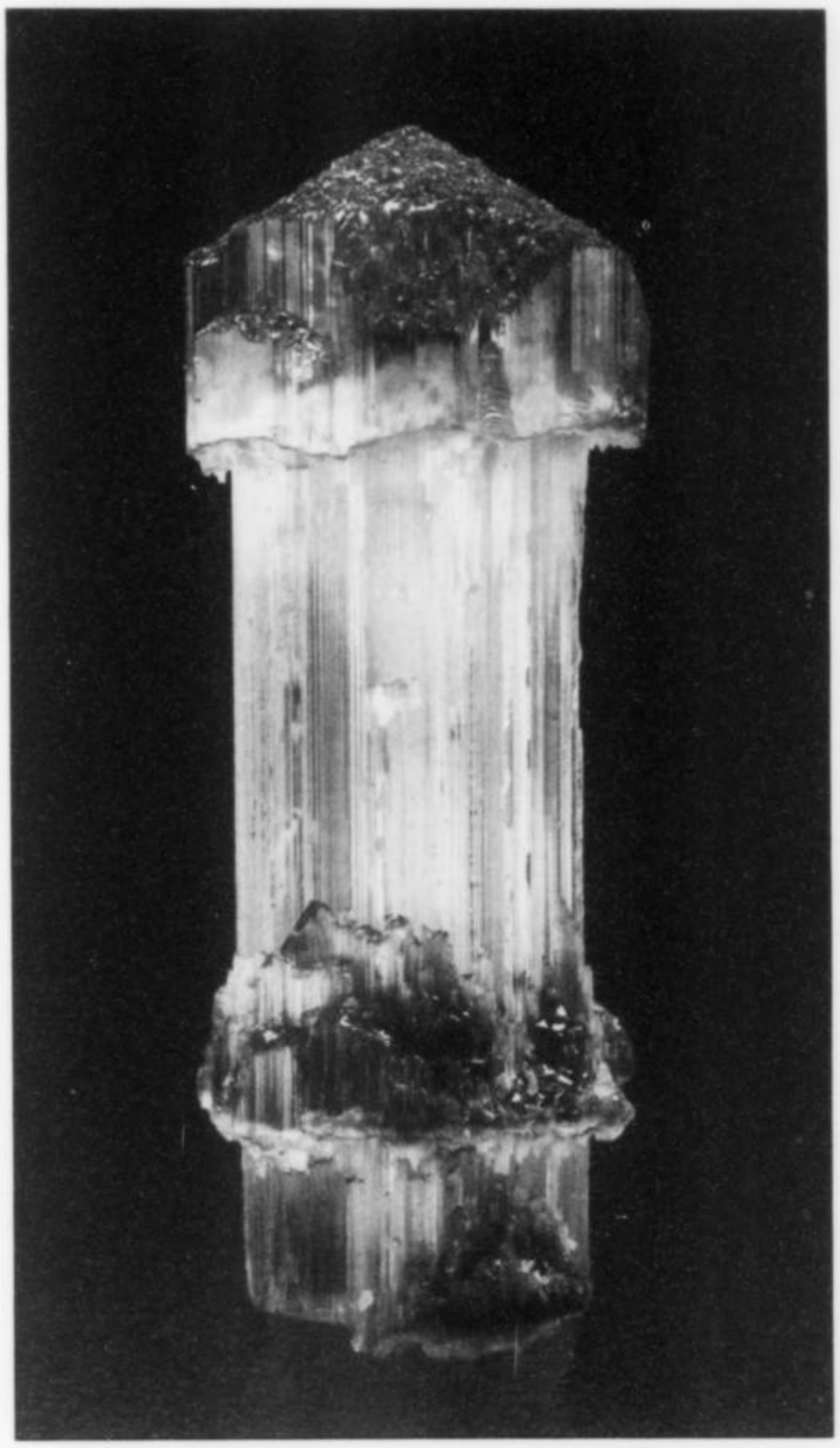


Figure 1. **Elbaite crystal, 3 cm, showing selective removal of the outer green zone, from Paprok, Kunar, Afghanistan. Private collection; Jeff Scovil photo.**

dodecahedrons, jet-black and quite sharp. They are almost complete, though most are somewhat flattened, with small roughened areas representing former contacts with matrix. A typical one of these interesting magnetite thumbnails could be had for around $15.

Next, and staying with the motif of loose, mostly thumbnail-sized single crystals, consider the very pretty, gemmy yellow-green **fluorapatite** crystals being offered by Scott Kleine of *Great Basin Minerals* (scottkleine@greatbasinminerals.com). The locality is an exposure in a creek bed (at 10,000 feet elevation) of the "Crystal Lode pegmatite" near Fulford, Eagle County, Colorado, where about 200 good crystals were dug in 2002, of which the top 35 or so were with Scott at Costa Mesa. A very thin alteration rind, unfortunately, renders some surfaces of all of these crystals, and all surfaces of some of them, an opaque chalky white, but the internal yellow gemminess dominates in the best specimens. All of the crystals are free of matrix and singly terminated, the terminal faces varying from dominant basal pinacoids with very small, shallow-pyramidal modifications, to large, sloping pyramids and very small basal tops; they are thick-prismatic, 1.5 to 5 cm long, and are priced between $25 and $150.

Doug Wallace of *Mineral Search, Inc.* (11882 Greenville Ave., Suite 123, Dallas, TX 75243) edified me regarding a few outstanding **celestine** specimens he was offering, not from the old Dana locality of Lampasas, Texas, but from a presently productive collecting site in the bed of Bull Creek, inside the city limits of Austin, Travis County. These are quite beautiful celestine specimens: translucent to transparent, lustrous, thick-prismatic crystals with flat terminations, bicolored gray and a limpid smoky blue, in lengths to 10 cm. The crystals form as floater singles and groups in a pale brown muddy sandstone of the Austin Chalk Formation, and bits of the mud-like material cling rather aesthetically to some surfaces. Matrix specimens also exist, with celestine crystals rising from lumps of the sandstone. Doug had only six miniature-size specimens, but advises us that more generous quantities may emerge at any time.

It is always fun to hear of the latest Bolivian exploits of Alfredo Petrov. At Costa Mesa, Alfredo was offering a few results of some specimen-hunters' recent activities at the famous San José mine, near Oruro. The San José mine officially closed in late 1991, but recent searches for more of its world-class andorite specimens have produced, instead, a few very fine examples of the rare lead-tin-iron sulfosalt **franckeite**, these found early in 2003 on the 380 level. The franckeite crystals are highly lustrous, metallic black blades to 5 mm individually, and they group in spheres and fanlike sprays to several cm. This new material is much brighter than the usual run of dull gray, feathery franckeite from earlier days; Alfredo's specimens are all thumbnail and miniature-sized.

But it was Minas Gerais, Brazil which turned out the two new discoveries which were, in most people's estimations, this show's most interesting (and least expected) What's New—and it was the tireless Luiz Menezes (lmenezesminerals@uol.com.br) who brought them to market. Fresh from surprising us at Tucson with his recent discovery of the world's finest kosnarite crystals, Luiz this time came up with some truly significant specimens of **helvite** and **anatase/rutile** from the fertile pegmatites of Minas Gerais—take the helvite first.

In March 2003, a 3 x 10 x 10-meter pocket yielded specimens of very large albite and milky quartz crystals with patches of fibrous white palygorskite; on this matrix rest beautiful orange-red, gemmy, heavily etched crystals of **spessartine** to 5 cm, and very sharp, isolated, silvery greenish yellow tetrahedrons of **helvite** to 5 mm. Actually the helvite crystals appear to be pseudomorphs: broken surfaces of some crystals show them to consist of a dull black managanese oxide internally, this having later been overgrown with thin rinds of fresh helvite. The sharp little crystals are liberally strewn over matrix pieces to 30 cm across, but the most appealing specimens are the miniature-sized ones, showing the crisp little helvite tetrahedrons perched on edge, or gently touching in delicate, loose intergrowths, on sparkling white quartz or albite. The locality is the Navegador mine (sometimes called the Orozimbo mine, after the name of the farmer who owns the land), Penha do Norte district, Conselheiro Pena, Minas Gerais, Brazil.

The new **anatase/rutile** specimens offered by Luiz are just as oddly attractive; about 1000 of them were found, during January and February 2003, in an alluvial deposit in the Cuiaba district, Gouveia, Minas Gerais. At Costa Mesa Luiz had about 50 of the loose crystal groups, between 2 and 3.5 cm tall, all arrayed seductively on the top shelf of his glass showcase, luring people in from the hallway. These specimens are fragile parallel clusters of bipyramidal anatase crystals, all points pointing up, sides lightly touching, to create a cathedral-like aspect. About half of the specimens are simply anatase of a greenish tan, caramel-like color and fairly high luster, while the other half show complete or partial, thin coatings, as if spray-painted, of very bright bronze-colored rutile; some may be partial pseudomorphs of rutile after anatase. All are winning thumbnails or toenails of a style of TiO_2 never seen before (to my knowledge, or Luiz's) from any locality in Brazil or elsewhere.

A few Russian dealers were in attendance at Costa Mesa, including the erudite Dmitriy Belakovskiy of the *Fersman Mineralogical Museum* (dmz@minmuz.msk.su). Here, as usual, were many exotic (though generally beauty-challenged) rarities from the ex-Soviet Union. Most interesting, and not so beauty-challenged after all, were a few cabinet-sized matrix specimens with glistening pale purple coverages of **chromian amesite** crystals, from the Saranoskii mine in the Urals. The sharp, transparent, hexagonal-prismatic crystals of this rare member of the kaolinite-serpentine group reach 5 mm, and form solid seam linings in massive black chromite, occasionally with pale brown cubes of rutile pseudomorphous after perovskite. Like the much better known, deep green crystals of uvarovite and chromian titanite from this giant chromite deposit, the chromian amesite druses are exposed by the etching-away of the calcite which fills the seams and veins. Dr. Belakovskiy says that he has seen chromian amesite specimens from this occurrence with individual crystals to 2 cm long.

Gem-quality **forsterite** ("peridot") crystals from Suppat, Pakistan are nothing new by now, but Jim Parrish of *C.S. Enterprises* (jdpsd@san.rr.com) showed me several very sharp, long-prismatic gemmy crystals, to 4 cm, displaying inclusions of long, black, hairlike crystals of ludwigite and vonsenite (verified as such by John Koivala), running vertically in horsetail formations from base to tip. Such included forsterite crystals, Jim said, are very rare from the occurrence; they should be watched for by devotees of the out-of-the-way in gem and/or Pakistani material.

I conclude with another new variation on an old theme: lustrous, transparent, pale green **fluorapophyllite** crystals from India—these from a new well-digging (April 2003) at Rahuri, Maharashtra. The last fluorapophyllite excitement from Rahuri, you will recall, took the form of enormous spheres of green crystals with flat basal-pinacoid terminations implanted on blankets of white stilbite. The specimens from the new discovery are mostly loose, thumbnail through small-miniature-sized sprays of crystals with the more familiar high-angle pyramid faces and no pinacoids, i.e. each fluorapophyllite crystal comes to a point. The very lustrous, spiky crystals are pale gemmy green, and have grown in subparallel fan-like arrangements which are truly gorgeous; on small cabinet-size pieces the sprays and fans rise from masses of glistening white,

platy stilbite crystals. K. C. Pandey of *Superb Minerals India Pvt. Ltd.* (www.superbmineralsindia.com) illustrates a fantastic specimen (he let me handle it too!) on the most recently published flyer for his "Gargoti" mineral museum in India.

Such, then, was my California experience—try it sometime, especially if it will be a New Thing for you, too.

Sainte-Marie aux Mines Show 2003

by Bill Larson

[June 26–29]

Monday

Among the most interesting of all mineral shows is that which takes place at Ste.-Marie-aux-Mines in France's Alsace region. On Monday morning, my eldest son William and I arrived. Sales tents were being set up, but few people were around. We walked to the main theater where the show staff was working hard, but there were very few dealers to be seen. I did see Michel Schwab, who runs the show marvelously, and he told us to enjoy our stay, adding that he expected tomorrow to be very busy. We left for our apartment in the hills above Sainte-Marie, to await Alain Martaud, who was coming to tell us what buzz he had heard. But Alain, when he arrived, said that he had heard of very few new finds. He and his partner had been able to purchase many minerals out of the Bally Museum of Schönenwerd, Switzerland, which has now become a shoe museum. Much of the Bally Collection was dispersed to various Swiss museums, and Alain Martaud and Eric Asselborn purchased the rest. So I knew I would be excited to see those flats when they arrived later.

Tuesday

Tuesday morning saw the venue transformed into a beehive of activity. Cars were lined up in all directions, and parking spots were impossible to find. By 10 a.m., many of the usual suspects had appeared—Andy Seibel, Wayne Leicht, Ian Bruce, the Gobins, Andreas Gurr, and many of the other top European dealers were all trying to get their cars in and their minerals unpacked.

The first new minerals we saw were the **spessartine** garnets which have been found recently in Brazil. They are dark red, and many are completely gemmy. In size they range from fine, small thumbnails with some attached quartz crystals, to small cabinets. The best three specimens, of small-cabinet size, were marked between €1,800 and 1,900. The thumbnail specimens with small quartz crystals were marked €60–100, and the finest miniatures reached €700. This lot was with Jean-Jacques Abello of *Cailloux* (64 Grand Rue, 04800 Greoux les Bains, France), who also had a couple of fine, small **rutiles** and some of the new **herderites** from Linopolis, Minas Gerais, Brazil; miniatures of the latter were priced at €120–400.

The next mineral to excite me was **microcline ("amazonite")** from Sidamo, Ethiopia. These specimens inspired a small feeding frenzy in the mineral tent of Herbert Kaiser (Westbahnstr. 42, A-1070 Wien, Austria), and he had sold out of the best within minutes. The crystals appear to be uncleaned and will probably look better after proper acid treatment. Their color is quite nice, and the best cluster was said to have been sold the day before to Frank Melanson of Canada. The finest specimen here, marked €1200 net, is a museum-sized piece, with two fist-sized, sharp bluish crystals on matrix and another broken crystal on the side which can be easily removed. Single crystals priced from €30 to €200 all sold quickly.

After walking around a bit more, we entered the booth of *3G Environment* (BP 76 2-4 rte Noue, 91193 Gif Sur Yvette, France), where we saw some stalactites of transparent calcite with crystallized tips, found in a quarry cave at Badurach, Germany. The best of these specimens will be offered in Tucson in 2004. 3G, which is the French distributorship of *Mikon*, also had nice miniature **rubies** in matrix from Ketito, Tanzania, marked from €10 to €30.

Nearby, the *Golden World of Mogok* (Via Monte Santo 5, Cernobbio Co, Italy) had a fine setup, with a front case filled with beautiful Mogok gemstones, including **spinel** crystals in both blue and red. Federico Barlocher of *Golden World* also had trays of fine small spinels and one fine, doubly terminated, 1 x 5-cm red Mogok **ruby** in calcite. Around the corner, the booth of Stephan Stolte of *Mineralien-Fossilien-Galerie* (Fahrgasse 88, 60311 Frankfurt, Germany) had a nice selection of new **aquamarine** from Erongo, Namibia, mostly miniatures in loose clusters and on matrix, very aesthetic. Prices were very reasonable—€80–250 for the average miniatures, up to €1400 for some of the more superb pieces—so sales were brisk.

Wolfgang Wendel of *Wendel Mineralien* (Kirchstr. 18, 79400 Kandern, Germany) had some newly prepared **silver** dendrites from the Pöhla mine in Saxony, Germany, most specimens priced between 80 DM and 870 DM, with one large, spectacular 25 x 25-cm piece marked 12,800 DM. Near the center of the show I came across Andreas Guhr's *Mineralien Zentrum* (Steintwiete 11, 20459 Hamburg, Germany), where there was a whole shelf of crystals of bi-colored **beryl**. These crystals are white, but display some fibrous cats-eye areas in pale blue; they are good miniatures marked €100–840. Andreas also had individually priced exceptional pieces, including a very large **titanite** from Capelinha marked €4,500.

The sun was taking its toll on us, so we retreated into the cooler theater. There *Fabre Minerals* had a whole table filled with new Spanish **fluorite**, with many specimens reminiscent of the fine examples that have come out in the past; some of these new specimens are larger and less damaged than was common before. Good specimens were marked €150–190. Jordi Fabre also had a fine lot of small blue bi-terminated crystals of **henmilite** from Japan.

Marcus Budil was there with *Fine Minerals International* (Raiffeisenstr. 14, 83607 Holzkirchen, Germany), featuring some new **morganite** from Coronel Murta, Minas Gerais, Brazil, marked $8/gram. Across the aisle was the booth of Ian Bruce and *Kristalle*, whose fine cases set the display standard for the show. This dealership also brought in the most classics—mostly old European pieces, including some fine English calcite miniatures which attracted my son William.

Andreas Weerth has been to Pakistan recently, and brought back some good crystals of **bastnäsite, parisite** and **xenotime-(Y)**—some of them gemmy. There is a 1 x 1.5-cm **bastnäsite** crystal perched on an 8 x 10-cm feldspar matrix, showing some transparency. Then there is a 3 x 4-cm complete, flat **parisite** crystal on a quartz crystal that has rutile inclusions and is perfectly terminated.

Escaut Minerals (3 Square Paul Verlaine, 91450 Soisy-sur-Seine, France) had cases filled mostly with Chinese minerals, including some beautiful **barite** on snow-white quartz, and one fine Japan-Law twin **quartz** on matrix from China—what makes this specimen incredible is that it is twinned twice and measures 15 cm overall. Another new Chinese mineral was a beautiful **calcite** heart-shaped twin completely encased in **pyrite.** And one of the nicest specimens of the show—Frédéric Escaut brought it out from behind the booth—was a 12 x 12-cm cube of greenish **fluorite**, absolutely perfect, on a matrix of **muscovite** with two **scheelite** crystals perhaps 6 cm on edge attached. A remarkable specimen!

At the booth of Gilbert Gauthier (7 av Alexandre III, 78600

Figure 2. **Titanite crystal, 6 cm, from Sarony, Ural Mountains, Perm Oblast, Russia. J. Pljaskov specimen; Jeff Scovil photo.**

Figure 3. **Microcline "amazonite" on matrix, 9 cm, from Konso, Sidamo, Ethiopia. Jürgen Tron specimen; Jeff Scovil photo.**

Maisons Laffitte, France) there were many of the new "rose beryls" destined to be described as the new mineral species **pezzottaite**, including several matrix specimens. Gilbert decided to price them by the gram, except for the 5 matrix specimens. The cutest is a 2.5 x 3.75-cm black **tourmaline** specimen with a 1-cm hexagonal "rose beryl" right in the center of it.

Next door was the beautiful display of Jean-François-Astier of *Astier Mineraux* (39 rue Granges Galand, 37554 Saint Avertin Cedex, France). His carefully selected minerals including one lovely **epidote** from Pakistan, marked €1,000; reminiscent of Knappenwand, Austria epidote, this specimen measures about 7 x 12 cm. This dealership also had a 2.5 x 3.75-cm gem **scapolite** marked €400 from Tanzania, and several **smoky quartz gwindles** that Jean had dug during the summer, the nicest of which sold immediately for around €900. Behind the booth in a special case was a magnificent miniature **cobaltoan calcite** containing a 2 x 2.5-cm gem crystal.

More of the show's red "**rose beryl**" (now **pezzottaite**) from Ambatovita, Madagascar was to be found at the booth of *Lino Caserini* (Via Don Guiseppe del Como 1, 20132 Milano, Italy). He had quite a few miniature-sized matrix specimens, reasonably marked from €120 to €1,500. The €1,500 piece is a 2.5 x 3.5-cm matrix of feldspar with a 2 x 2.5-cm gemmy tabular crystal perched on top. A quarter of the surface of the €120 matrix specimens shows crystals of the new beryl. Lino also had a fine selection of **spessartine** garnets from the new find, labeled Lavra Navigadore, Brazil. Prices range from €250 for a perfect 1.5 x 1.5-cm gem crystal, up to €1,800 for a gem **spessartine** measuring perhaps 2 x 2.5 cm with a little matrix on the bottom—very stunning. He also had two specimens of **amblygonite** on albite matrix from Arqueana, Torquaral Aministraes, Brazil. The matrixes measure 12 x 15 cm, and show quartz crystals and scattered tourmaline; the white amblygonite crystals each measure 5 x 6 cm. These two fine specimens were priced €900 and €600.

On Tuesday night we had an exciting invitation to visit one of the numerous superb restaurants in the hills overlooking Sainte-Marie. It is the type of place that visitors cannot find without local assistance, and William and I took our time enjoying the views of mountains and forests as we drove up for our 7 o'clock reservation. The owner greeted us and led us to our table, where we were presented with a menu. William did the brave thing and tried the rabbit, whereas I had duck paté, and we had a very light wine and some local mineral water. My son was lukewarm about the paté but relished the rabbit.

By the time we finished, the stars had come out and it was an incredible evening, like many shared in this Alsace region of France by the various participants in the Sainte-Marie show.

Wednesday

We returned to the theater and the booth of Ennio Prato (Via Aurelia 53, 16031 Bogliasco, Italy), who had an interesting glass case containing an excellent old **azurite** from Tsumeb, marked €7,500. It is fully 15 x 17.5 cm with 7.5-cm crystals of azurite

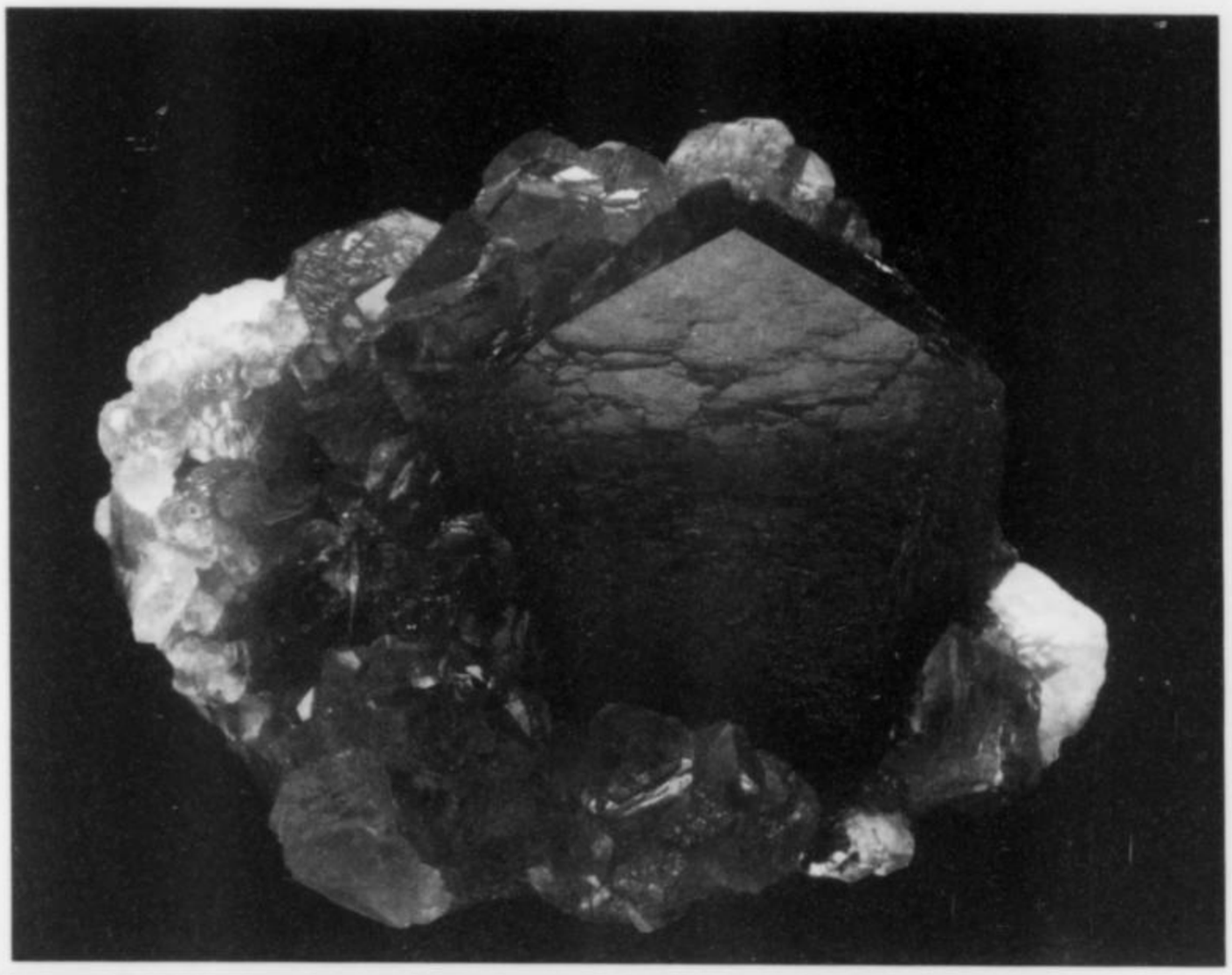
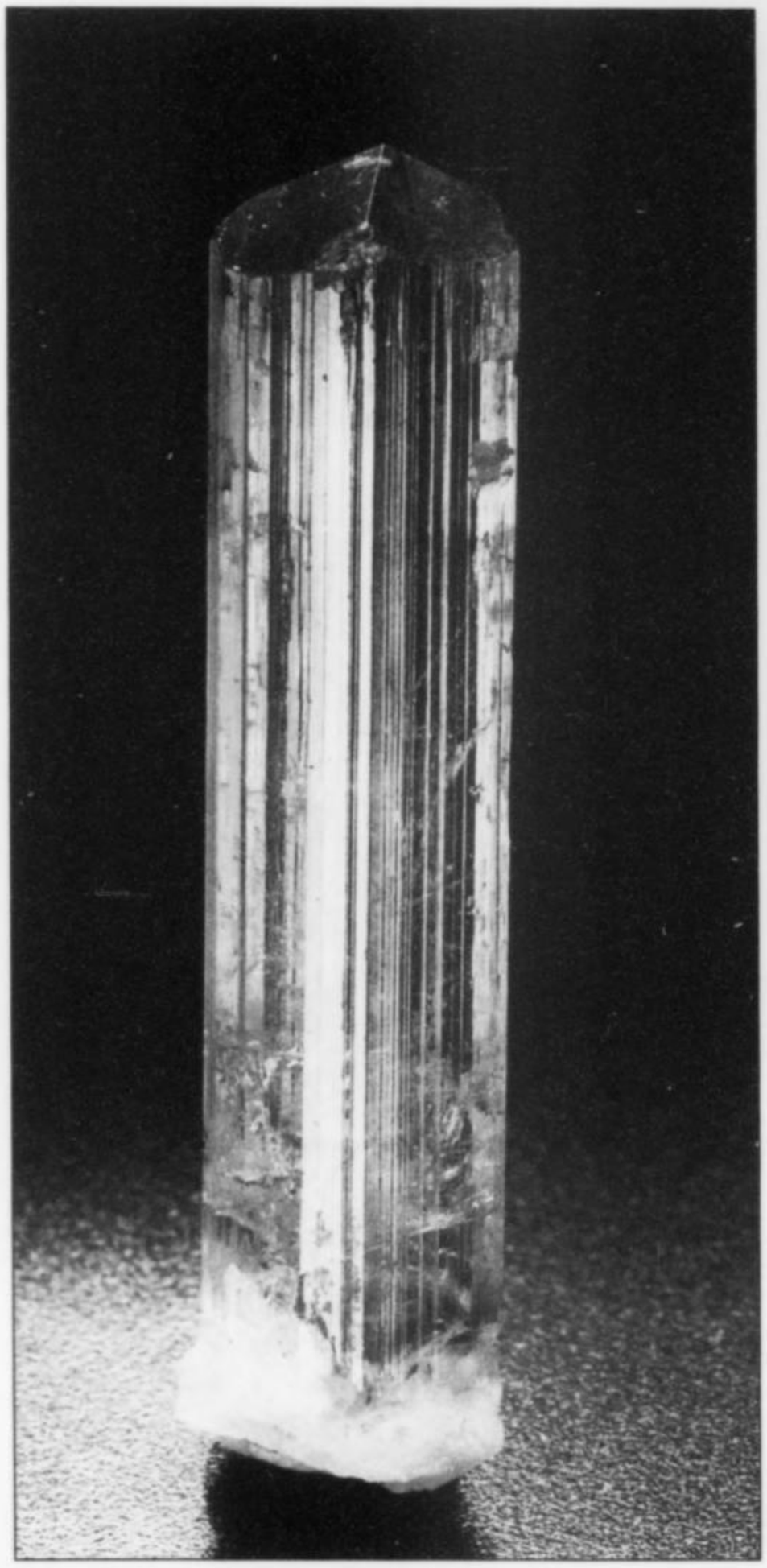


Figure 4. **Cobaltoan calcite, 4.4 cm, from Bou Azzer, Morocco. Astier Mineraux specimen; Jeff Scovil photo.**

Figure 5. **Scapolite crystal, 5 cm, from Badakhshan, Afghanistan. François Lietard specimen; Jeff Scovil photo.**



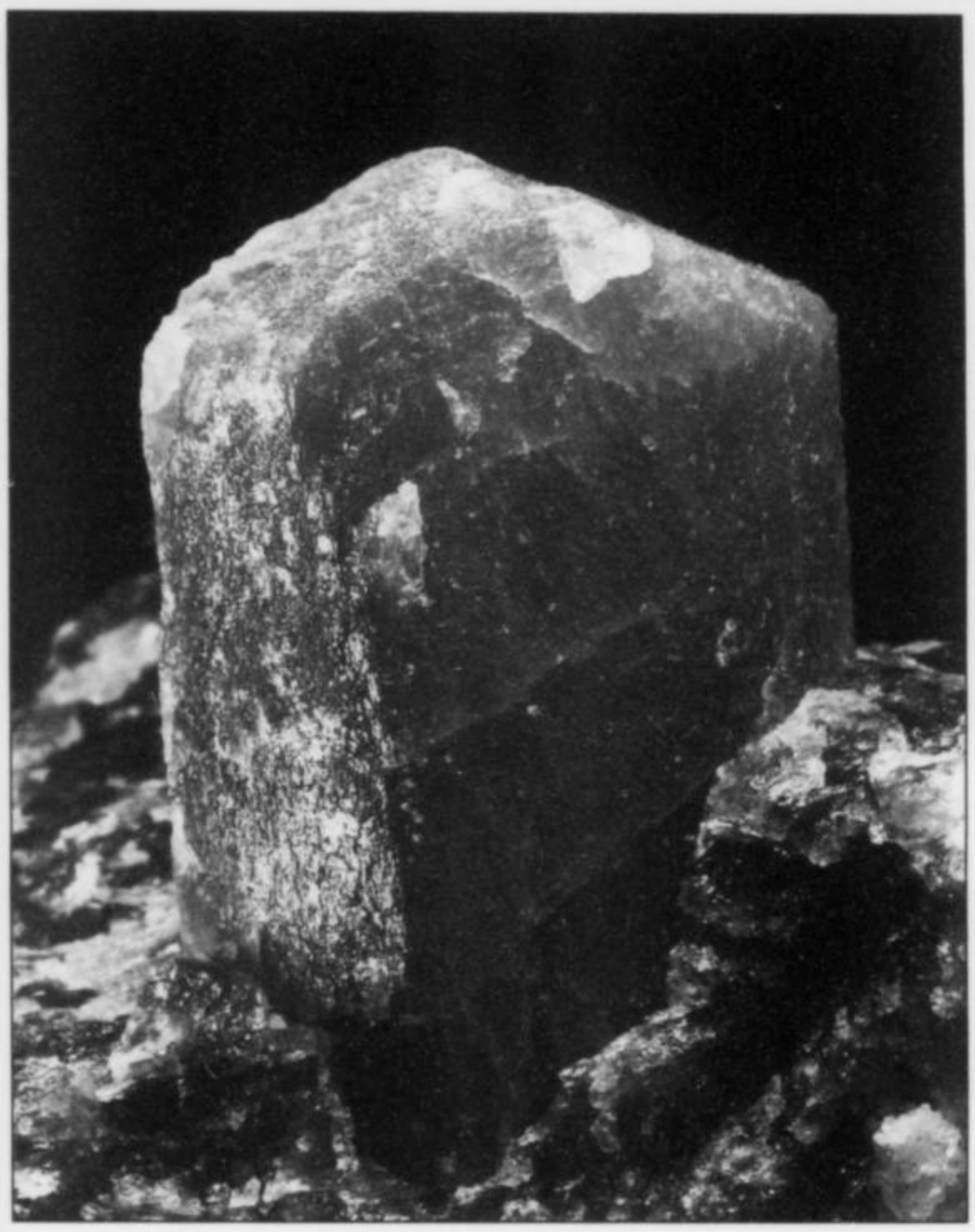


Figure 6. **Microcline ("amazonite") crystal, nearly transparent, from Afghanistan. François Lietard specimen; Jeff Scovil photo.**

being replaced somewhat selectively by malachite. It is not razor-sharp, but is a rare large example. Ennio also had a 5 x 7.5-cm **tanzanite (= zoisite)**, pale in color but perfectly terminated, from the Merelani mine in Tanzania, and a large selection of blue **hemimorphite** from Tinding, China. There were about 20 specimens of the hemimorphite, marked quite a bit more reasonably than one normally sees in America (€80–€150); some of these specimens reach 20 x 20 cm.

In the booth of *Tironi Minerali* (via Nazionale 11/A, 23020 Prata Camportaccio So, Italy), we found a good selection of new **euclase** crystals from Rio Grande do Norte, Brazil—no prices were marked but the finest one was a 2.5 x 2.5-cm crystal, colorless with the typical blue stripe running down through the middle. Tironi Minerali also had some very large (20 cm) **feldspar** crystals with **garnet** crystals to 5 cm attached.

Around the corner lay the booth of Pregi Gemme (Via dei Piatti 2, 20123 Milano, Italy), with a fine selection of many things, including a new lot of **sillimanite** from the Jeffrey mine in Canada and some fine new **epidote** from the Capelinha area, Brazil. The epidote specimens are radiating crystal clusters up to 15 cm across on white quartz crystal sections, marked €380–700. This dealership also had the show's finest selection of the new Brazilian garnets—five absolutely spectacular **spessartine** specimens with crystals in the 7 to 12-cm range, on matrix for the most part. The entire contents of the case were sold immediately.

Christophe and Brice Gobin had a new find of **cobaltoan calcite**, probably the most exciting yet, from Mine de Aghbar, Morocco. They had a 10 x 10-cm crystal group, with an electric pink color, on **pyrite**. They had an adequate supply of fine miniatures marked from €110 to €185, and a few small cabinet specimens, one of which is a 5 x 5-cm section of bright pink 1.25-cm crystals on a somewhat crude pyrite matrix, marked €1,120. But the best specimens had all been pre-sold. There were also some very fine **fluorite** specimens such as are coming once again from the El Hamman mine in Morocco. The fluorite crystals are of many different colors; the greens seem a little bit dull but some of the yellows show tremendous potential, and many crystals have sparkling druses of quartz, calcite or pyrite on them.

The other new find featured by the Gobins was snowflake **cerussite** from Morocco's Taouz mine. They had two very fine miniatures on display marked around €1,800 each; the smaller fine thumbnails run €185–450. The largest specimen I saw is about 8 cm across. All of these excellent cerussites will make beautiful photographs.

François Lietard (of *Minerive*, 18 rue Vaganay, 69850 St. Martin en Haut, France) had many interesting things from Pakistan and Afghanistan. The best I saw are a couple of new **tourmaline** specimens, one of which is a doubly terminated pale green to dark green crystal measuring 2.5 x 10 cm, with a 3-cm, doubly terminated quartz crystal perched on top. François also had gem **scapolite** crystals from Badakhshan, Afghanistan that are pale pink and completely transparent, to 5 cm long and 1.25 cm in diameter. He had some very fine dark blue-green **microcline ("amazonite")** on massive smoky quartz, and new purple 2.5 x 4-cm **apatite** crystals, the best of which is doubly terminated and shows excellent color. François was offering a few specimens of green **diopside** on calcite from the lapis mine [presumably meaning the Sar-E-Sang mine], the best of which is a 3 x 3-cm gemmy crystal priced at €760. Finally, François had **stalactitic prehnite** on quartz from Baluchistan, Pakistan—a very attractive miniature with 2.5-cm crystals on matrix and small, transparent quartz crystals, marked €180.

Andreas Weerth (Hochfeldstr. 37, 83684 Tegernsee, Germany) waved me over to see a new find of medium-blue **aquamarine** from Chigar-Tow, Pakistan. The finest specimen he had is a 15 x 20-cm feldspar matrix with a quartz crystal gracing it, and a superb, finely colored, two-step aquamarine with basal termination measuring 5 x 7.3 cm. This is a specimen for anyone's collection.

At the booth of *Martaud Mineraux* (33 rue Compans, 75019 Paris, France), Alain Martaud by this time had priced what he'd gotten from the Bally Museum, and another feeding frenzy was proceeding. Small, fine miniatures representing rare occurrences include a little **boyleite** on a 1 x 1 x 2-cm matrix, marked €50, and some fine Chessy, France partial **pseudomorphs of malachite after cuprite**, 1.25 cm each, marked €100.

Minerama (49 rue République, 42800 Rive-de-Gier, France), occupying the large booth to the right as you are facing the theater, had come up with some fine colored **creedite** from Mina Navidad, Abasolo, Durango, Mexico. Some clusters have individual creedite crystals up to 2 cm. The small miniatures were marked €70–140 each, keystoned, and some of the larger specimens were €1,500 net. One is a cluster of 15 x 20 cm, and quite perfect. The same dealership had fine, mixed-sized gem crystals of several species in one case, including many from Madagascar localities.

In the booth of Jörgen Margraf (Hochstr. 15, 82481 Mittenwald, Germany), Jessie Fisher was showing some of the new **fluorite** from the West Cross Cut in the Rogerley mine, England—dug in June of 2003. The crystal groups require almost no cleaning except with a light water gun, and their color in the sun is not to be believed. The best specimen is about 3 x 5 cm, asking €2,500.

Matrix India (B-36 Abhimanshri Society 411 008 Pune, India) had two of the largest and finest **scolecite** specimens ever seen from Maharashtra, India. The individual sprays are up to 25 cm across, and one of the groups is composed of three nearly perfect intergrown spherical sprays, so it's perhaps 60 x 60 cm—an incredible specimen for any museum.

At the booth of Pierre Clavel (4 Chemin Vie Borgne BP4 38460 Cremeiu, France), there was a wonderful glass case holding minerals from the collection of Michel Legros, including a superb **quartz** with chlorite phantoms from Oisans, France, 10 x 10 cm overall and absolutely perfect, marked sold. The collection also contains many old epidotes and axinites from the same area—some of which had been pictured in books.

We finished up in the theater, and as we went outside we realized that it was closing time. Sadly, we were finished at Ste.-Marie for this year, because tomorrow we would have to drive to Lucerne, Switzerland, where the very exciting and challenging job of appraising Professor Edouard Gübelin's magnificent gem collection, containing over 3,000 examples of faceted gems and minerals, awaited me.

Springfield Show 2003

by Joe Polityka

[August 8–10]

As I drove into the parking lot of the Eastern States Exposition Center in Springfield on Friday August 8th, I noticed a small crowd of people staring into the sky. I soon realized they were looking at a pair of nesting bald eagles perched atop a utility pole. At that point I wondered if Marty Zinn and his crew had placed a couple of bald eagle puppets atop the pole just to prepare us for being overwhelmed by nature, as we would be inside the show hall. But no, the eagles were real, just as were the great minerals, fossils and gems.

The featured mineral exhibit this year contained specimens from the collection of Rock Currier, well-known author, mineral dealer, raconteur and world traveler. The fifty or so cases were arranged geographically and by topic. There were cases full of choice mineral specimens from Bolivia, Brazil, China, India, Mexico, Peru, Russia and Tsumeb; there was a case of mixed European specimens, and there were lots of cases of specimens from the United States. I drooled over choice minerals from Bisbee, Arizona; the Jeffrey mine, Arkansas; the Keweenaw Peninsula, Michigan; Tiger, Arizona; and various localities in California. There were individual classics from the eastern and western United States, and several cases were devoted entirely to single specimen

types, e.g. microcline ("amazonite") and smoky quartz from Colorado or amethyst from Brazil and Uruguay. One specimen of amethyst and calcite from Artigas, Uruguay was recently featured on the cover of *Rocks & Minerals* (July/August 2003). Rock also brought several cases of California borates (I'm told they are his favorites) to our humid east coast, and to all appearances they survived the trip.

Of course, each browser among the Currier cases had one or two favorite specimens: it was interesting to hear comments such as "Wow, look at that tourmaline!" or "I'd like to own that California gold!" or "How about that freibergite on pyrite from Bolivia!" Yes, and how about those huge pyrite octahedrons from Huanzala, Peru, or those 5-cm doubly terminated ludlamite crystals from Bolivia, or those tetrahedrite crystals to 16 cm from the Morococha District, Lima Department, Peru? Not impressed? How about the 10-cm magnetite crystal from Russia, or the huge 5-cm leadhillite from Tsumeb, Namibia, which Rock said he purchased from a miner for $75.00? How about the Kongsberg, Norway wire silver specimen! How about the east coast and European classics! How about giving Rock Currier a standing ovation for bringing all those great rocks for us to see? Only one slightly nagging memory of this display remains with me: on the label for a doubly terminated 6 x 15-cm azurite crystal in the Tsumeb case, Rock had printed the word "azurite" followed by a question mark, and I never got to see Rock to ask him if the specimen is indeed azurite.

There were so many dealers to see at the show that I decided that the best way to proceed was to start at the dealer booth closest to the entrance and systematically weave my way through the aisles until I reached the last booth. Frank and Wendy Melanson of *Hawthorneden* were my first contacts, and **spessartine** from the Navigador mine, Conselheiro Pena, Minas Gerais, Brazil was the most prominent mineral at their stand. There have already been many different names given for this locality, but, according to Frank, Luis Menezes has verified "Navigador mine" as correct. The specimens I saw are irregular crystalline shapes up to 4 cm in the longest dimension, without matrix . They are reddish-brown and very gemmy, and seemed to be very popular with showgoers. In fact, by the end of the first day Frank had already sold most of his spessartine, he said. Frank and Wendy also featured **microcline** ("amazonite") of a medium-blue color, with crystals to 7 cm, from Konso, Sidamo, Ethiopia. One aggregate of solid crystals is about 30 cm across! They also showed me a specimen of **amethyst** with crystals to 20 cm from the Turt mine, Satu Mare, Romania: a dead ringer for one of the classic Guerrero, Mexico amethyst specimens.

At the booth of *Excalibur Minerals* I was shown specimens of **nevadaite**, a new copper mineral which has been approved but not yet published. The specimens consist of blue micro-spheres of nevadaite associated with microcrystals of fluellite and hewettite. They are from an already mined-out locality—the Gold Quarry mine, Eureka County, Nevada (see the article in the *Mineralogical Record*, Vol. 26, No. 5). Excalibur also had some gemmy **diamond** crystals, without matrix, from 1 to 5.5 carats; they are from the great diamond mine now being developed in the Canadian Arctic, the Ekati mine, Lac DeGras, NWT, Canada.

Gloria's Minerals (P.O. Box 263, East Hampton, CT 06424) was disbursing a large collection of **calcite** from various locations in India; the collection formerly belonged to Berthold Ottens, the author of the "Indian Zeolites" issue of the *Mineralogical Record* (Vol. 34, No. 1). Gloria was handling the specimens for Terry Huizing and, needless to say, there were many choice calcite specimens (single crystals and twins) in all sizes for sale.

Rocko Minerals and Jewelry (Box 3A, Route 3, Margaretville, NY 12455) had specimens of **clinozoisite** featuring yellowish brown crystal sprays to 2.5 cm (individual crystals average 1 cm) from near Huancavelica, Peru. The lustrous, wedge-terminated crystals are quite attractive and sit on a contrasting white quartz matrix; available specimens are thumbnail and miniature-size.

Jeff Fast of *JBF Minerals* (860-985-6321) had a variety of minerals from Mexico. Most prominent among them was **calcite** in butterfly-twinned crystals from Jose Maria Patoni, Durango, Mexico. Jeff, who self-collected the specimens in April 2003, told me that the locality is the one previously known as Rodeo, Durango, Mexico. Individual butterfly twins average about 4 cm wide and 5 mm thick, and are milky white to colorless and transparent. They are mostly off matrix, and loose twins and clusters range from thumbnail to small-cabinet size.

The guys at *Toveco Specimen Mining* (www.toveco.com) have continued to work at the William Wise mine, Westmoreland, New Hampshire in search of the well-known beautiful green **fluorite** that occurs there. Recently, as they mined deeper into the quartz vein, they uncovered white **quartz** scepters to 5 cm; in contrast to previous finds, these scepter crystals have smoky tips. As they mined deeper they encountered fewer but better green fluorite crystals. Who knows what the future holds, and what attractive new quartz/fluorite combinations will be found?

Bill Clark of *Clark's Rocks and Jewelry,* Coventry, CT (860-742-3169) had blue **barite** from a new location near Somers, Connecticut. The barite crystals suggest average-quality specimens from the old English localities, being composed of translucent blue or tan crystals, with individuals averaging 3 cm, in aggregates up to 7 cm. The location is on private property, but Bill hopes to do more exploration in the near future. Massive, granular purple fluorite was also found with the barite crystals.

A few years ago, Terry Ledford of *Mountain Gems and Minerals* (P.O. Box 239, Little Switzerland, NC 28749) began appearing at the major shows with an old hoard of green gemmy crystals of **spodumene variety hiddenite** from the classic locality of Hiddenite, North Carolina. The specimens in that lot, Terry said, were all collected many decades ago, but at Springfield this time Terry came up with about a dozen hiddenite crystals which he said had just been collected within the year. The crystals are all loose, and range from 1.5 to about 3 cm. They are very gemmy and typically hiddenite-green in color, and a few show distinctly curled tips. He promises to have even better ones at Tucson in February.

Val Collins of *Mohawk Minerals* had some specimens of **henmilite** from the type locality for this rare calcium copper borate: the Fuka mine, Bicchu Town, Kawakama County, Okayama Prefecture, Japan. The specimens were found in March 2003. The sharp, dark blue henmilite crystals are mostly micro-sized, and rest on massive white calcite matrix.

Lehigh Minerals (www.lehighminerals.com) had a large selection of **epidote** from the exciting new locality reported on from Tucson this year—the Northern Frontier Region, Kenya. Most specimens consist of singly terminated crystals without matrix, averaging 5 cm long but reaching a maximum of 7 cm.

Dudley Blauwet of *Mountain Minerals International* had his usual selection of goodies from Asia, including some nice specimens from Pakistan. Among the new items here are white **microcline** twins to 7.5 cm from Raikot, Chilas, Northern Areas, Pakistan. Dudley told me that about 70% of the crystals found are Carlsbad or Baveno twins, 10% are Manebach twins and 20% are untwinned crystals. **Epidote** sprays without matrix from Wadd, Baluchistan, Pakistan looked very similar to recent specimens out of Peru. The crystal sprays reach 4 cm in length and were found at a prospect very near the Iranian border. **Prehnite** stalactites (very pale green, and to 4 cm long) were recently found at Charman, Baluchistan, Pakistan, near the Afghanistan border; these prehnite specimens are not as attractive as those from the northeastern

Figure 7. **Diopside crystal, 1.9 cm, from the Kokcha Valley, Badakhshan, Afghanistan. François Lietard specimen; Jeff Scovil photo.**

United States but would make good additions to a collection of Pakistan minerals. And Dudley had some nice doubly terminated crystals of lime-green **herderite** from Chhappu, Baltistan, Pakistan, near the border with China. These translucent crystals reach 2.5 cm, are usually free of matrix, and are quite attractive.

Ross Lillie of *North Star Minerals* showed me some great specimens from Romania—I'd call them "museum" specimens both for size and quality. One specimen of drusy brown **siderite** pseudomorphous after rhombohedral crystals of calcite, from the Turt mine, Maramures, Romania, is about 30 x 50 cm in size, the calcite crystals averaging 10 cm. Two giant specimens of this description were mined in 2001; the other one went to Harvard. Next, Ross showed me a phenomenal specimen of **nagyagite** from the type locality at Nagyag (now called Sacaramb), Romania. The specimen was collected in 1790 (!) and consists of more than 100 metallic gray-black, star-shaped nagyagite crystals to 1 cm on a sparkling pale pink carbonate matrix. The overall size of the matrix is 10 x 15 cm. When I asked Ross how he had acquired the specimen, he told me he had been "in the right place at the right time." So what else is new? A single specimen of **gypsum** from Cavnic, Romania was another show-stopper at the North Star dealership. The sharp, transparent and colorless crystal, 12 cm across, rests on a matrix of drusy quartz, and a quartz stalactite visibly penetrates the gypsum crystal. Lastly, I was shown a 10 x 15-cm drusy quartz matrix on which were perched numerous cherry-red **realgar** crystals to 2 cm. This Baia Sprie, Maramures, Romania specimen will soon be on display at the Carnegie Museum in Pittsburgh, Pennsylvania.

Fine Minerals International (Raiffeisenstr. 14, 83607 Holzkirchen, Germany) had several **quartz** specimens that caught my eye: one was a huge quartz scepter about 60 cm tall with pale brown mud inclusions. The head on this beauty is about 20 x 30 cm. The locality given was simply Minas Gerais, Brazil. Another scepter quartz, this one from Winterstock, Furka, Switzerland, sits on a chloritic matrix about 10 x 10 cm; the quartz crystal measures 3 x 10 cm and has a pale purple amethystine head. This is a one-of-a-kind piece, as is typical of Alpine locations.

Syed M. Shah of *Hunza G. C. Corp* had, in addition to his usual inventory of minerals from Pakistan, a **fluorite** specimen from a new location in Pakistan. The specimen consists of a pale greenish gray 2.5-cm octahedron, slightly rough-faced, on a white drusy quartz matrix. The specimen is from the Olter Valley, Hunza, Pakistan, not far from the more familiar "Hunza Valley" localities for fluorite.

Wright's Rock Shop had some choice **fluorite** crystals to 2 cm, in clusters mostly of miniature size, from Dal'negorsk, Russia. The crystals are lustrous, colorless and transparent dodecahedrons, and inside many of them are phantoms of cubic fluorite crystals outlined in milky white. *Iouri Poustov* of Moscow, Russia had similar specimens.

In the wholesale section, Luis Menezes had about 100 specimens, in thumbnail to cabinet sizes, of **helvite** from the Navegador mine, Conselheiro Pena, Minas Gerais, Brazil. The olive-green to pale gray-green, tetrahedral crystals sit isolated on white matrix and reach 1 cm.

Many other dealers had large inventories of singular outstanding specimens that were not from new finds: in this honorable category are Dan Weinrich, Kristalle, John Betts, The Mineral Cabinet, Larry Conklin, IC Minerals, Iteco, XTAL, Minerals America and others.

According to Marty Zinn and his staff, attendance was up about 35% over last year's Springfield Show. The full parking lot on Friday was ample proof that plenty of folks saw fit to come . . . heck, even the two bald eagles perched near the entrance seemed to be interested in minerals that day.

At the 2004 show the featured exhibitors will be Dan and Dianne Kile of Aurora, Colorado, who will present their collection of outstanding field-collected minerals, worldwide mineral specimens, and mineralogical instruments, especially petrographic microscopes (Dan is the author of the monograph on the subject which went out with the November-December 2003 issue).

New York State Museum, Albany

On my way home I stopped at the New York State Museum in Albany (next to the state capital buildings) to look over their new exhibit dedicated to minerals found in New York state. Mining in New York is well past its heyday, of course, but the many fine minerals on display from the 19th and early 20th centuries are evidence of a rich past. The display is arranged both by region and by collector. There are cases of minerals on loan from Harvard, the Canadian Museum of Nature, Steven Chamberlain, and Ken Hollman, and from the Oren Root collection at Hamilton College in Clinton, New York. Don't expect to see azurite, wulfenite and other minerals from oxidized zones of orebodies here: if such minerals ever existed in New York they were pushed into the Atlantic Ocean during the last Ice Age. However, if minerals of sedimentary, metamorphic and plutonic origins are your bag, this is the place to visit. How about sea-green fluorite groups to 50 cm in diameter, or 15-cm spinel crystals? How about calcite crystal groups that have yet to be equaled, or celestine as gemmy as any found in Madagascar? How about a suite of the minerals of the Tilly Foster iron mine, New York? There are about 500 specimens on display from across New York that are *not* Herkimer diamonds. I suggest you see this eye-opening collection when you visit the Albany, New York area, or the Springfield Show in 2004. You will be impressed!

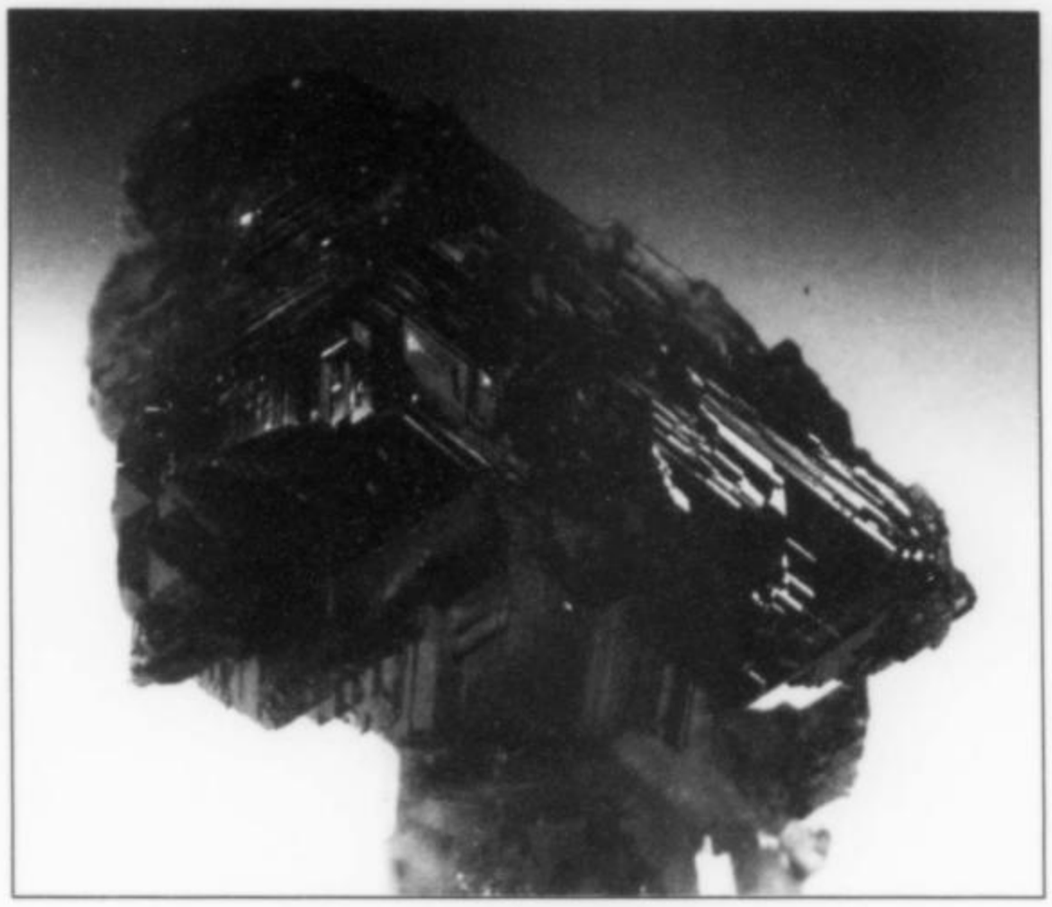


Figure 8. **Spessartine crystal with irregular stepped surfaces, internally flawless, 4 cm, from Lavra (= mine) Navigdor, Conselheiro Pena, Minas Gerais, Brazil. Dave Waisman; Wendell Wilson photo.**

Denver Show 2003

by Thomas Moore

[September 10–16]

The Denver International Airport lies many long miles east of the Merchandise Mart (the "main" show) and the Holiday Inn site of Marty Zinn's hotel show, and yet, however eager he is to reach that mineral mecca, the arriver-by-air is always bound to enjoy the view ahead as he drives west from the airport. The mountains at first appear as a very sharp row of peaks, the suture line of a continent; and then (as the Denver skyline comes up on the south) they loom over the city with their scumbled clouds, and there is the sense of snowstorms lurking in the awful distance. Such is the grandly indifferent but world-sized welcome one comes to expect from the Rockies' Front Range—and the air around you is pleasantly cool, even pre-autumnal, and that is a welcome thing if you happen to be flying in from a desert as we were. I wish to announce that on a couple of chilly evenings I actually wore the sweater that I had so hopefully brought from Tucson.

The upfront human scene is cheerfully familiar too: rituals of commerce and good fellowship seem to unfold in the same way every year at Denver, and good minerals of course are everywhere. This year only a few truly new discoveries appeared, but a great many items mentioned in earlier show reports came back strong, attaining new levels of quality and/or abundance. Business seemed good for most of the dealers (in fact, almost all whom I asked said that it *was* good), and some old collections came onto the market to excite and educate contemporary collectors. In general the market's vitality, so evident in recent years, seemed undiminished this placid September in Denver. And so, here comes the parade . . . .

The Cresson mine at Cripple Creek, Teller County, Colorado is renowned both as the source of the world's finest specimens of calaverite and as one of the richest and most rambunctious of the gold mining camps of the American West a century or so ago, but specimen material of any kind from the mine has always been rare. However, about a year ago, in the old open pit, about 50 good specimens of pale purple **creedite** were found—the first recorded occurrence of this species at Cripple Creek—and Dave Bunk had a half-casefull for sale at the Holiday Inn in Denver. Medium-lustrous, translucent, typically wedge-shaped creedite crystals to 5 mm form seam linings, or are grouped in spherical aggregates to about 2 cm in diameter, in mottled gray-green rock; some specimens also show small, yellow, subhedral celestine crystals. The specimens range from toenail-sized to matrix plates 25 cm across lightly sprinkled with creedite sprays and druse-patches. This creedite strongly resembles the somewhat brighter material which came years ago from the Hall mine in Nevada.

Meanwhile, at the Sweet Home mine, Alma, Park County, Colorado, the expert specimen-miners of the *Collector's Edge* company have been having a good season. In early July of this year they breached "Nate's Pocket": a 1 x 1-meter cavity which has turned out perhaps the best **fluorite** yet found at the Sweet Home mine, colorfully combining with **rhodochrosite** to make dazzling specimens. The fluorite, mostly found on the footwall of the pocket, occurs as rich bluish purple, slightly rough-faced but gemmy, compound octahedrons to 4 cm, sharing matrix with gemmy rose-red rhodochrosite rhombohedrons to 5 cm. The pocket's hanging wall was covered by a lawn of needle **quartz** crystals with cubic **pyrite** crystals, glassy green **fluorapatite** crystals to 2 mm, and a few isolated, razor-sharp rhodochrosites. The zone of pockets adjacent to "Nate's" is still a work in progress; as of Denver time it had not yet been fully cleaned out, and several major pieces already collected had not yet been prepared for sale. But one foot-wide specimen in its own showcase in the *Collector's Edge* booth at the Main Show fairly dominated the space, glowing vividly red and purple.

Another famous Colorado locality which keeps refusing to die is the Stoneham, Weld County source of transparent, elongated blue **barite** crystals occurring in beds of altered volcanic ash (see vol. 17, no. 4, p. 255). This past summer, Martin Jensen extracted about 1,200 miniature and small cabinet-sized jackstraw groups of lightly attached barite crystals, and these were being sold by *Collector's Edge* at the Main Show. Much more odd-looking are a few giant matrix plates (to 35 cm across) with single barite crystals to 5 cm standing separated from each other and quite upright: dense, uncut forests of shiny blue sticks.

And what western U.S. mineral is more charismatic than the fiery red **wulfenite** of the Red Cloud mine, Arizona, and what locality has had more major renaissance periods of specimen production? The beautiful pieces taken in March 2003 from what Rob Lavinsky is calling the "Red Gem Pocket" may be the last we

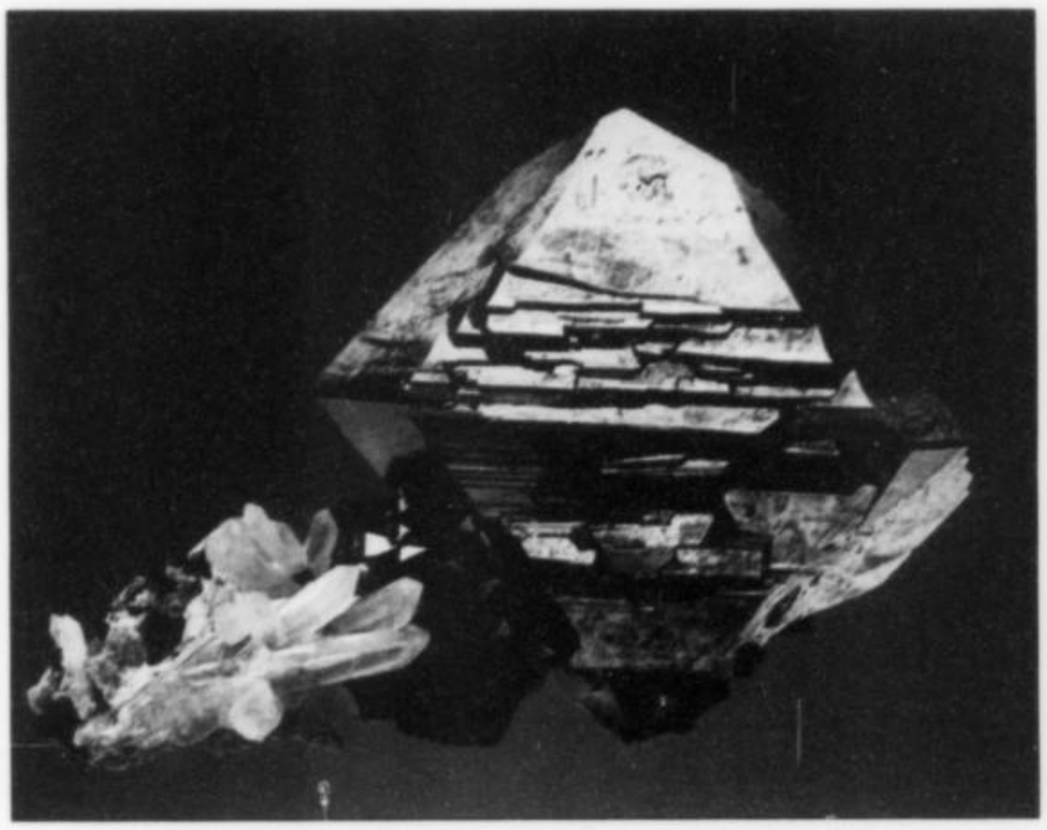


Figure 9. **Brookite crystal with quartz, 2.8 cm, from Magnet Cove, Arkansas. Allan Young collection; Jeff Scovil photo. (This specimen won the Lidstrom Trophy at the 2004 Tucson Show.)**

will see of new Red Cloud wulfenite for a while: *Collector's Edge*, the most recent developer, has now ceased work at the place, and believes that the mine can no longer be profitably worked for specimens. Of course, it's a big mine, and it's been sporadically yielding specimens in modest numbers to hard-working private collectors since the 1880's, so it can hardly be considered "extinct," but merely "unprofitable" on a commercial mining basis. The "Red Gem Pocket" wulfenite crystals are bright orange-red (naturally), and reach 2.5 cm on edge. Many of them are very gemmy: pristine little "windows" which perch on a matrix (unusual for the Red Cloud) of massive iron-stained quartz, with some patches of drusy quartz. Thumbnail through miniature-sized specimens were available at Denver from Rob Lavinsky of *Arkenstone*, and continue to be available (while supplies last!) on his website.

Returning now to what's truly *new*, Casey Jones of *Geoprime Minerals* (11332 Hawthorne Ave., Hesperia, CA 92345) had a small, promising handful of wire **gold** specimens from UNICO Inc.'s Bromide mine in the Henry Mountains, Wayne County, Utah—who ever heard of good Utah gold until now? The very thin but very bright, twisted gold wires rise to heights of 2 cm or so from their points of light attachment to a soft greenish rock matrix, in the thumbnail-sized specimens that were available from Casey in the Holiday Inn; there are, Casey says, more to come.

Chris Tucker of *Chris Tucker Minerals* (P.O. Box 22575, Billings, MT 59104) is an expert field collector who has recently found a couple of very unusual (for Montana) things in Montana, and he was offering them in his room in the Holiday Inn. Last Labor Day weekend, Chris entered the old underground workings of the North Home silver mine in Broadwater County (active ca. 1880–1940), and there he found about five flats' worth of very nice, small specimens of brown **vanadinite** which closely resembles arsenian vanadinite (the so-called "endlichite") of Los Lamentos, Chihuahua, Mexico (Chris hasn't had the material analyzed so I can't say how arsenian it is). Some of the lustrous, richly orange-brown crystals are acicular, and occur in bundles lightly attached to matrix or as little loose sprays; other specimens exhibit solid coverages of typical convex hexagonal prisms on matrix, the crystals reaching 8 mm individually. None of these specimens rival Mexican "endlichite" at its best, but they are fairly pretty, and certainly the material is interesting in a "locality" way. Along similar lines, Chris also found some good **hemimorphite** last year at the Summit mine, Broadwater County, Montana, and *this* aspires to mimic the hemimorphite of Santa Eulalia, Chihuahua, Mexico. About 10 flats held miniature-sized clusters of medium-lustrous, colorless to white, bladed hemimorphite crystals to 5 cm long individually, some bedecked with opaque white rounded "snowdrops" of calcite; specimen sizes here range from 3 to 6 cm.

John and Gloria Cornish (j&gcornish@tenforward.com) made their debut as a mineral dealership at this Denver Show, and after a few days in the Holiday Inn John was glad (in fact, ecstatic) to say that he had almost sold out of the 2000 or so specimens—a roomfull—of **heulandite/mordenite** he dug this May and June at the remote claim in Custer County, Idaho opened three years ago by Lanny Ream. The site is a 160-foot cut in a hillside; it has been named the Rat's Nest claim, the term referring to how unpleasant the white silky beds of mordenite hair-crystals look when wet or mashed down. When pristine, however, the mordenite cavity linings are glistening white, and 4-cm "puffballs" are known to rise from them—the Rice Northwest Museum has a basketball-sized piece which probably is the best mordenite specimen in the world. The star of the show in the Cornish room, though, was heulandite, in sharp, wedge-shaped crystals to 5 cm, and flaring groups of these, loose or resting on mordenite blankets. As pretty as any from India, this heulandite is entirely distinctive, with a delicate silky luster and exquisite pale peach color (in some of the smaller pockets a more iron-rich, deeper orange heulandite is also found). The rock matrix, a greenish gray altered andesite, tends to come out as rounded pieces, loosely called "geodes," with window-openings to crystal realms deep within, and some of these geodes weigh up to 65 pounds. Best of all, the prices are low for such beautiful things: John took only *six dollars* from me for three of his best large thumbnail-sized heulandite clusters.

Come to find out that John Cornish is a friend (as I have been for some 35 years) of Doug Toland, the latterday-collecting king of Prince of Wales Island, Alaska. Doug recently found some fine **epidote** specimens of an entirely new habit (for Prince of Wales Island) just this summer. The crystals are not the familiar deep greenish black, bladed singles or blocky twins (although some fresh examples of both of these emerged too), but rather are acicular crystals in subparallel growth, forming bundles which occur either loose or with pretty, transparent crystals of chloritoid-impregnated quartz. The epidote crystals are color-zoned, too, becoming a pale pistachio-green near their tips. Marshall Kovall of *Silver Scepter Minerals* (P.O. Box 3025, Kirkland, WA 98083) was marketing just a few of these new specimens at the Main Show, including a 12-cm cluster of epidote/quartz with a central, fat epidote bundle 5 cm tall.

The *Tyson's Minerals* stand at the Main Show featured—not for the first time—a surprise or two from Canada. From the magnesite mine at Mt. Brussilhof, near the town of Radium in British Columbia, about 200 thumbnail and small-miniature specimens of very fine **dolomite**, some with microcrystals of **svanbergite**, were found last spring. The dolomite comes as sharp, lustrous, slightly flattened penetration-twinned rhombohedrons, the specimens being either loose individual twins or small, busy clusters; the loners suggest the similar clean, bright dolomite twins from the Brumado mine, Bahia, Brazil, or even the limpid dolomite microcrystals from cavities in the white marble of the Lengenbach quarry, Switzerland. Most of these crystals are colorless and transparent, though grading to milky white in thicker areas. Then there is the very rare species svanbergite, as bright orange-brown pseudo-rhombohedrons uniformly about 1 mm, sprinkled, in some cases quite densely, over the dolomite crystals or over white dolomite matrix pieces from 2 to 10 cm.

In Ontario, two neighboring roadfill quarries, the Flambrough and Canada Crushed Stone quarries, produced some excellent small specimens of **fluorite, sphalerite** and **marcasite** during this past year. The specimens were collected from both (active) quarries by two employees of Canada Lafarge Co., the operating concern, and a few flats of specimens were offered at the Main Show by the Tysons. Fluorite occurs here as very sharp, brilliantly lustrous, transparent cubic crystals running from nearly colorless through pale yellow-brown, much resembling the fluorites of Ft. Wayne, Indiana. So far the record size for the cubes is 7 cm on edge, but those measuring 2 or 3 cm are the brightest and classiest, particularly when they perch delicately on matrix of pale gray siliceous dolostone. The sphalerite crystals are never larger than 5 mm, but they too are very sharp, and have a beautiful orange-brown color and bright resinous luster, and are translucent to gemmy; the best sphalerite specimens are sparkling thumbnail-sized clusters with minor matrix. The marcasite shows itself as brilliantly lustrous coxcomb-aggregate crystals to 1 cm in groups either on or off matrix; some are a clean metallic yellow while others are intensely iridescent, with "running" oilslick colors. Minor species from this locality include calcite, celestine, and gypsum . . . this little suite of fine things from a hitherto practically unknown source is one of the best Canadian surprises that the Tysons have sprung in recent years.

Wholesale dealer Mike New (of *Top Gem Minerals*, P.O. Box 50251, Tucson, AZ 85703) always holds court in one of the big white tents in the courtyard of the Holiday Inn. This year he wowed the tent-browsers (both expert and novice, I would imagine) with very large crystal groups of what's surely the loveliest **danburite** yet to emerge from the Aurora mine, Charcas, San Luis Potosi, Mexico. Yes, yes, the colorless, transparent danburite crystals and "points" from this place have for many years now been abundant and cheap enough to give away to kids, throw at cats, or even *cut*, and even large, beautiful crystal groups have not been uncommon. But in June of this year, while putting in a ramp to a new orebody in the Aurora mine, workers found danburite crystals which, besides being lustrous and gemmy and large (to 20 cm long individually) are pale *pink*, and these stunning pink groups attain sizes of 25 x 30 cm. Mike got them all—six very large cabinet-sized clusters and about 15 of medium-cabinet size—and hauled most of them somehow to Denver. Further supplies of pink danburite specimens (just a bit smaller next time, perhaps?) would certainly be nice to see; however, according to Mike, the Aurora mine is due to close soon.

In this year's May-June issue of our magazine, Jaroslav Hyrsl and Zolina Rosales told us about some things that have emerged from Peru since the special Peru Issue of 1997; among these are **proustite** and **arsenpolybasite**, both in fine crystals, from the Uchucchacua mine, Oyon Province, Lima Department. This mine is best known for its deep red crystals of rhodochrosite, its wire silver, and more recently its large acanthite crystals, and although Hyrsl and Rosales say that proustite is "quite commonly found," Uchucchacua mine proustite has always been rare on the market, and arsenpolybasite is a great rarity from anywhere at any time (the only earlier-known good crystals having come from the Sarbay mine in Kazakhstan). Thus it was an adrenaline-booster when Dan Weinrich proved to have a few excellent thumbnail-sized specimens of both species in his Holiday Inn room in Denver this year. The dozen or so proustite specimens show lustrous, dark to bright red, thick scalenohedrons to 1.5 cm, as loose clusters or on a grayish white matrix; there is at least some damage on all of these pieces, but not much in the best of them, and prices topped out at around $300. The arsenpolybasite specimens (there are fewer than ten) are bright metallic black groups of sharp hexagonal-tabular crystals in short stacks, no more than a few mm thick and 1.75 cm across, resembling hematite roses but without the offsetting of "petals"; the finest of these little thumbnails cost $100 and is now owned by Tom Gressman (who got there before I did). Dan has no idea whether or not more selections of exotic sulfosalts will be forthcoming from this fickle locality.

Last July, Terry Szenics (4 Manchester Dr., North Massapequa, NY 11758) discovered an interesting new occurrence of **wulfenite** near an old nitrate-mining camp in the ferociously dry deserts of northern Chile (Terry's accustomed stomping grounds, of which he had many interesting snapshots to show around). The locality is a deserted old prospect called the Chapacase mine, in the Antofagasta region, where Terry gophered into a small hole to follow the mineralized milky quartz vein until he found small pockets containing druses of very bright red wulfenite crystals, with individuals to 5 mm; in general aspect the specimens resemble Russian crocoite. Thick-tabular and fat bipyramidal wulfenite crystals may exist on the same specimen, and although they are small they congregate thickly, mostly on thumbnail-sized pieces, although Terry's largest matrix plates reach about 14 cm across.

It seems that Luis Menezes never fails to come up with something new from the pegmatites of Brazil. This year his Holiday Inn room sported about 50 miniature to cabinet-sized specimens of yet *another* style of **hydroxyl-herderite** from the Linopolis region of Minas Gerais. Found by Luis last May, the wedge-shaped crystals are sharp, translucent, and lustrous, and reach 4 cm. Pale brown in an outer zone and deeper brown within, and coated in places with microcrystals of the same species, the hydroxyl-herderite crystals are associated with microcline and a brownish mica on matrix which sometimes features hollow shaft-shaped spaces where elbaite crystals have been leached away.

Luis also had two loose, very large **montebrasite** crystals from a pocket found last August in a pegmatite in the Jenipapo district, Itinga, Minas Gerais. These are greenish yellow flattened twins, medium-lustrous and generally opaque to translucent although with some small gemmy areas, measuring an amazing 18 and 20 cm long; what's more, they are doubly terminated and largely undamaged and are probably thus the world's best (surely the world's biggest, anyway) crystals of montebrasite. Orange drusy crusts of **kosnarite** microcrystals decorate some of the surfaces, making for added interest, for this occurrence of the very rare kosnarite is entirely different from the one that produced the larger, pale yellow-brown crystals that Luis brought to the last Tucson Show. The largest of all the montebrasites which came from the pocket is a clean, doubly terminated 25-cm beast which was purchased by Paul Powhat for the Smithsonian Institution.

One very beautiful recent Brazilian item appeared at many dealerships at this show: I refer to the very complex, deep reddish brown, totally gemmy crystals of **spessartine** from a place called either the Navigador mine or the Orozimbo mine, Peña do Norte area, near the town of Galileia, Minas Gerais. I noted a tiny handful of these with one dealer at Tucson, but in Denver the crystals were liberally available, chiefly from the Brazilian dealers, though Cal Graeber had about 25 very fine miniature-sized examples at the Main Show. There are a few matrix pieces around, but generally the spessartine comes as loose single crystals, so heavily distorted as to lose any overall crystal shape; i.e. they look like beautifully faceted irregular lumps. The thought that they may be etch fragments comes to mind at first, but to turn them slowly in good light is to see that they are not etched but are cleanly crystallized (step-wise) all around, a fact also evidenced by the matrix specimens. Good backlighting shows them all to possess a spectacular, deep orange-burgundy color too—let's hope that the gem cutters don't cut too deeply into future supplies.

Since nothing noteworthily new appeared from Europe this time, this seems a good place to digress on the subject of four exciting collections, three of them European in origin, which were being sold off at this show. Alain Martaud (33 rue Compans, 75019 Paris, France) acquired part of the venerable **collection of the Bally Museum**, Schönenwerd, Switzerland—about 2,000 pieces in all, of which about 250 came to Denver. As with the Behier collection which Alain first brought to market a few years ago, this assemblage of classics, with their multilingual old labels in varying states of picturesque dilapidation, was a treat to paw through. Then, at the Main Show, Wayne and Dona Leicht of *Kristalle* had a spectacular, museum-like, double-sized room in which they were selling hundreds of fine specimens of all kinds and vintages from the **collection of William Hiss**, a California collector with (it would seem) refined tastes in worldwide classics. Also the Leichts had substantial remnants of the **Wein collection**, the main wave of which they had offered in Tucson; more of this collection still reposes, they said, in Stuttgart, and will be brought later to the U.S. Finally, late on set-up day at the Main Show a great crush of usual-suspect advanced collectors was to be found milling about in the hallway outside Rob Lavinsky's late-opening room: they were waiting to see the hundreds of goodies (more will appear in Tucson next year, Rob says) from the **W. H. Leithauser collection,** displayed in majesty in a high glass case. Leithauser is a collector

from the Rhineland, now in declining health, whose entire collection Rob recently purchased. He had acquired many wonderful pieces, especially German, reaching back to the 18th century, as the many old labels proved. Among the things in the case that one could espy between jostling shoulders of eager shoppers were large, world-class specimens of Neudorf galena, Andreasberg pink apophyllite, Austrian brookite and strontianite, Ems pyromorphite, Siegerland rhodochrosite—oh, and one superlative little calcite thumbnail from Fischbach, near Idar-Oberstein, which (you guessed it) I could not afford. Thus concludes the digression on what is *old* (but again made new: be alert for recycled collections like these, as they are among the great joys of collecting) in minerals.

For several years now the Imiter mine in Morocco (type locality for the rare silver mercury sulfide imiterite) has been whispering proustite suggestions (sparse red sparkles of microcrystals in matrix), but now, at last, the locality is producing some fairly significant thumbnail-sized **proustite** specimens, with bright red, sharp crystals to around 5 mm, exceptionally to 1 cm, in loose, vivid clusters to 2.5 cm. Matrix, when present, is a dark gray, silicified mixture of silver sulfides and sulfosalts, with tiny wires of **silver** and microcrystals of **xanthoconite** and **imiterite**. The Imiter mine has been operating for at least 30 years, but the proustite-rich zone of its orebody was only entered about two years ago, this according to veteran Morocco hand Horst Burkard of *Burkard Mineralien/Fossilien* (Dornheckerstr. 20, 53227 Bonn, Germany), who brought about 50 of these vivacious little proustite beauties to the hotel show in Denver. The best thumbnails ran around $350.

A couple of websites lately have featured large, pale to deep green crystals of **microcline** ("amazonite") from a remote outcrop near the village (?) of Konzo, Ethiopia; I could glean no further locality information except that there is a tantalite mine near the site. In June 2003 this place produced fair numbers of blocky microcline crystals to 12 cm with bases merging into a "graphic" perthitic granite. In most cases the crystals' color is pale and their luster dull, but one or two pieces approach Colorado standards (though minus the smoky quartz), so this may be a locality worth watching. Stefan Stolte of *Mineralien-Fossilien-Galerie* (Fahrgasse 88, 60311 Frankfurt, Germany) had about a dozen specimens in the Holiday Inn.

Dave Bunk had about 20 loose, singly terminated **elbaite** crystals from Goma, Congo—again, there is no further locality information. The lightly striated prisms range between 1.5 and 2.5 cm long; they are rich green near the termination and pink lower down. The best news is that the crystals, although fairly conventional-looking and orphaned of matrix and geographical context, are quite clean and bright, and totally gemmy.

From South Africa, the **amethystine "cactus" quartz** which flooded the last Tucson Show was back in a second and even greater wave at Denver, some dealerships filling whole rooms with thousands of specimens of the material. The Overfamiliar-Thus-Boring Syndrome seems in danger of setting in, which would be a shame, since the specimens at their best are quite striking, with prickly, glittery quartz stalks, colorless to pale orange to pale lilac, rising to heights up to 15 cm, and usually capped by a lustrous dark purple scepter or "point." Single stalks were moving to tourists for a few bucks apiece, but the beautiful plates to a foot or more across, richly planted with glades of purple or purplish stalks, are major quartz specimens. There is a locality correction, though, on the authority of (among others) Cactus Crystal Mining Co. (P.O. Box 873, Halfway House 1685, Republic of South Africa): instead of simply "Magaliesberg" as before, the labels should say Boekenhout-Mpumalanga, South Africa.

While in South Africa, let us briefly check out some serious **diamonds**. Rob Lavinsky of *The Arkenstone* is now beginning to import some colorless, flat-triangular spinel-twinned diamonds ("macles") which range from 5 to 13 carats weight and a few millimeters to more than 1 cm on edge, and these are lustrous and perfectly, beautifully gemmy. At Denver, Rob had only six large crystals of this description, but, in his hot-wired way, he is in pursuit of more.

Supplies of interesting minerals from the ex-Soviet Union are not what they were in the early 1990's, just after the Wall fell, when the dam broke and a flood of exotic material washed over us in the West. But since those breathless days a few prolific localities have become familiar old-reliables, and one of the best of these is the great complex of copper mines around the onetime prison-camp town of Dzhezkazgan, northern Kazakhstan. This August, a major pocket of **copper** crystals was opened in the Itauz mine, 60 kilometers from Dzhezkazgan, and of the 200 or so good specimens which came out, Mike Bergmann had two shelves-full of the best at Denver. Most of the copper specimens are flattened herringbone aggregates without matrix; they range from 3 to 6 cm across, but some delicate groups grew around greatly elongated spinel twins and reach 10 cm. The few matrix pieces, with copper latticeworks rising from or enclosing shards of a dark gray rock, range from 5 to 15 cm. Some of this copper is of a pure coppery color and very clean (and not over-cleaned), while in other specimens the copper shows an appreciable darkening from films of cuprite, and dark red, subhedral cuprite crystals to 2 cm hang on some of the branching groups. A fine toenail-sized specimen cost $150 at Mike's, while some of the Russian dealers had smaller, loose sprigs of copper, generally of poorer quality, for around $25.

Without doubt, the greatest of the now-familiar localities of the ex-Soviet empire is Dal'negorsk, in the Russian Far East, which at every show seems to offer some new kind of fluorite, calcite, quartz, galena, sphalerite, chalcopyrite, pyrrhotite, etc. This time the most intriguing new Dal'negorsk item I saw was colorless phantom **fluorite**, from a pocket uncovered in March 2003 in the Nikolay mine. The best pieces (only about 10 of them, miniature to small cabinet-sized) were offered in the Holiday Inn room of the KARP dealership (P.O. Box 54, 272 80 Kladno, Czech Republic). The icy-clear fluorite crystals are perfect dodecahedrons to 4 cm, perching nicely on bristly greenish matrix composed mainly of elongated prisms of chloritoid quartz. Pick a fluorite crystal, look through one of its dodecahedron faces, and deep within you will see a sharp cube-shaped phantom subtly outlined by a milky white film. Also, according to KARP's man Ivo Szegeny, on April 1 a pocket in the Nikolay mine produced Dal'negorsk's first *blue* fluorite, and, sure enough, Ivo showed me a 7-cm matrix studded with sharp, frosty-faced, purplish blue fluorite dodecahedrons to 3 cm. Only about 20 specimens came from this pocket.

Visitors passing from the main lobby into the ballroom of the Holiday Inn could glance to the right and see a small case set up on a small table in a small side aisle, where there reposed a few *large* examples of the famous **platinum** crystals from the Konder massif, Khabarovsky Kraj, Russia. These crystals, you will recall, first amazed showgoers in 1993 in Tucson, where the van Scrivers debuted them (see Vol. 24, No. 3, p. 227). Since platinum crystals of any size had been pretty much unheard-of previously, there was some suspicion at first that these were fakes, but a study performed by Cabri and Laflamme (see Vol. 28, No. 2, p. 97 ff.) showed them to be indeed natural crystals of a platinum-iron alloy, Pt_3Fe; the same study identified some of the crystals (elongated ones, with a subtle pink tinge) as the species **zvyagintsevite**, Pd_3Pb. Although one cube-penetration twin of more than 2 cm appeared in 1993, the average size of these sharp, silky metallic gray platinum crystals is more like 2 mm, and even these tiny ones have eluded most collectors (even those who can afford them), as market supplies

have not increased during the past twelve years. Well, nowdays the *Siberia Berkut Recovery Co., Ltd.* (P.O. Box 190851, Atlanta, GA 31119) is exporting limited numbers of Russian platinum crystals; at that small set-up in the Holiday Inn, Demetrios and Theo Manos of Berkut told me that although, yes, the crystals are still being mined from alluvium in the Konder massif, the great bulk of them, including some indeterminate number of "big" ones, are staying behind in Russia. Demetrios and Theo offered for sale two platinum crystal specimens of what I'd call major size, the larger a just slightly rounded cube-penetration twin of 1.75 cm, weighing 9.6 grams and costing $3360. Otherwise the Berkut stock consists of maybe a hundred 1 or 2-mm cubes (averaging $100 apiece), a fair supply of rough platinum nuggets of varying sizes, and a few zvyagintsevite crystals from 5 mm to 1.25 cm. The Manos men were unclear about what's going on, exactly, with all this platinum in Russia today, but seemed to share the pain I registered when they told me that the crystals probably are being smelted along with the nuggets, indiscriminately.

A new find of **scolecite** this August in a well-digging in Sangamer, Ahmadnagar district, Maharashtra, India produced about a ton of enormous crystal sprays, including a few almost 2 feet across. Colorless to milky white scolecite needle-crystals to 10 cm long and 1 cm thick show good terminal faces, and may be decorated with white, translucent calcite pseudocubes to 1 cm. A wholesale dealer in one of the tents outside the Holiday Inn offered several of these giant specimens, but cleaner, more elegant-looking sprays were to be had in the room of K. C. Pandey of *Superb Minerals India* (superb@giasbm01.vsnl.net.in).

We have seen plenty of sherry-brown, gemmy **topaz** crystals from Pakistan by now, but a new lot collected this past spring are something special: totally gemmy, lustrous, clean, and nearly free of damage (!), the crystals reach 3 x 3 x 10 cm and are actually doubly terminated, with pyramid faces much larger (i.e. low-angled) at one end than at the other. The locality is Yuono village, Shigar Valley, Skardu, Pakistan. The three crystals in the keeping of Marshall Kovall of *Silver Scepter Minerals* (see earlier under Alaskan epidote) are, I think, the most all-around impressive large gem topaz crystals I've ever gazed on, save possibly some of the bigger blue ones from Russia and Brazil.

Dudley Blauwet of *Mountain Minerals International* is, as usual, just back from Asia with something new and interesting: this time it's excellent **norbergite** crystals in matrix from Oak Saung Tang, Mogok, Myanmar (Burma). Norbergite generally is an unexciting species, found in subhedral crystals at best, these enclosed in "dirty" limestones and contact-metamorphosed marbles; probably the best of the earlier-known crystals are those from in and around the Sterling Hill mine, Franklin, New Jersey. But the new Burmese crystals are fairly sharp, even fairly lustrous, yellow-brown ones reaching 2 cm across; they are equant to oval-shaped, and are found embedded in a cleavable smoky gray calcite. In his booth at the Main Show, Dudley offered about a dozen matrix specimens of thumbnail to small-miniature size, carefully prepared so that the norbergite crystals are at least half exposed.

To conclude this survey I have a locality correction—or perhaps it is just a clarification—for a very significant item: the beautiful new Chinese **mimetite**, the hit of this past Tucson Show, of which I raved at length in that show report (and see the superlative specimen on the cover of that issue, May/June 2003). You will read in the show report that at first the material was said to have come from the Wu Chuan mine in Guangxi Province, and that it was later said to come from "near Bapu" in Guangdong Province. Well, according to Dr. Guanghua Liu (mineralogist and respected mineral dealer), who has visited the locality, the source of the mimetite is the Pingtouling mine, Liannan, Guangdong Province. Whether the Pingtouling mine is in fact "near Bapu" Dr. Liu could not say, but in the name of precision, at least, it appears we must change our labels (again) if we're lucky enough to own a specimen of this marvelous new mimetite. In Denver, by the way, it was evident that no new pocket finds have been made as of that time; the specimens floating about were middling leftovers from the initial strike. However, Rob Lavinsky has reported that a new pocket of specimens has been collected just recently and will be available at the Tucson Show.

At the Main Show at the Denver Merchandise Mart there is usually a Colorado show theme of some kind. This year it was the Gilman mining district of Eagle County, with its crown jewel, the Eagle mine, famous for outstanding pyrite and golden barite specimens and for very good chalcopyrite, galena, siderite, rhodochrosite and other species. I counted nine display cases devoted to the Eagle mine, including a large case which greeted entering visitors in a very effective no-frills way with about 100 neatly arrayed specimens, some of them truly stellar. Credit for this case goes to Bill Warren, Dan and Dianne Kile and Ed Raines. Also located in the Gilman district is the Groundhog mine, whose most renowned single specimen by far, a stately 5-cm twist of ram's-horn gold, was brought to Denver this year by the Los Angeles County Museum of Natural History.

Very impressive in a plethora of different ways (the diversity of ways in which a mineral case can be "impressive" is an interesting thing to think about) were the following cases—a partial list at best, of course. Keith and Mauna Proctor's usual case of technicolor experiences in large mineral specimens was especially dazzling this year, as it centered on a 2-foot plate of rhodochrosite from "Graham's Pocket" at the Sweet Home mine, with deep-rose-colored crystals to 4 cm. A case of fine worldwide thumbnails and another case full of toenail-size specimens from Colorado was the double contribution of Michael and Debbie Ausec of Hubbard, Oregon. The Mineralogical Association of Dallas always seems to fill its showcase with uniformly fine worldwide specimens owned by its members, and here it did so again. An educational case about the diversity of "Black Minerals" was brought all the way from the University of Wollongong, Australia by Penny Williamson and Paul Carr. "A Few Rarities" was the deceptively modest title of a case from the Houston Museum of Natural Sciences which held some of the more unusual mega-specimens pictured in the Houston Museum Supplement (vol. 23, no. 1), as well as others, e.g. a sharp, 8-cm geocronite twin from Virgem de Lapa, Brazil. The Smithsonian put in a "what's-new" case with wonderful specimens from some important mineral discoveries of the past ten years; the Royal Ontario Museum showed ten very fine Canadian pieces; the Cranbrook Institute showed major silver, copper and calcite/copper specimens from Michigan and an imperial-scale Kongsberg silver specimen, with a dense bundle of parallel wires rising vertically about 25 cm from matrix. Bill and Carol Smith noted the 25th anniversary of their marriage by filling a case with specimens of silver minerals, including a thumbnail proustite from Germany which is one of the great unrequited loves of this writer's life (heaved sigh). Allan Young's case of 35 impeccably tasteful thumbnails from Idaho localities, many of them self-collected, was noteworthy, as was Tom Hughes' case which was *entirely* filled with self-collected things, including a wide, beautiful, baby-blue Silver Bill mine, Arizona rosasite and a terrific thumbnail of willemite ("troostite") from the Sterling Hill mine, New Jersey. Finally, Carolyn Manchester displayed a group of specimens with the unique common motif of "dual spheres," i.e. on each one there are two prominent spherical aggregates immediately adjacent to each other. But seriously folks, one of these was a remarkable specimen of the very rare benstonite, from

Cave-in-Rock, Illinois: two 3-cm spheres of discrete white crystals on matrix.

Great minerals, autumnal zephyrs, enthusiastic swarms of schoolkids at the Main Show (with familiar old "Mr. Bones" roaming the floor), healthy sales for the dealers, good-humored friends . . . this Denver Show must be accounted one of the best I've attended. Can Tucson, with its 50-year-anniversary extravaganza of gold, be far behind?

Munich Show 2003

by Bill Larson

[October 31–November 2]

Munich 2003. Had it been a year already? Time doesn't just fly, it moves like a cruise missile and, à la Slim Pickins in *Dr. Strangelove,* I was riding it towards one of the world's greatest mineral shows. *Yee-haw!*

I arrived on Tuesday, October 27th—a beautiful brisk, sunny day in Munich—after traveling with Harold and Erica Van Pelt, perhaps the finest photographers ever to enter the gem and mineral world, and my friends for over 30 years. We made our way to the Hotel Seibel and had an early night. On the way to dinner we noticed a large kiosk absolutely plastered with copies of the Munich poster. At the center of the poster was a magnificent faceted neon-blue Paraiba tourmaline photographed by the Van Pelts, and on the outer edge Johannes Keilmann has placed a Madagascar liddicoatite – quite an effective poster. (It is a round kiosk; to encircle it takes four posters and there are three posters above each of these, making a very effective sight.)

On Wednesday morning we took the Underground, and after one change we came to the Messe East, where it is a simple walk into the A-Halls. The show occupies halls A4, A5 and A6. A4 favors beads, jewelry, some minerals and special displays. A5 is the Overseas and European Mineral Dealer Hall, and A6 is filled with direct-supplier dealers from prolific countries, especially China and Morocco.

On this Wednesday morning the setup process was going rather more slowly than it had in earlier years. By 12 o'clock a few people were set up, and we saw that the Chinese had become much more integrated into the market than they used to be. Almost all of them carry the same mix of minerals—a few stibnites, a few green, very heavily oiled fluorites, quartzes, barites—in various qualities and quantities. Too much oil is being applied to these minerals; in fact, the joke among all the savvy American dealers is that we should invest in WD-40 shares.

I started to view specific jewelry stands in a corner of hall A-5, where we found the *Golden World of Mogok* (Via Monte Santo 5, Cernobbio Co, Italy), featuring mineral specimens from Mogok, Burma, such as **spinels** and **rubies** (of course, it is illegal to import all these items into the United States at this time because of the trade embargo—see http://www.palagems.com/burma_embargo.htm for full details). There are good specimens of transparent **mica in calcite** from Mogok up to 1 inch, silver-gray and absolutely clean.

Kaiser Mineralien from Vienna (Westbahnstr. 42, A-1070 Wien) had a very large selection (as this same dealership did in Ste.-Marie) of new Ethiopian **microcline ("amazonite")**, priced from €28–60 for miniatures, and in the €500 range for large cabinets. I saw a very beautiful specimen with three pale smoky **quartz** crystals, the largest of which is perhaps three inches long, and "amazonite" crystals on the base. This points to a possible great future supply. The color of the microcline varies from pale green to intense blue, and two small single crystals have some of the darkest blue color I've ever seen for the species.

Luis Menezes Minerals (R. Esmeralda 534, Belo Horizonte, MG, BR-30410-080 Brazil) featured some beautiful new **vivianite** with **muscovite** and **pyrite** from the Cigana mine, Galileia, Minas Gerais, Brazil. The prices were marked somewhere between €80 and €200, and Luis had a very fine cluster, already sold when I saw it, marked €3,000. He also had a new find of **quartz** with **brookite** and **rutile** inclusions, the brookite crystals in some of them being very fine, from Corinto, Minas Gerais, Brazil, priced anywhere from €50–600. Carter Rich, an American-classic specialty dealer, had purchased the finest one.

We moved on to the booth of Clive Queit (Box 1014, RSA-2055 Sandton Fourways, South Africa), where Clive showed me an absolutely magnificent pale **amethyst** twin from the now famous Mpumalanga quartz discovery (source of the so-called "cactus quartz"). This is a beautiful Japan-law twin, about 7.5 cm on one leg and 5 cm on the other, with a small, exciting single crystal making an accent on the front. Clive reminded me that there was a special showcase full of some beautiful quartz specimens from the same occurrence, including several other Japan-law twins, although the one I was holding was the most charming. Also, Clive had flat after flat of beautiful single crystals marked from €10 to €80 in miniature sizes.

We continued our tour of A-5, and in the "Guests from Overseas" booths we saw many dealers who had come directly from Pakistan and Afghanistan, each one with 2–3 meters of table space, and featuring lapis, aquamarine, beryls, and garnets of medium quality. Most of them had much finer things underneath the table, which they were willing to bring up for the knowledgeable.

Next I saw *Fabre Minerals.* Jordi's booth was extremely well lit, and the minerals were graded by size: in the top glass case were miniatures and in the bottom two were large and still larger cabinet specimens. Everything was well selected, colorful and well priced. He had a lot of the new **gypsum** in radiating clusters of transparent needle crystals, from Murcia, Spain. He had some new Japan-law twinned **quartz** from the Feng Jiashan mine in Daye, China. One particularly attractive specimen, with a twin measuring 4 x 5 cm on a matrix of other quartz crystals and pyrite, was marked €250. Across the way was Stephan Stolte's booth, filled with new things from Namibia, mostly **aquamarines** and Brandberg, Namibia **amethyst**. Next to him was a large selection of **cobaltoan calcite** from Bou Azzer, Morocco, displayed by Thomas Deil; these are newly found, and resemble the ones that appeared at Sainte Marie. The specimens were marked from €15–35 for miniatures to small cabinets, and somewhat better specimens, in bright pink colors, were marked from €35 to €200.

Alain Martaud (33 rue Compans, 75019 Paris, France) had three cases, each filled with very carefully selected miniatures and small cabinet specimens. He has had no luck unearthing collections, but he has produced several fine classics, including a series of old **siderite** specimens from Isère, France marked from €40–270. They are quite exceptional in quality, with almost no damage, and a fine greenish brown color. Next to these were four very nice, small **gwindel quartz** miniatures, marked €275.

Enrique Kucera (Comte d'Urgell 171, E-8036 Barcelona, Spain) had a very large selection of Vera Cruz **amethyst**, mostly small miniatures in the €40–60 range; more interestingly they had, as they did last year, a group of **amethyst** specimens from Guerrero, Mexico. Many of the small cabinets were priced at €200, and were selling well. Some of the larger ones show a little damage, but have a lovely color, and some of the crystals are almost 15 cm long. Across the way was *Cactus Crystal Mining Co.* (P.O. Box 873, RSA-1685 Halfway House, South Africa) with flat after flat of variously colored **quartz** specimens, including Japan-law twins, from the fairly new discovery in South Africa, and business seemed extremely brisk. This booth may turn a lot of casual tourists into new collectors, since the pieces are fascinating as well as inexpen-

sive. Next to it I found my friend Rashid with a large selection of Moroccan minerals, including new **cobaltoan calcite** and **roselite** specimens, priced more modestly than at Ste.-Marie and definitely selling rapidly. The best of the calcites are a wonderful pink with 1-cm crystals, and were marked €100 maximum (these were all gone in 60 minutes). The roselite specimens have crystals up to 5 mm with calcite crystals, and were priced at only €30. Rashid also had some **vanadinite** on barite, and one could find a good specimen for €25–60. These are bargain specimens for beginning collectors. He had other vanadinite specimens, with crystals to 2 cm, but not of top color, marked up to €1,500.

The *Geofil* dealership (Alto de Bela Vista, 2-A, 2750 Cascais, Portugal) had its normal selection pf specimens from Mozambique, including large **lepidolite** clusters, and two 10 x 10-cm **phenakite** crystals; within this first day, both of the large phenakites were sold to lapidaries for cutting. Geofil also had a very nice collection of old Panasqueira, Portugal **apatite/quartz** specimens. The ones with the apatite crystals showing the best blue color were marked from €380 up to €1,500; the very best sold quickly, but after the frenzy was over there were still about a dozen nice specimens left.

Next-door was the stand of *ESM-Impex* (Friedhofstr. 3, 95709 Tröstau, Germany), where the owner, Erich Schmidt, had a complete new selection of **schorl, aquamarine**, and **fluorite** specimens from the Okorusu mine, Namibia. The fluorites were marked from €42–120; the €120 piece is a small cabinet, about 10 x 20 cm, with 1-centimeter crystals, and quite well cleaned. The schorls show an amazing variety of crystal forms in a range from trigonal to simple-hexagonal. Right here, I could have assembled an entire collection as good as in the "Special Tourmaline" display in Hall A-6, and the specimens were very modestly priced from €18 up to the most expensive one I could find, at €165. This specimen measures 5 x 5 cm and shows a dominant, perfect, doubly terminated schorl crystal.

Across the way was the booth of *Brice & Christophe Gobin*, with an excellent selection of minerals including some very fine **cobaltoan calcites** from Morocco—of a little higher quality than at other dealerships, and priced accordingly. In the front was a magnificent giant cabinet specimen of **malachite**— I've never seen the likes of it. It measures about 2 x 2 feet and harbors perhaps 30 perfect, absolutely undamaged stalactites. The Gobins also had a large selection of single crystals of golden color **topaz** said to be from Zambia. These are true "imperial" topaz crystals measuring up to 7.5 cm; they are extremely similar to the Brazilian crystals from the Ouro Preto area, though somewhat paler in color, and (as in Brazil) there are even a few pink crystals among them. The smaller crystals are priced in the hundreds of Euros; €300–400 buys a small miniature, and €800–2,200 buys you a fine single crystal up to 2.5 x 6 cm. This may be the most important new find seen at Munich, as true imperial topaz is quite distinctive.

Moving on, we passed booths full of faceted gems as we slowly worked our way into hallway 5. There three adjacent booths offered Pakistani minerals, including some **feldspars** 2 feet across with **tourmalines** to 10 cm across sitting on top. Along the wall, *Stone Flower* (Dovzenko 6, 562, GUS-119590 Moscow, Russia) had a new selection of skarn minerals from the Dashkesan mine in Azerbaijan, as well as a nice selection of **rutile**, but only as small miniatures, from Kapudjhuk Mountain in Azerbaijan.

Tironi Minerali (Via Nazionale 11/A, I-23020 Prata Camportaccio (SO), Italy) offered a nice display in six showcases, including about a dozen exceptional specimens of the new **spessartine** from Brazil—small miniatures marked at €190 each. The same dealership had some new large specimens of **hematite** from Brazil, including one that is about 10 x 20 cm, marked €2,600, the largest hexagonal platelets being individually 4 x 5 cm.

Bersani & Rossi (Via Mario Borsa 24, I-20153 Milano, Italy) had one of the largest fine **arsenopyrite** specimens from China I have ever had the pleasure of seeing. It is a quartz crystal group of about 20 x 25 cm; attached to a major quartz crystal with almost no damage is a 10 x 15-cm cluster of arsenopyrite crystals, better than anything I've seen from Mexico, even in its heyday. At this stand, too, was a very fine Chinese green **fluorite** octahedron, lacking the oil of some of the Chinese fluorite specimens, so it actually looks nice.

Hori Mineralogy Ltd. (4-13-18 Toyotamanaka, J-Nerima, Tokyo 176-0013, Japan) brought some unusual things, including a few rarities, e.g. **kobeite, ferrierite** and **henmilite**, and a so-called "cherry stone after cordierite"—all modestly priced from €10–60 each. Next, former Fersman Museum curator Dr. Leo Bulgak of *Exotic Minerals of Russia* (Lazorevy Prospect 24-96, GUS-129323 Moscow, Russia) was displaying his usual mixed supply of goodies, including some **khaidarkanite** from Khaidarkan, Kirghizia, a bright blue mineral marked €60. Also, some **likasite** specimens from Kazakhstan were marked €40 each.

Horst Burkard of *Burkard Mineralien/Fossilien* (Dornheckerstr. 20, D-53227 Bonn, Germany) had a large selection of Moroccan minerals in the front of his fine booth, including fine **fluorites** and **vanadinites**, and a whole glass case of the new **proustite** matrix crystal clusters, which are still only showing promise. He seems also to have found a nice new lot of **azurite**, as microcrystals and pseudomorphs. Some small cabinet specimens of azurite are very bright: they scintillate with blue fire and sport crystals to 3 mm, but were very modestly priced in the €35–90 range.

Nearby was *Barras-Gautier Mineraux* (Le Besset, F-63880 Olliergues, France) with the usual selection of high-quality, well-selected minerals. The Pakistan specimens here included **schorl** with beautiful **spessartine**, but, unluckily, few of the schorl crystals are terminated, though they are extraordinarily brilliant. About 25 excellent specimens of this type were priced mostly in the €500–1,800 range. Across the way, at the stand of our friend Lino Caserini (Via Don Giuseppe del Corno 1, I-20132 Milano, Italy), was a beautiful case of the new rose-red beryl-group mineral **pezzottaite**. Lino has also gotten hold of some very old Swiss collections—one **fluorite** specimen from Val d'Ossola is a 15 x 35-cm matrix with 1-cm bright pink octahedrons, marked €2,900. The pezzottaites in the thumbnail range seem to be the best, and they are marked about €100 each in "perky boxes"—up to 1-cm crystals with very nice form. He had also a few larger matrix specimens marked up to €2,200.

Next came *Polychrom France Sarl* (29, rue des Buissons, F-37170 Chambray les Tours, France) with an extraordinary display of pezzottaites, including many specimens in a beautiful hexagonal glass case taller than I am, with revolving circular shelves. Each crystal is vibrant pinkish red, but most are damaged, so that, for their high value and extraordinary color, they will probably need to be cut in the end. No prices were marked, but some of these pieces weigh 200 and 300 grams each. The same dealership had a small selection of other minerals from Madagascar, mostly **quartz** and a few nice **schorl** specimens.

In the center aisle was *Le Minéral Brut* (BP 16, F-01450 Poncin, France), mostly with cut stones, but also offering some interesting Madagascar specimens, including a new selection of small single crystals of **phenakite** and four nice thumbnails of what he called "gem" **staurolite** from Madagascar.

August Mayer had a large booth featuring a massive selection of **gold**. The gold here could be measured in kilos, and different localities were represented, although the bulk of the specimens were from California. There must have been close to 1,000 gold specimens, as I judged from counting the specimens in

Figure 10. **Tourmaline exhibits at the 2003 Munich Show. Jeff Scovil photo.**

Figure 12. **Vivianite on matrix, 3.6 cm, from the Cigana mine, Galileia, Minas Gerais, Brazil. Luis Menezes specimen; Jeff Scovil photo.**

Figure 11. **Tourmaline exhibits at the 2003 Munich Show. Jeff Scovil photo.**

Figure 13. **Vivianite crystal cluster, 3.6 cm, from the Conotillas mine, Potosí, Bolivia. Jürgen Tron specimen; Jeff Scovil photo.**

one of the cases and multiplying by the number of cases—truly an amazing sight.

I arrived at the center of the mineral show, where I could see three magnificent booths, and when I say magnificent I mean that I think these booths set a new trend for upscale mineral collecting. The first was that of Marcus Budil's *Fine Minerals International GmbH* (Raiffeisenstr. 14, D-83607 Holzkirchen, Germany): a 30 x 30-foot booth with excellent lighting. The minerals were individually placed in glass cases with many halogen lights and three or four very large decorator-type specimens placed among them; one of these was a 3 x 4-foot **amethyst** geode with a perfect, undamaged calcite crystal a foot tall, and sprinklings of amethyst crystals re-grown on the calcite. This specimen would be truly magnificent for any museum—Joel Bartsch admitted that it would be a centerpiece even in Houston's fantastic display.

Across the way was Andreas Weerth of *Weerth Edelsteine und Mineralien*, who, along with Helmut Brückner, was one of the first to really go upscale in show-stand presentation, with magnificent individual lighting by halogen lamps, and of course with terrific selections of Pakistani minerals. It was fun to stand here at the show's center, where these opulent booths were placed, and listen to comments: as people walked by they saw the Pederneira tourmaline case, or the Arkansas quartz crystal case, or the new things that Marcus Budil had just bought in Pakistan, and the oo's and ah's provided rewards for all the efforts that these booths had taken to set up.

And, to my taste, the most beautiful showing of minerals ever done at Munich, or at any commercial show for that matter, was presented at the *Kristalle/Crystal Classics* booth, which covered an area measuring about 10 x 40 feet. The back part of the area was bounded by five cases in a gentle arc; then there were three more cases separated from these by a row of 2-foot balls of yellow daisies. I teased Dona Leicht that she must have brought such beautiful flowers from California. In the front, there were low-level showcases filled with silver specimens and with single gem crystals. Accompanying these cases were lilies and orchids. The whole effect was that of a magnificent living room, or at least of what many would wish their living rooms looked like. . . . Wayne and Dona certainly set the standard high for display.

Next came Helmut Brückner (Postfach 13 42, D-79373 Müllheim, Germany), who had a small **amethyst** geode with one **calcite** crystal completely capped by microcrystals of amethyst: a truly wonderful specimen! I hope that the amethyst miners in Brazil are receiving enough encouragement so that they will continue to preserve geodes like that. Across from Helmut was the Desert Inn re-creation, a tribute to Johann Keilmann's genius.

As I was finally walking away from the central exhibition area I spotted the fine booth of *René Triebl* (Rudolf-Hawel-Gasse 21, A-2700 Wiener Neustadt, Austria), featuring Romanian minerals. He had specimens of **gypsum** from a May 2002 discovery at Cavnic, Maramures, Romania. These are complex, quite exciting matrix specimens, quite different from anything that Mexico ever produced, with flaring, doubly terminated crystals. René also had **calcite** with **siderite** and **dolomite** from the Turt mine in northern Romania, labeled April 2003. These are beautiful white balls of subparallel crystals, very complex and very perfect, marked between €50 and €150.

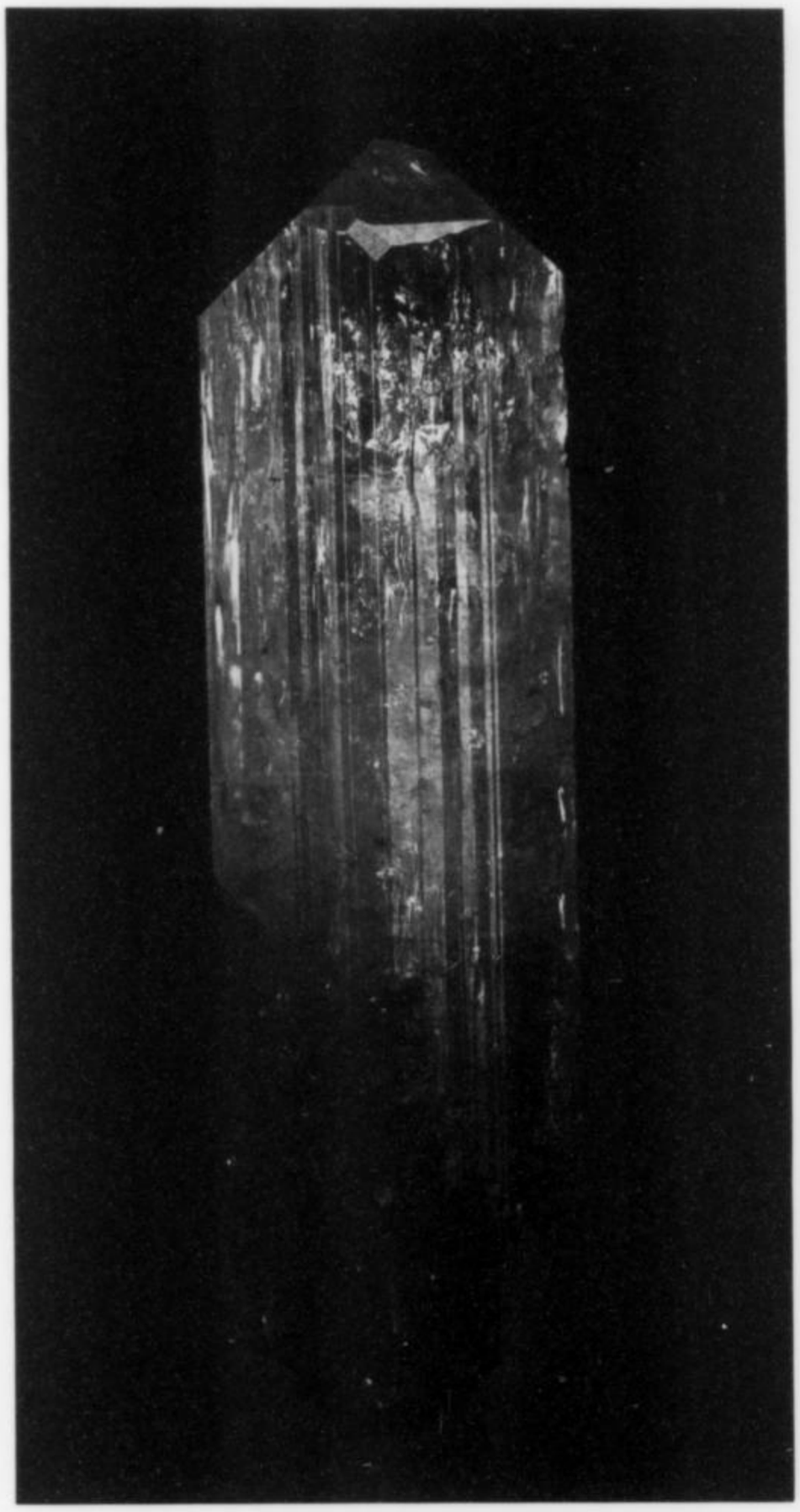


Figure 14. **"Imperial" topaz crystal, 7.8 cm, from near Kolwezi on the Zambian border, Republic of the Congo. Bill Larson collection; Jeff Scovil photo.**

Wilke Mineralien (Odenwaldring 44, D-64859 Eppertshausen, Germany) had whole cases full of **cavansite** and a complete selection of Indian minerals—an amazing sight.

At the booth of François Lietard (18 rue de Vaganay, F-69850 St. Martin en Haut, France) there was a very well displayed selection of mostly Pakistani and Afghan minerals; however, I also saw a fine group of **garnets** from Brazil reminiscent of some of the things he had at the Ste.-Marie show. I talked to François himself and he said the only new thing in his stock was **sapphire** from Afghanistan. These are bluish gray, elongated crystals to more than 6 cm long on a mica matrix. François also had a nice selection of blue-purple apatite crystals from €50–180.

Next door to François was *3 G Environment* (BP 76, 2-4 rte Noue, F-91193 Gif SurYvette, France) with a good display, including a beautiful "cross" of **amethyst** from Piedra Parada, Veracruz, Mexico. This specimen shows doubly terminated, lightly colored amethyst crystals 10 cm long forming a perfect cross; it was marked €3,000, but it is truly exceptional.

At the end of the row was the booth of *Pregi Gemme*, from Milan (Via dei Piatti 2, I-20123 Milano, Italy). This dealership inspired the biggest stir of the show by bringing out a new find of exceptionally dark blue **topaz** from Virgem da Lapa, Minas Gerais, Brazil. The best four specimens sold immediately. In the center of the display, a triangular glass case held three specimens, two of which were very fine, large, vibrant pink **elbaite**. Although they are only single crystals, they are extremely complex; the largest weighs 11 kg and is perfectly terminated. In the case were pictures of the mine and of workers cleaning the specimens. They are very pale in color in the photos; however, they are now a vibrant pink in real life. The mine is named Lavra Urubu, near Taquaral, Minas Gerais, Brazil.

In the center of the "Guests from Overseas" section was Christopher Johnston (P.O. Box 354, NAM-Omaruru, Namibia), who is mining the Okorusu mine in Namibia for **fluorite**, and he is taking exceptional time in trying to perfect the cleaning of specimens without destroying the fluorite or the associated minerals, especially the quartz crystals. He has done quite a good job, and in Munich he had a large display of mostly cabinet specimens marked from around €350 to €450. He is quite excited that his profit-sharing plan benefits the miners' town, and he is trying to do something for the local schools and some of the children.

Next door was *Hammad Gems* (Nawab Gemstone Market, PAK-25000 Peshawar, Pakistan), with a nice selection of individual specimens from Pakistan, especially **aquamarine** on matrix. A special box which was shown to me contains a magnificent 15 x 20-cm matrix specimen of feldspar with no less than four perfect aquamarines growing in and around it, from Shigar, Parkistan. I dared not ask the price, but it is absolutely gorgeous.

Behind *Hammad Gems* there were no fewer than four more Pakistani dealers with similar wonderful specimens from the various pegmatites in Pakistan, and occasionally Afghanistan. Some exceptional **feldspars** have been coming out of Shigar, Pakistan lately—the crystals are pure white and extremely sharp, and come in small clusters. One particularly attractive specimen I saw measures 7.5 x 10 cm; it is a cluster of little quartz crystals and a few topaz crystals, and very sharp white feldspars up to 2.5 cm, the whole specimen asking €150.

On the end of the Overseas booth was *Intan, S.L.* (Provenca 281, 1ø 4A, E-08037 Barcelona, Spain), with a large number of **amethyst** crystals from Bolivia, somewhat lighter in color than before, showing great phantoms—a large selection of pieces, from crystal groups several feet across, marked in the €2,000 range, right down to single crystals. There were perhaps 400 or 500 specimens in the €30–85 range. Being lighter in color, the crystals reveal their phantoms all the more attractively.

The very good stand of the *Mineralogical Record* was doing a brisk business in various books and magazines, in back issues of the *Record*, and in a few select, nice minerals brought by Renato and Adriana Pagano. At the booth I noticed Erica Pohl, the wonderful collector from Switzerland, looking at a very fine, unusual specimen of **rhodizite** from Madagascar. She was working Renato Pagano for new information on the rhodizite specimen, which he supplied, and she also picked out a very fine, small, brilliant red **liddicoatite**. The stand was very well done, with large posters arrayed in the back. Next to it were the stands of *Rocks & Minerals* and Eberhard Equit. *Rocks & Minerals* had a beautiful display of all their latest books, and Equit was signing copies of his book for people. For those *Record* readers who don't yet have Equit's book, *World's Mineral Masterpieces,* it is time to get one before it is sold out.

The stand next to these was that of *Lapis*, perhaps 60 feet long. Here was a tremendous variety of mineral books and magazines (mostly in German), including books and magazines that we don't often see in America. These included *Minerals of Sweden*, the new *extraLapis* on copper, a book called *Faszination Turmalin* by Rustemeyer (appropriate for the Munich Special Display this year), and publications on collecting areas in Switzerland. The fourth side of the large booth was devoted to antiquarian books, and here I spotted Mr. and Mrs. Jerusalem of Idar-Oberstein, searching through about 400 fairly priced old books for a few to add to their collection. By now we were back at the Desert Inn Re-creation, where music was drifting out and people were sitting at the bar drinking beers. It's quite amazingly accurate and brings back memories from the 70's.

By the time we came to Hall A-6 on Friday morning the grand opening of the special exhibit had taken place, and we saw tourmalines on the left and trilobites on the right (those constituting the dual show theme this year). I walked into the trilobite area and saw wonderful examples of all types and localities of trilobites, with explanatory text. One display, perhaps 4 x 5 feet, contained almost a dozen foot-long trilobites from Morocco; the people showing me around said that very little restorative work had been done on these.

One museum showed a meteorite from Neuschwanstein, and one display put in by the Freiberg Mining Academy showed international schorl tourmalines, while the other one featured interesting pieces of cone-shaped German schorl, about 1 x 3 x 7 cm. Then there was an entire case of just German schorls. On the other side they had very good elbaite specimens, and in the back was a fine 5 x 12-cm "rubellite" from Pala, San Diego County, California, probably mined before 1908.

The center portion of the special exhibit area, labeled "Meditation Turmalin," displayed large pictures of miners in Africa, probably at Alto Ligonha, and then incredible, poster-sized pictures showing micro-details on the terminal faces of blue tourmaline crystals. There were many hexagonal glass cases mostly filled with schorls showing different habits, with color photographs of thinly sliced tourmaline crystals resembling some of the finest liddicoatites from Madagascar, but only 1 inch across. In other cases, tourmaline crystals displaying various combinations of forms made for interesting displays, and again there were vibrantly colored poster-size photographs of tourmaline slices in all shades, including one showing nine slices in vibrant orange.

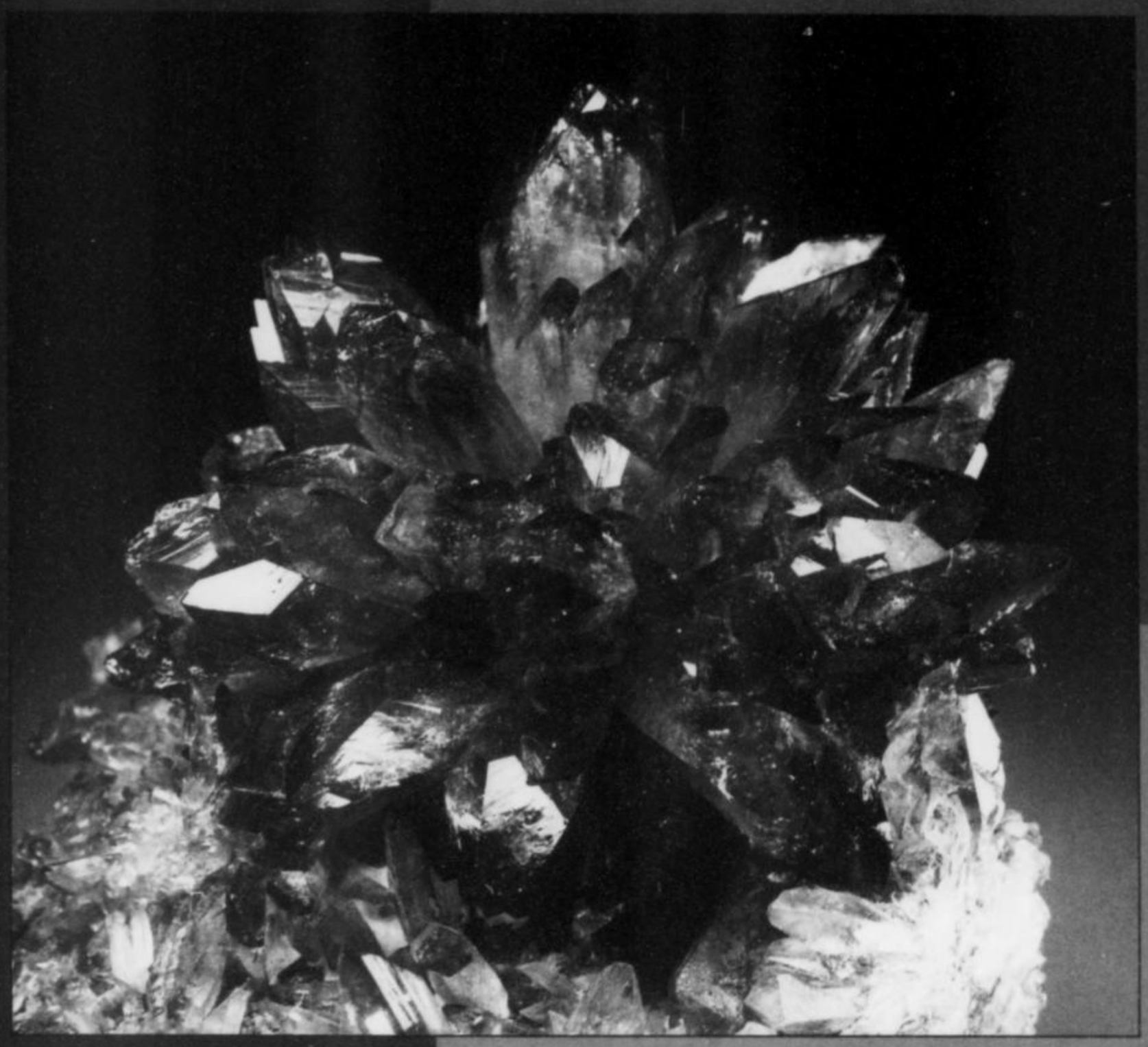
From the crystal museum in Riedenburg, there was a series of 21 very large slices from what appeared to be the same crystal of

(continued on p. 179)

Fine Minerals

for the Discriminating Collector.

See us in Tucson at the Executive Inn (Feb. 2-15) and the Westward Look Show (Feb. 7-11), and in Denver at the Holiday Inn



Creedite, 5.2 cm, from Akchatau, Kazakhstan.
Wendell Wilson photo.

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William Metropolis
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Specialties: Systematic Mineral Coll'n

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Tel: (719) 495-2182
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Curator: Paul J. Bartos
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Curator: Dr. Bruce Bradford
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E-mail: bbradfor@stetson.edu
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Mailing: 421 N. Woodland Blvd., Unit 8403, DeLand, FL 32720-3757
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Curator (mineralogy):
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Adjunct Curator: Dr. John A. Jaszczak
Tel: (906) 487-2572
Michigan Technological Univ.
Houghton, Michigan 49931
Hours: 9–4:30 M–F
Specialty: Michigan minerals, copper minerals & worldwide minerals

Natural History Museum of Los Angeles County

Fax: (213) 749-4107
Website: http://nhm.org/minsci
Curator (Mineral Sciences):
Dr. Anthony R. Kampf
Tel: (213) 763-3328
e-mail: akampf@nhm.org
Collections Manager:
Dorothy L. Ettensohn
Tel: (213) 763-3327
e-mail: dettenso@nhm.org
900 Exposition Blvd.
Los Angeles, CA 90007
Hours: 9:30–5:00 Daily
Specialties: Calif. & worldwide minerals, gold, gem crystals, colored gemstones
Support organization:
The Gem and Mineral Council

Museums listed alphabetically by city

THE MUSEUM DIRECTORY

California State Mining and Mineral Museum

Website: http//parks.ca.gov/parkpages/park_page.asp?lvl_id=227
Curator: Peggy Ronning
Tel: (209) 742-7625
Fax: (209) 966-3597
e-mail: mineralcurator@sierratel.com
5005 Fairgrounds Rd.
Mariposa, CA 95338
Mailing Address:
P.O. Box 1192
Mariposa, CA 95338
Hours: 10–6 Daily (May–Sept.)
10–4 Wed.–Mon. (Oct–Apr.)
Specialties: Gold, California minerals, California mining

Arizona Mining & Mineral Museum

Department Director: Doug Sawyer
Curator: Sue Celestian
Tel: (602) 255-3795
1502 W. Washington Avenue
Phoenix, AZ 85007
Hours: 8–5 M–F, 11–4 Sat., closed Sun. & holidays
Specialty: Arizona minerals

Matilda and Karl Pfeiffer Foundation Museum

Executive Director: Anne Winchester
Tel: (870) 598-3228
E-Mail: execdir@pfeifferfoundation.org
P.O. Box 66
1071 Heritage Park Drive
Piggott, AR 72454
Hours: 9–4 Thurs.–Sat., 9–5 Thurs.–Sat. (Daylight Savings Time)
Specialties: Fine collection of geodes from Keokuk, Iowa, area; worldwide collection of minerals

Carnegie Museum of Natural History

Collection Manager: Marc L. Wilson
Tel: (412) 622-3391
4400 Forbes Avenue
Pittsburgh, PA 15213
Hours: 10–5 Tues.–Sat., 10–9 F, 1–5 Sun., closed Mon. & holidays
Specialty: Worldwide minerals & gems

Museum of Geology

Curator: Thomas J. Campbell
Tel: (605) 718-2288
South Dakota School of Mines & Technology
501 E. St. Joseph St.
Rapid City, SD 57701-3995

New Mexico Bureau of Mines & Mineral Resources—Mineral Museum

Director: Dr. Virgil W. Lueth
Tel: (505) 835-5140
E-Mail: vwlueth@nmt.edu
Fax: (505) 835-6333
Associate Curator: Robert Eveleth
Tel: (505) 835-5325
E-mail: beveleth@gis.nmt.edu
New Mexico Tech,
801 Leroy Place
Socorro, NM 87801
Hours: 8–5 M–F, 10–3 Sat., Sun
Specialties: New Mexico minerals, mining artifacts, worldwide minerals

Penn State Earth & Mineral Sciences Museum

Curator: Dr. Andrew Sicree, PhD
Tel: (814) 865-6427
E-mail: sicree@geosc.psu.edu
Steidle Building
University Park
State College, PA 16802
Hours: 9–5 M–F & by Appt. (closed holidays)
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Gargoti Mineral Museum

Director: K. C. Pandey
Tel: ++91 2551 230528
Fax: ++91 2551 230866
D-59 MIDC, Malegaon, **Sinnar,** Nashik 422 103 India
Specialty: Minerals of India

Arizona-Sonora Desert Museum

Fax: (520) 883-2500
Website: http://www.desertmuseum.org
Curator, Mineralogy: Anna M. Domitrovic
Tel: (520) 883-3033
E-mail: adomitrovic@desertmuseum.org
2021 N. Kinney Road
Tucson, AZ 85743-8918
Hours: 8:30-5 Daily (Oct.-Feb.)
7:30-5 Daily (Mar.-Sept.)
Specialty: Arizona minerals

Pacific Museum of the Earth

Curator: Kirsten Parker
Tel: (604) 822-6992
E-mail: kparker@ubc.ca
Dept. of Earth and Ocean Sciences
Univ. of British Columbia
6339 Stores Rd.
Vancouver, BC, Canada V6T 1Z4
Hours: 9–4, M–F
Specialties: BC–Yukon–Pacific NW, Worldwide Gold & Silver

U.S. National Museum of Natural History (Smithsonian Institution)

Curator: Dr. Jeffrey E. Post
e-mail: minerals@nmnh.si.edu
Collection Managers: Paul Pohwat and Russell Feather (Dept. of Mineral Sciences)
Washington, DC 20560-0119
Hours: 10 am–5:30 pm daily
Specialties: Worldwide minerals, gems, research specimens

William Weinman Mineral Museum

Asst. Curator: Doug Gravely
Tel: (770) 386-0576
51 Mineral Museum Dr.
White, GA 30184
Hours: 10–4:30 Tues.–Sat., 2–4:30 Sun.
Specialty: Georgia & worldwide minerals & fossils

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Tel: +39 02 8846 3326
Fax: +39 02 8846 3281
E-Mail: fpezzotta@yahoo.com
Associate Curator: Alessandro Guastoni
Department of Mineralogy and Petrography
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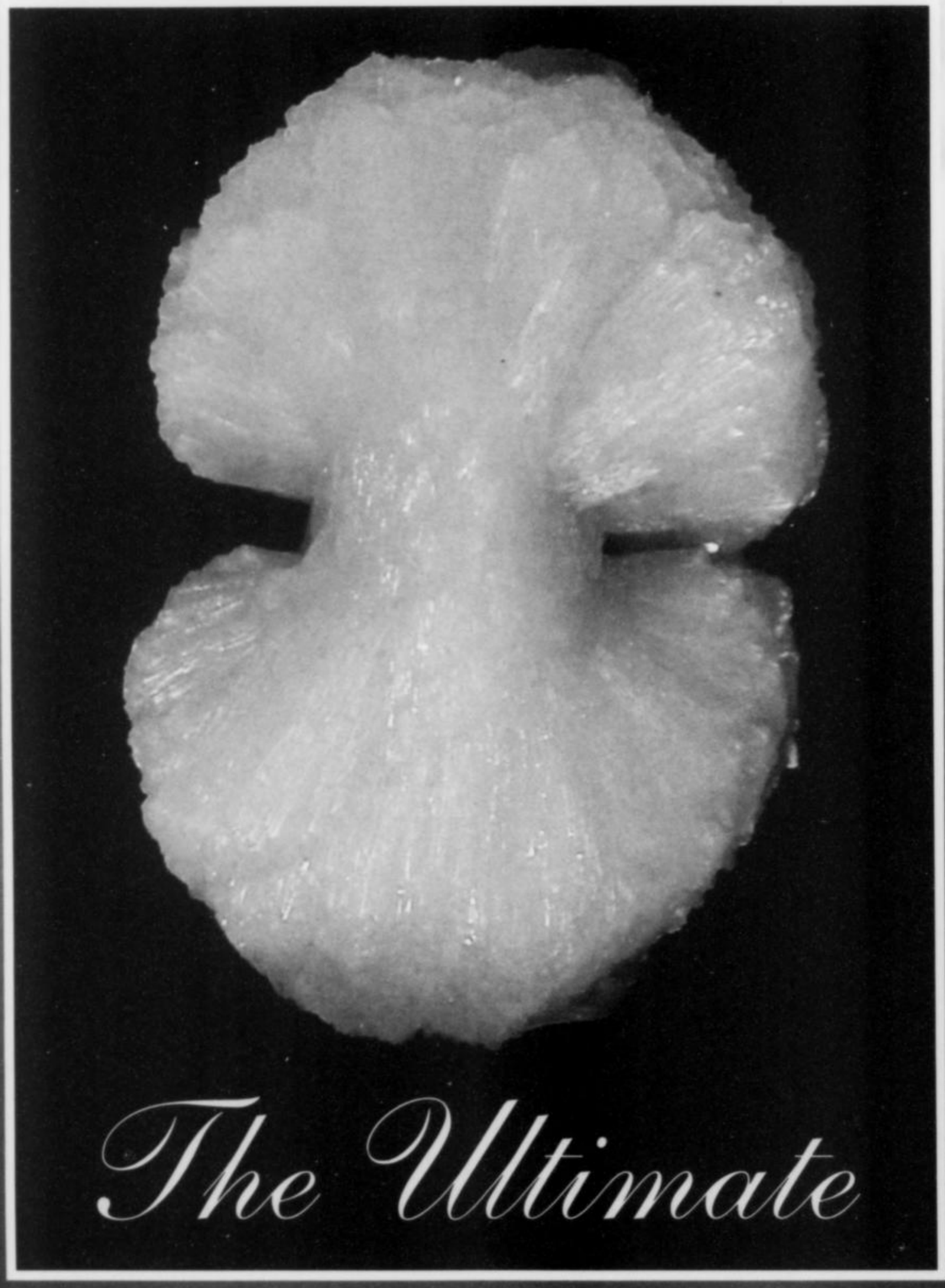

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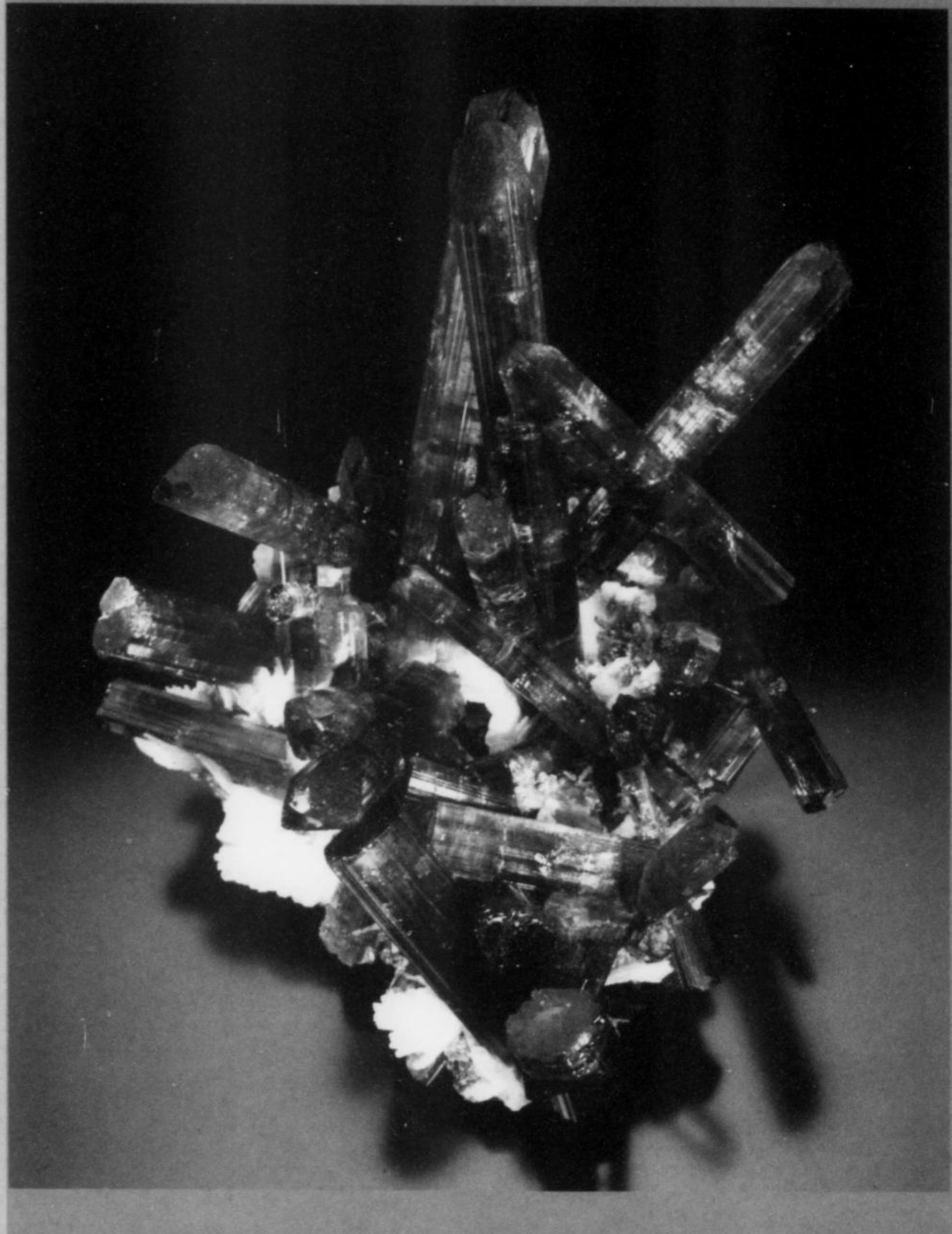

ELBAITE with Cleavelandite and Lepidolite, 20.8 cm, from the Pederneira mine, Minas Gerais, Brazil. Acquired at the 2003 Tucson Show from Collector's Edge Minerals, Inc.

Jeff Scovil Photo

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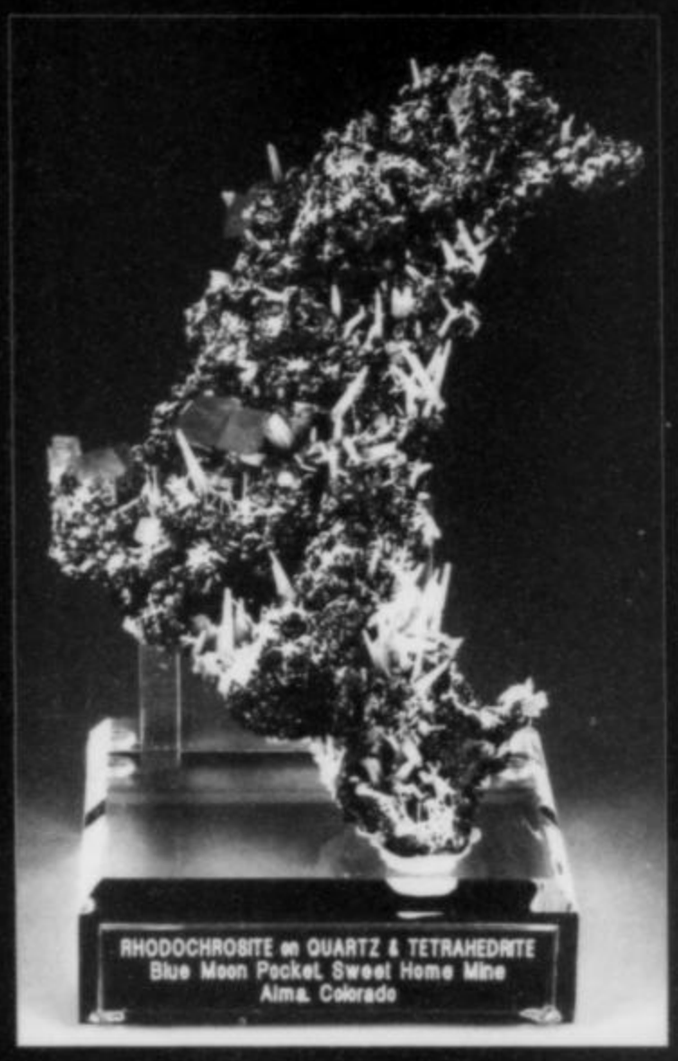

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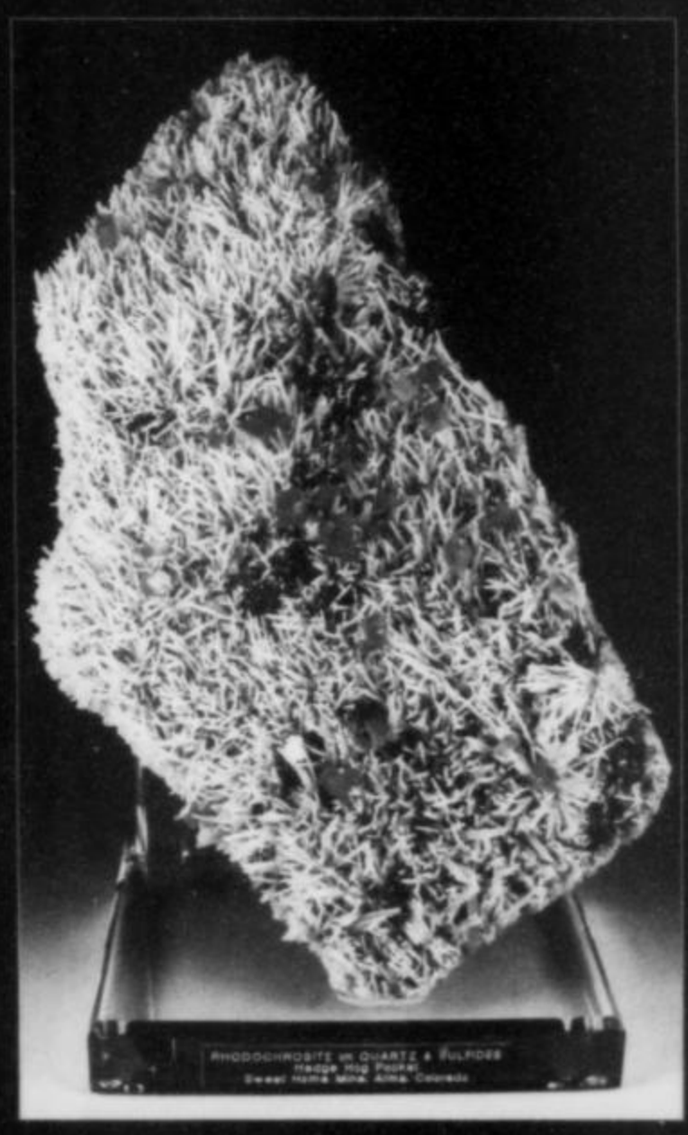

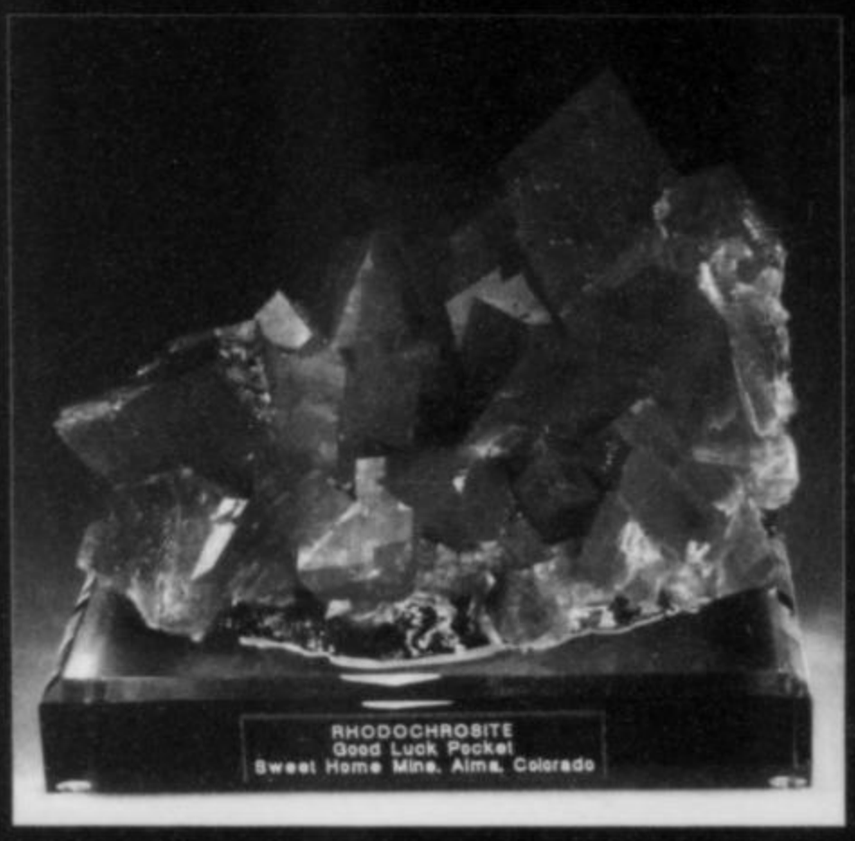

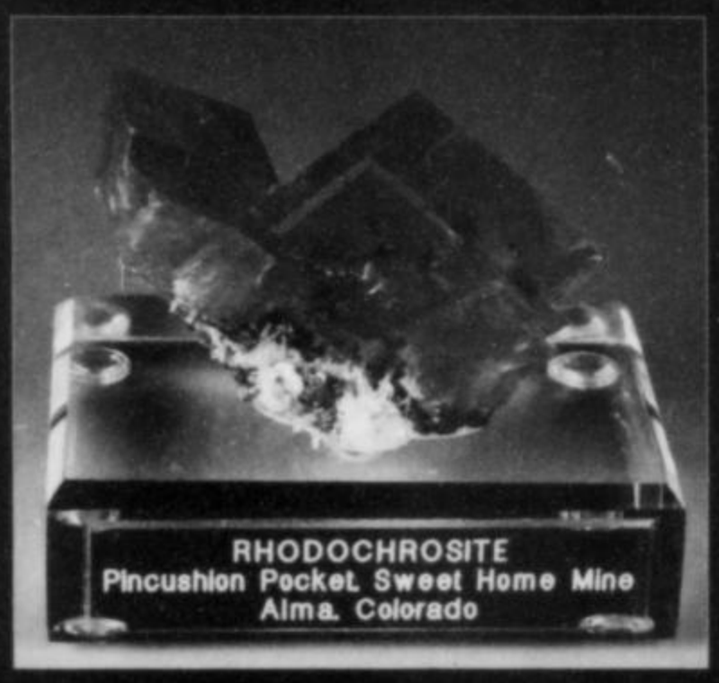

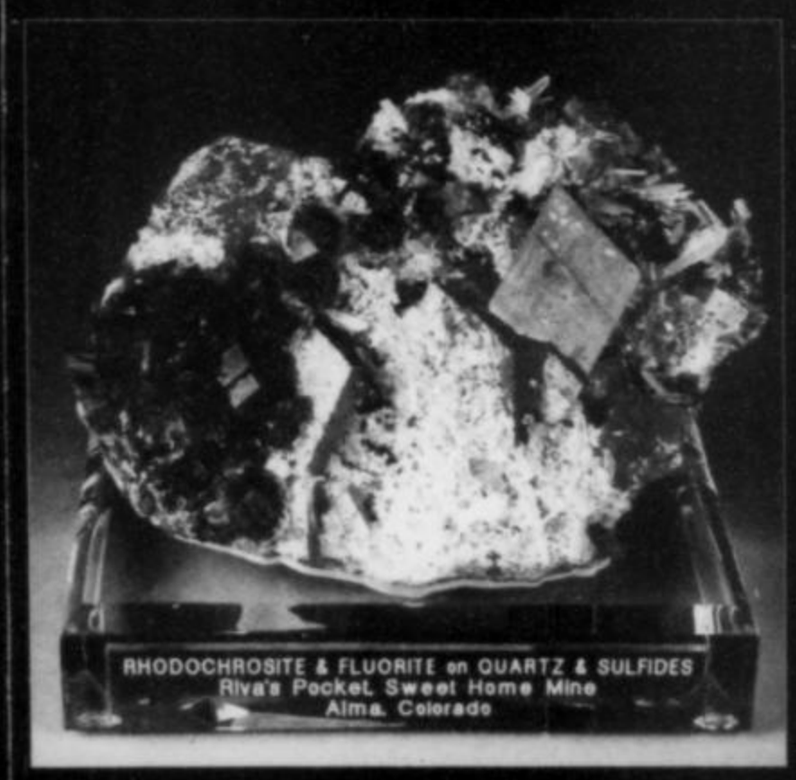

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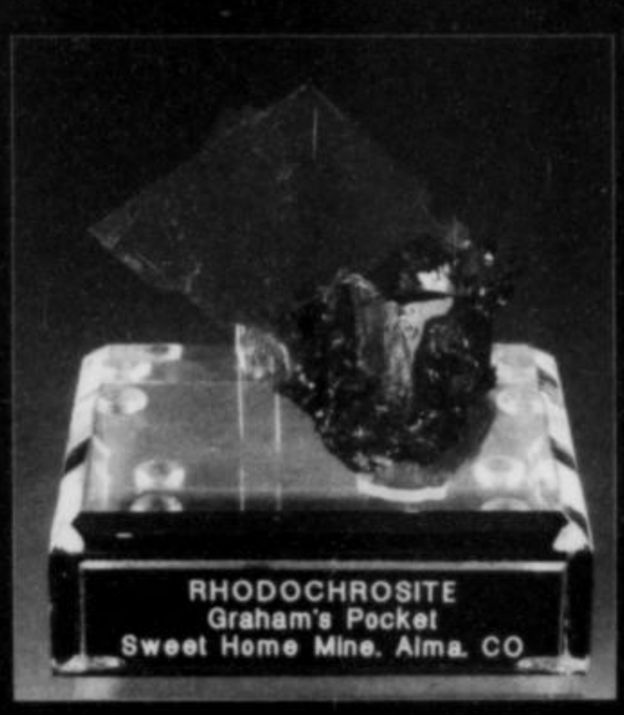

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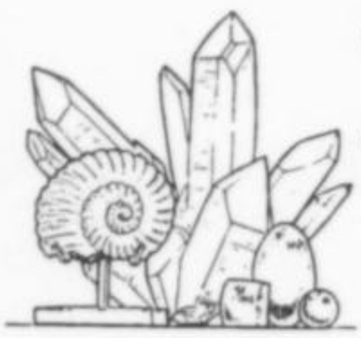

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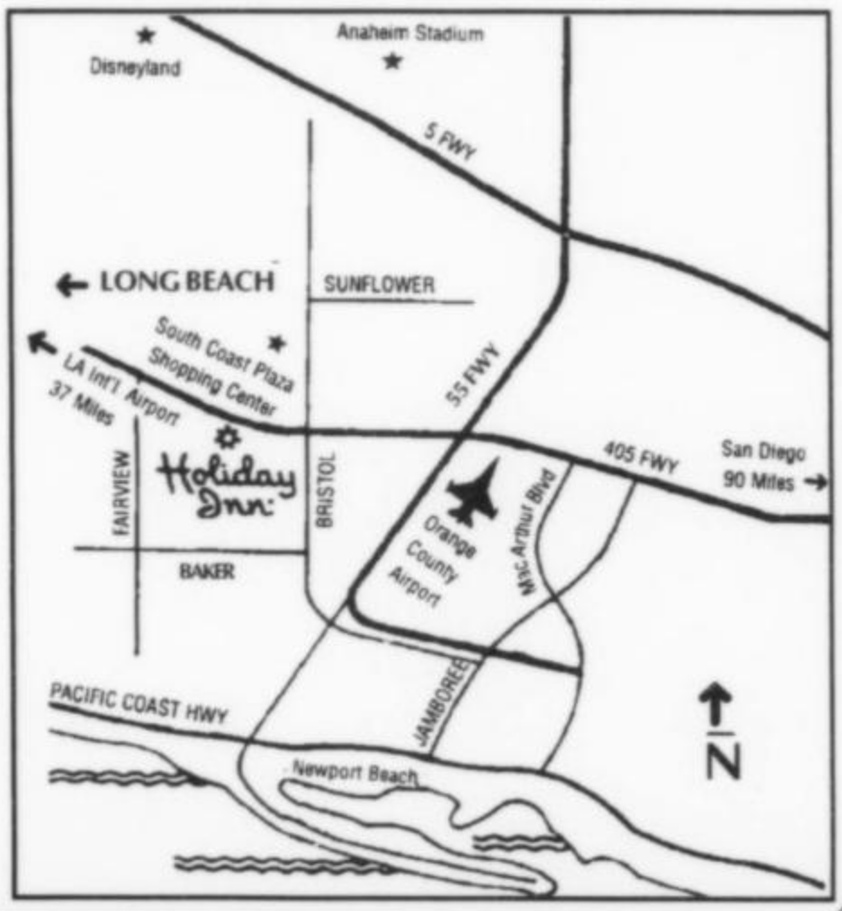

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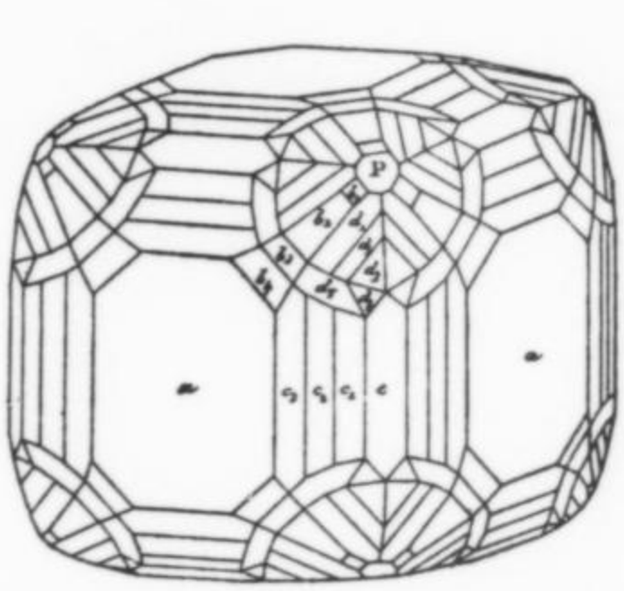

J. A. Mandarino
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New Minerals and Mineral Names
of the International Mineralogical Association
and
Curator Emeritus
Department of Mineralogy
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Allabogdanite — Orthorhombic

$(Fe,Ni)_2P$

Locality: The Onello iron meteorite found in 1997 in the alluvium of the Bol'shoy Dolguchan River, Onello River basin, Aldan shield, Sakha-Yakutia, Russia (Lat. 62°20′ N, Long. 137°40′ E).

Occurrence: In "plessite," an intergrowth of taenite and kamacite; other associated minerals are: nickelphosphide, schreibersite, awaruite and graphite.

General appearance: Lath-like crystals (up to 0.4 x 0.1 x 0.01 mm).

Physical, chemical and crystallographic properties: *Luster:* metallic. *Diaphaneity:* opaque. *Color:* light straw-yellow. *Streak:* not given. *Hardness:* 5 to 6. *Tenacity:* highly brittle. *Cleavage:* not observed. *Fracture:* not given. *Density:* could not be measured, 7.11 g/cm^3 (calc.). ***Crystallography:*** Orthorhombic, *Pnma*, *a* 5.748, *b* 3.548, *c* 6.661 Å, *V* 135.8 Å^3, Z 4, *a:b:c* = 1.6201:1:1.8774. Morphology: {001} and probably {110} and {100}; flattened on {001}. Twinning: gypsum-like possibly with twin plane {110}. ***X-ray powder diffraction data:*** 2.238 (100) (112, 210), 2.120 (80) (211), 2.073 (70) (103), 1.884 (50) (013, 212), 1.843 (40) (301), 1.788 (40) (113), 1.774 (40) (020), 1.758 (40) (203), 1.346 (40) (123, 313, 410), 1.277 (40) (321). ***Optical data:*** In reflected light: creamy, distinct anisotropism from light to dark creamy, no bireflectance, pleochroism not given. R_1, R_2: (47.0, 37.6 %) 480 nm, (48.2, 39.2 %) 540 nm, (49.6, 40.7 %) 580 nm, (52.3, 44.3 %) 660 nm. ***Chemical analytical data:*** Means of nine sets of electron microprobe data: Ni 20.7, Fe 57.7, Co 1.4, P 20.4, Total 100.2 wt.%. Empirical formula: $(Fe_{1.50}Ni_{0.51}Co_{0.03})_{\Sigma 2.04}P_{0.96}$. ***Relationship to other species:*** It is the orthorhombic polymorph of barringerite which is hexagonal.

Name: For Alla Bogdanovaa (1947–), crystallographer at the Geological Institute, Kola Science Center of the Russian Academy of Sciences, Apatity, Kola Peninsula, Russia. ***Comments:*** IMA No. 2000-038.

BRITVIN, S. N., RUDASHEVSKY, N. S., KRIVOVICHEV, S. V., BURNS, P. C., and POLEKHOVSKY, Yu. S. (2002) Allabogdanite, $(Fe,Ni)_2P$, a new mineral from the Onello meteorite: The occurrence and crystal structure. *American Mineralogist* **87**, 1245–1249.

Burnsite — Hexagonal

$KCdCu_7O_2(SeO_3)_2Cl_9$

Locality: The great fissure Tolbachik eruption (GFTE), Kamchatka Peninsula, Russia.

Occurrence: In a fumarole. Associated minerals are: cotunnite, sophiite, ilinskite, georgbokite, chloromenite and an undefined Cu-Pb selenite.

General appearance: Usually as round anhedral equidimensional grains (up to 0.1 mm) with no obvious crystal forms.

Physical, chemical and crystallographic properties: *Luster:* given as "strongly vitreous (metalloid)" but the optical data indicate adamantine. *Diaphaneity:* opaque to translucent. *Color:* dark red. *Streak:* red. *Luminescence:* nonfluorescent. *Hardness:* VHN 12 kg/mm^2, Mohs 1 to 1½. *Tenacity:* brittle. *Cleavage:* {001} good. *Fracture:* uneven. *Density:* could not be measured, 3.85 g/cm^3 (calc.). ***Crystallography:*** Hexagonal, $P6_3/mmc$, *a* 8.7805, *c* 15.521 Å, *V* 1036.3 Å^3, Z 2, *c:a* = 1.7677. Morphology: no forms were observed. Twinning: none mentioned. ***X-ray powder diffraction data:*** 7.779 (100) (002), 6.823 (50) (101), 4.391 (80) (110), 3.814 (80) (200), 3.066 (70) (203), 2.582 (50) (006), 2.501 (60) (213), 2.190 (50) (220). ***Optical data:*** Uniaxial (–), ω 1.920, ε 1.912, nonpleochroic. ***Chemical analytical data:*** Means of an unstated set of electron microprobe data: K_2O 4.3, CuO 46.74, CdO 10.45, SeO_2 19.91, Cl 25.46, sum 106.86, less O = Cl 5.75, Total 101.11 wt.%. Empirical formula: $K_{1.08}Cd_{0.97}Cu_{6.98}O_{2.08}(SeO_3)_{2.13}Cl_{8.53}$. ***Relationship to other species:*** The only chemically related species are georgbokite, $Cu_5O_2(SeO_3)_2Cl_2$, chloromenite, $Cu_9O_2(SeO_3)_4Cl_6$, and ilinskite, $NaCu_5O_2(SeO_3)_2Cl_3$.

Name: For Professor Peter C. Burns (1966–) of the University of Notre Dame, Notre Dame, Indiana, USA. ***Comments:*** IMA No. 2000-050.

KRIVOVICHEV, S. V., VERGASOVA, L. P., STAROVA, G. L., FILATOV, S. K., BRITVIN, S .N., ROBERTS, A. C., and STEELE, I. M. (2002) Burnsite, $KCdCu_7O_2(SeO_3)_2Cl_9$, a new mineral species from the Tolbachik Volcano, Kamchatka Peninsula, Russia. *Canadian Mineralogist* **40**, 1171–1175.

Bushmakinite — Monoclinic

$Pb_2Al(PO_4)(VO_4)(OH)$

Locality: The Berezovskoye gold deposit, middle Urals, Russia.

Occurrence: In the oxidized zone in a "nest" consisting of galena, tetrahedrite and tennantite in a quartz vein. Other associated minerals are: cerussite, bindheimite, vauquelinite, mottramite and pyromorphite.

General appearance: Lamellar crystals (up to 0.3 x 0.2 x 0.02 mm).

Physical, chemical and crystallographic properties: *Luster:* given as vitreous but the optical data indicate adamantine. *Diaphaneity:* translucent. *Color:* bright yellow. *Streak:* yellowish. *Luminescence:* nonfluorescent. *Hardness:* 3 to 3½. *Tenacity:* brittle. *Cleavage:* {001} perfect. *Fracture:* stepped to uneven. *Density:* not measured, 6.22 g/cm^3 (calc.). ***Crystallography:*** Monoclinic, $P2_1/m$, *a* 7.734, *b* 5.814, *c* 8.69 Å, β 112.1°, *V* 362 Å^3, Z 2, *a:b:c* = 1.3302:1:1.4947. Morphology: probably {001}. Twinning: none observed. ***X-ray powder diffraction data:*** 4.68 (8) (011), 3.57 (5) (111), 3.21 (10) (21$\bar{1}$), 2.91 (8) (21$\bar{2}$, 10$\bar{3}$), 2.71 (7) (021, 112), 2.27 (4) (220), 2.05 (5) (12$\bar{3}$, 11$\bar{4}$). ***Optical data:*** Biaxial (-), α 1.99, β 2.03, γ 2.06, 2V(meas.) large, 2V(calc.) 80°; dispersion r < v, significant; nonpleochroic; orientation is given as X (or Y) ∧ *a* = –11°, Z = *c*, but this is not possible in the monoclinic system. ***Chemical analytical data:*** Means of four sets of electron microprobe data (H_2O calculated from the ideal formula): CuO 2.46, ZnO 0.08, PbO 65.95, Al_2O_3 5.75, Fe_2O_3 0.05, P_2O_5 11.67, V_2O_5 9.84, As_2O_5 0.06, SO_3 0.10, CrO_3 1.99, H_2O (1.35), Total (99.30) wt.%. Empirical formula: $Pb_{2.02}(Al_{0.77}Cu_{0.21}Zn_{0.01})_{\Sigma 0.99}(PO_4)_{1.00}[(VO_4)_{0.74}(CrO_4)_{0.14}(PO_4)_{0.12}(SO_4)_{0.01}]_{\Sigma 1.01}(OH)_{1.02}$. ***Relationship to other species:*** It is a member of the brackebuschite group, specifically the Pb-, Al-, PO_4-, VO_4-dominant member.

Name: For the Russian mineralogist A. F. Bushmakin (1947–1999) who made significant contributions to the mineralogy of the oxidized zone of the Berezovskoye deposit. ***Comments:*** IMA No. 2001-031.

PEKOV, I. V., KLEIMENOV, D. A., CHUKANOV, N. V., YAKUBOVICH, O. V., MASSA, W., BELAKOVSKIY, D. I., and PAUTOV, L. A. (2002) Bushmakinite $Pb_2Al(PO_4)(VO_4)(OH)$, a new mineral of the brackebuschite group from the oxidized zone of the Berezovskoye gold deposit, the middle Urals. *Zapiski Vserossiyskogo Mineralogicheskogo Obshchestva* **131(2)**, 62–71.

Cerite-(La) — Trigonal

$(La,Ce,Ca)_9(Fe,Ca,Mg)(SiO_4)_3[SiO_3(OH)]_4(OH)_3$

Locality: Mt. Yukspor, Khibina massif, Kola Peninsula, Russia.

Occurrence: In an aegirine-natrolite-microcline vein in foyaite. Associated minerals are: aegirine, anatase, ancylite-(Ce), barylite, catapleiite, cerite-(Ce), chabazite-Ca, edingtonite, fluorapatite, galena, ilmenite, microcline, natrolite, sphalerite, strontianite and vanadinite.

General appearance: Porous pseudomorphs (up to 7 cm long) after an unidentified hexagonal prismatic mineral, possibly belovite-(Ce). Cerite-(La) occurs as framework-like aggregates of crystals up to 2 mm across within the pseudomorphs.

Physical, chemical and crystallographic properties: *Luster:* vitreous. *Diaphaneity:* translucent. *Color:* light yellow to pinkish brown. *Streak:* white. *Luminescence:* not mentioned. *Hardness:* 5. *Tenacity:* brittle. *Cleavage:* not observed. *Fracture:* conchoidal. *Density:* 4.7 g/cm^3 (meas.), 4.75 g/cm^3 (calc.). ***Crystallography:*** Trigonal, $R3c$, *a* 10.7493, *c* 38.318 Å, *V* 3834.4 Å^3, Z 6, *c:a* = 3.5647. Morphology: {102} and {001}, habit equant to tabular on {001}. Twinning: none mentioned. ***X-ray powder diffraction data:*** 3.53 (26) (1.0.10, 211), 3.47 (40) (122), 3.31 (38) (214), 3.10 (25) (300), 2.958 (100) (0.2.10), 2.833 (37) (128), 2.790 (24) (306), 2.689 (34) (220), 1.949 (34) (238, 1.3.13). ***Optical data:*** Uniaxial (+), ω 1.810, ε 1.820, nonpleochroic. ***Chemical analytical data:*** Means of 42 to 70 sets of electron microprobe data (with H_2O by the Penfield method) gave: MgO 0.51, CaO 5.09, SrO 1.97, Fe_2O_3 1.40, La_2O_3 37.57, Ce_2O_3 23.67, Pr_2O_3 0.61, Nd_2O_3 1.48, Sm_2O_3 0.10, Gd_2O_3 0.24, SiO_2 22.38, P_2O_5 0.63, H_2O 3.20, Total 98.85 wt.%. Empirical formula: $(La_{4.26}Ce_{2.67}Ca_{1.38}Sr_{0.35}Nd_{0.16}Pr_{0.07}Gd_{0.02}Sm_{0.01})_{\Sigma 8.92}(Fe_{0.32}Ca_{0.30}Mg_{0.23})_{\Sigma 0.85}(SiO_4)_{3.00}[(Si_{0.84}P_{0.16})_{\Sigma 1.00}O_{3.11}(OH)]_4(OH)_{2.56}$. ***Relationship to other species:*** It is the La-dominant analogue of cerite-(Ce).

Name: For the relationship to cerite-(Ce). ***Comments:*** IMA No. 2001-042.

PAKHOMOVSKY, YA. A., MEN'SHIKOV, YU. P., YAKOVENCHUK, V. N., INANYUK, G. YU., KRIVOVICHEV, S. V., and BURNS, P. C. (2002) Cerite-(La), $(La,Ce,Ca)_9(Fe,Ca,Mg)(SiO_4)_3[SiO_3(OH)]_4(OH)_3$, a new mineral species from the Khibina alkaline massif: occurrence and crystal structure. *Canadian Mineralogist* **40**, 1177–1184.

Ciprianiite — Monoclinic

$Ca_4[(Th,U)(REE)]Al\square_2(Si_4B_4O_{22})(OH,F)_2$

Locality: Tre Croce, near Vetralla, Viterbo province, Latium, Italy.

Occurrence: In miarolitic cavities in a syenitic ejectum within a pyroclastic formation. Associated minerals are: danburite, thorite, fluorite, tourmaline and a cancrinite-group mineral.

General appearance: Small (<0.5 mm) tabular crystals.

Physical, chemical and crystallographic properties: *Luster:* vitreous. *Diaphaneity:* translucent to transparent. *Color:* brown to pale brown. *Streak:* white. *Luminescence:* nonfluorescent. *Hardness:* not given. *Tenacity:* brittle. *Cleavage:* {100} fair to good. *Fracture:* conchoidal. *Density:* could not be measured, 3.97 g/cm^3 (calc.). ***Crystallography:*** Monoclinic, $P2/a$, *a* 19.059, *b* 4.729, *c* 10.291 Å, β 111.33°, *V* 864.0 Å^3, Z 2, *a:b:c* = 4.0302:1:2.1761. Morphology: {010}, tabular. Twinning: frequent on (100). ***X-ray powder diffraction data:*** 4.729 (72) (010), 3.454 (79) ($\bar{2}$12), 3.089 (86) ($\bar{4}$12), 2.911 (74) (212), 2.846 (100) (411), 2.653 (80) ($\bar{4}$13), 2.648 (79) (013), 2.634 (84) ($\bar{6}$11). ***Optical data:*** could not be determined. ***Chemical analytical data:*** Means of two to four sets of electron microprobe data (light elements by SIMS): Li_2O 0.05, BeO 1.95, MgO 0.18, CaO 24.60, BaO 0.00, B_2O_3 13.28, Al_2O_3 2.33, Cr_2O_3 0.02, Mn_2O_3 0.37, Fe_2O_3 2.87, Y_2O_3 0.19, La_2O_3 1.39, Ce_2O_3 5.48, Pr_2O_3 0.86, Nd_2O_3 3.03, Sm_2O_3 0.33, Eu_2O_3 0.05, Gd_2O_3 0.14, Dy_2O_3 0.05, Er_2O_3 0.01, Yb_2O_3 0.01, SiO_2 22.94, TiO_2 0.73, ThO_2 15.80, UO_2 0.87, H_2O 0.47, F 0.89, sum 98.89, less O = F 0.37, Total 98.52 wt.%. Empirical formula: $Ca_{4.00}[(REE)_{0.73}Th_{0.63}Ca_{0.60}U_{0.03}]_{\Sigma 1.99}(Al_{0.48}Fe^{3+}_{0.38}Ti_{0.10}Mg_{0.05})_{\Sigma 1.01}(Be_{0.82}\square_{0.14}Li_{0.04})_{\Sigma 1.00}B_{4.00}Si_{4.01}O_{22.00}[O_{0.97}(OH)_{0.54}F_{0.49}]_{\Sigma 2.00}$. ***Relationship to other species:*** It is a member of the hellandite group.

Name: For Curzio Cipriani (1927–), Professor of Mineralogy and Head of the Museum of Mineralogy, later of Natural History, at the Università di Firenze, Italy. ***Comments:*** IMA No. 2000-021.

DELLA VENTURA, G., BONAZZI, P., OBERTI, R., and OTTOLONI, L. (2002) Ciprianiite and mottanaite-(Ce), two new minerals of the hellandite group from Latium (Italy). *American Mineralogist* **87**, 739–744. OBERTI, R., DELLA VENTURA, G., OTTOLONI, L., HAWTHORNE, F. C., and BONAZZI, P. (2002) Re-definition, nomenclature and crystal-chemistry of the hellandite group. *American Mineralogist* **87**, 745–752.

Cobaltkieserite — Monoclinic

$CoSO_4 \cdot H_2O$

Locality: Bastnäs, Skinnskatteberg, Sweden (Lat. 59°51′ N, Long. 15°35′ E).

Occurrence: In a dark, dense quartzitic rock. Associated minerals

are: cobaltite, pyrite, chalcopyrite, quartz, garnet (Al-rich), scorodite and erythrite.

General appearance: Euhedral crystals (0.5 to 3 μm).

Physical, chemical and crystallographic properties: *Luster:* powdery. *Diaphaneity:* not given. *Color:* pink. *Streak:* not given. *Luminescence:* not mentioned. *Hardness:* 2 to 3. *Tenacity:* not given. *Cleavage:* not given. *Fracture:* not given. *Density:* could not be measured, 3.28 g/cm^3 (calc.). ***Crystallography:*** Monoclinic, *C*2/*c* (by analogy with synthetic material), *a* 6.980, *b* 7.588, *c* 7.639 Å, β 118.65°, *V* 355.06 Å^3, Z 4, *a*:*b*:*c* = 0.9199:1:1.0067. Morphology: no forms were identified, but the crystals are largely euhedral with a thick tabular to "bipyramidal" habit. Twinning: none mentioned. ***X-ray powder diffraction data:*** 4.829 (33) ($\bar{1}11$), 3.405 (100) ($11\bar{2}$), 3.339 (34) (111), 3.291 (32) (021), 3.062 (56) (200), 2.567 (30) ($22\bar{1}$), 2.513 (49) ($02\bar{2}$). ***Optical data:*** Biaxial (+), no other data could be determined because of the minuteness of the crystals. ***Chemical analytical data:*** Means of twenty sets of electron microprobe data (H_2O calculated): CoO 42.7, FeO 0.2, SiO_2 0.3, As_2O_5 4.3, SO_3 44.2, H_2O (10.5), Total (102.2) wt.%. Empirical formula: $Co_{0.98}(S_{0.95}As_{0.06}Si_{0.01})_{\Sigma 1.02}O_{4.00}\cdot 1.00H_2O$. ***Relationship to other species:*** It is the cobalt-dominant analogue of kieserite, $MgSO_4\cdot H_2O$.

Name: For the relationship to kieserite. ***Comments:*** IMA No. 2002-004. Slowly soluble in water.

HOLTSTAM, D. (2002) Cobaltkieserite, $CoSO_4\cdot H_2O$, a new mineral species from Bastnäs, Skinnskatteberg, Sweden. *Geologiska Föreningens i Stockholm Förhandlinger* **124**, 117–119.

Decrespignyite-(Y) — Monoclinic

$(Y,REE)_4Cu(CO_3)_4Cl(OH)_5\cdot 2H_2O$

Locality: The Paratoo copper deposit, 30 km southwest of Yunta, Olary district, South Australia, Australia (Lat. 32°41′ S, Long. 139°20′ E).

Occurrence: A supergene mineral in narrow fissures of a fine-grained, inhomogeneous dolomitic slatestone. Associated minerals are: muscovite, caysichite-(Y), donnayite-(Y), kamphaugite-(Y), malachite, nontronite, "limonite" pseudomorphs after pyrite, calcite and gypsum. Other rare earth minerals found in the deposit but not directly associated with decrespignyite-(Y) are: a Y-rich bastnäsite-(La), a Y-rich calcioancylite-(Nd) and a new Ca-La-Cu-carbonate.

General appearance: Crusts (up to 5 mm thick), coatings and fillings in thin fissures. Less common are globular aggregates of thin pseudo-hexagonal crystals (10 to 50 μm in maximum dimension and <0.5 μm thick).

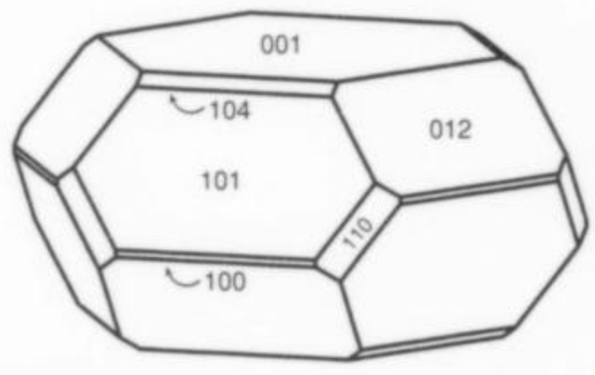
Physical, chemical and crystallographic properties: *Luster:* vitreous to pearly. *Diaphaneity:* transparent. *Color:* intense royal blue to turquoise-blue. *Streak:* pale blue. *Luminescence:* nonfluorescent. *Hardness:* aggregates 2, individual crystals estimated to be 4. *Tenacity:* not given. *Cleavage:* could not be observed but if present is {010}. *Fracture:* not given. *Density:* 3.64 g/cm^3 (meas.), 3.82 g/cm^3 (calc.). See COMMENTS. ***Crystallography:*** Monoclinic, *P*2, *Pm* or *P*2/*m*, *a* 8.899, *b* 22.77, *c* 8.589 Å, β 120.06°, *V* 1506.3 Å^3, Z 4, *a*:*b*:*c* = 0.3908:1:0.3772. Morphology: no forms were mentioned. Twinning: none mentioned. ***X-ray powder diffraction data:*** 22.79 (30) (010), 7.463 (30) (001), 7.086 (50) (011), 6.241 (100) (021), 4.216 (30) ($\bar{1}12$), 3.530 (40) (022), 3.336 (30) (032), 2.143 (30) (222, $\bar{4}01$). ***Optical data:*** Biaxial (−), α 1.604, β could not be measured but is very close to γ, γ 1.638, 2V could not be measured but must be very small, dispersion could not be measured; pleochroism medium strong, X very pale bluish, Y and Z bluish with a greenish tint, Z ≈ Y ⩾ X; orientation not given. ***Chemical analytical data:*** Means of seven sets of electron microprobe data (H_2O and CO_2 by CHN analyser): CaO 0.50, CuO 10.90, Y_2O_3 42.20, La_2O_3 0.30, Pr_2O_3 0.10, Nd_2O_3 1.30, Sm_2O_3 1.00, Gd_2O_3 4.80, Tb_2O_3 0.40, Dy_2O_3 3.70, Ho_2O_3 2.60, Er_2O_3 2.50, CO_2 18.80, H_2O 10.80, Cl 3.00, sum 103.90, less O = Cl 0.68, Total 103.22 wt.%. Empirical formula: $(Y_{3.13}Gd_{0.22}Dy_{0.17}Ho_{0.12}Er_{0.11}Ca_{0.07}Nd_{0.06}Sm_{0.05}Tb_{0.02}La_{0.02}Pr_{0.01})_{\Sigma 3.98}Cu_{1.15}(CO_3)_{3.77}[Cl_{0.71}(OH)_{0.29}]_{\Sigma 1.00}(OH)_{5.63}\cdot 2.07H_2O$. See COMMENTS.

Relationship to other species: Probably structurally related to kamphaugite-(Y).

Name: For Mr. Robert James Champion de Crespigny (1950–), Executive Chairman of Normandy Mining Limited, Chancellor of the University of Adelaide and Chairman of the South Australian Museum, in recognition of his contribution to the Australian mining industry and Australian education.

Comments: IMA No. 2001-027. The calculated density given in the paper is 3.645 g/cm^3 rather than 3.82 g/cm^3 given here. The empirical formula in the paper has subscripts which are somewhat different from those given here. Dr. Pring agrees with the calculated density and empirical formula presented here.

WALLWORK, K., KOLITSCH, U., PRING, A., and NASDALA, L. (2002) Decrespignyite-(Y), a new copper yttrium rare earth carbonate chloride hydrate from Paratoo, South Australia. *Mineralogical Magazine* **66**, 181–188.



Feklichevite

Feklichevite — Trigonal

$Na_{11}Ca_9(Fe^{3+},Fe^{2+})_2Zr_3Nb[Si_{25}O_{73}](OH,H_2O,Cl,O)_5$

Locality: The Kovdor Phlogopite Mine, Kovdor alkaline-ultrabasic massif, Kola Peninsula, Russia.

Occurrence: In a pegmatoid cancrinite vein. Associated minerals are: potassic feldspar, cancrinite, aegirine-diopside, pectolite, titanite, hematite and pyrrhotite.

General appearance: Equant to thick tabular crystals and grains (up to 2.5 cm).

Physical, chemical and crystallographic properties: *Luster:* vitreous. *Diaphaneity:* translucent. *Color:* dark brown. *Streak:* brownish. *Luminescence:* nonfluorescent. *Hardness:* 5½. *Tenacity:* brittle. *Cleavage:* {001} perfect. *Fracture:* stepped to rough. *Density:* 2.87 g/cm^3 (meas.), 2.85 g/cm^3 (calc.). ***Crystallography:*** Trigonal, *R*3*m*, *a* 14.255, *c* 30.170 Å, *V* 5309.3 Å^3, Z 3, *c*:*a* = 2.1165. Morphology: {001}, {110}, {100}, {101}, {104}, {012}, {021} and {267}. Twinning: none mentioned. ***X-ray powder diffraction data:*** 6.43 (39) (104), 4.31 (69) (205), 3.53 (37) (027), 3.218 (56) (208), 3.170 (34) (036, 217), 3.036 (42) (119, 042), 2.977 (81) (135), 2.854 (100) (404), 2.602 (44) (039). ***Optical data:*** Uniaxial (+), ω 1.616, ε 1.620, nonpleochroic. ***Chemical analytical data:*** Means of twelve sets of electron microprobe data (H_2O by Penfield method): Na_2O 11.45, CaO 15.55, MnO 0.49, FeO 2.08, SrO 0.28, Fe_2O_3 3.20, La_2O_3 0.11, Ce_2O_3 0.16, SiO_2 50.35, ZrO_2 11.65, HfO_2 0.62, TiO_2 0.12, Nb_2O_5 2.41, H_2O 1.72, F 0.12, Cl 0.61, sum 100.92, less O = F + Cl 0.19, Total 100.73 wt.%. Empirical formula:

$Na_{11.13}(Ca_{8.35}Mn_{0.21}Sr_{0.08}Ce_{0.03}La_{0.02})_{\Sigma 8.69}(Fe^{3+}_{1.21}Fe^{2+}_{0.87})_{\Sigma 2.08}(Zr_{2.85}Hf_{0.09}Ti_{0.05})_{\Sigma 2.99}Nb_{0.55}[Si_{25.24}O_{73.00}][(OH)_{2.41}(H_2O)_{1.67}O_{0.21}Cl_{0.52}F_{0.19}]_{\Sigma 5.00}$. ***Relationship to other species:*** It is a member of the eudialyte group.

Name: For V. G. Feklichev (1933–1999), Russian mineralogist and crystallographer. ***Comments:*** IMA No. 2000-017.

PEKOV, I. V., EKIMENKOVA, I. A., CHUKANOV, N. V., RASTSVETAEVA, R. K., KONONKOVA, N. N., PEKOVA, N. A., and ZADOV, A. E. (2001) Feklichevite, $Na_{11}Ca_9(Fe^{3+},Fe^{2+})_2Zr_3Nb[Si_{25}O_{73}](OH,H_2O,Cl,O)_5$, a new mineral of the eudialyte group from the Kovdor massif, Kola Peninsula. *Zapiski Vserossiyskogo Mineralogicheskogo Obshchestva* **130(3)**, 55–65.

Ferriallanite-(Ce)

Monoclinic

$CaCeFe^{3+}AlFe^{2+}(SiO_4)(Si_2O_7)O(OH)$

Locality: Mount Ulyn Khuren, Altai Range, Mongolian People's Republic (approximately at Lat. 48°32′ N, Long. 92°55′ E).

Occurrence: In an alkaline granitic pegmatite. Associated minerals are: zircon, quartz, kainosite-(Y), aegirine, β-fergusonite-(Y), yttrian ilvaite, ilvaite, hingganite-(Ce), neodymian allanite-(Ce), magnetite, fayalite and fluorite.

General appearance: An aggregate of subhedral grains 0.3 x 0.5 to 1 x 2 mm.

Physical, chemical and crystallographic properties: *Luster:* resinous. *Diaphaneity:* opaque to translucent. *Color:* black with red or orange internal reflections. *Streak:* brown. *Luminescence:* nonfluorescent. *Hardness:* VHN_{100} 1250 kg/mm², Mohs 6. *Tenacity:* brittle. *Cleavage:* not observed. *Fracture:* conchoidal to uneven. *Density:* 4.22 g/cm³ (meas.), 4.16 g/cm³ (calc.) for the crystal used for the structure refinement and 4.21 g/cm³ (calc.) for another sample. ***Crystallography:*** Monoclinic, $P2_1/m$, *a* 8.962, *b* 5.836, *c* 10.182 Å, β 115.02°, *V* 482.6 Å³, Z 2, *a:b:c* = 1.5356:1:1.7447. Morphology: no forms were observed. Twinning: none mentioned. ***X-ray powder diffraction data:*** 3.55 (55) ($\bar{2}11$), 2.93 (65) ($\bar{1}13$), 2.72 (80) (120, 013), 2.69 (55) (300), 2.63 (60) ($\bar{3}11$), 2.34 (55) ($\bar{2}22$), 2.18 (100) (122, $\bar{1}23$, $\bar{4}01$), 2.14 (80) (221, $\bar{4}03$, $\bar{2}23$, 014), 1.46 (50) (040). ***Optical data:*** Biaxial (–), α 1.825, β 1.855, γ 1.880, 2V could not be measured, 2V(calc.) 83°; dispersion r < v, strong; pleochroism X = greenish gray, Y = brown, Z = dark red-brown, Z > Y > X; orientation not given. ***Chemical analytical data:*** Means of four sets of electron microprobe data: CaO 10.85, MnO 0.82, FeO 8.44, Al_2O_3 6.07, Fe_2O_3 18.88, La_2O_3 5.12, Ce_2O_3 10.86, Pr_2O_3 1.63, Nd_2O_3 5.29, SiO_2 28.72, TiO_2 1.85, H_2O 1.48, Total 100.01 wt.%. Empirical formula given by the authors (with all REEs indicated as Ce) is: $(Ca_{0.97}Ce_{0.03})_{\Sigma 1.00}(Ce_{0.89}Ca_{0.11})_{\Sigma 1.00}(Fe^{3+}_{0.80}Ti_{0.14}Al_{0.06})_{\Sigma 1.00}(Al_{0.56}Fe^{3+}_{0.44})_{\Sigma 1.00}(Fe^{2+}_{0.93}Mn_{0.07})_{\Sigma}(Si_{0.94}Al_{0.06})O_{4.00}(Si_2O_7)O(OH)$. ***Relationship to other species:*** It is the Fe^{3+}-dominant analogue of allanite-(Ce).

Name: For the relationship to allanite-(Ce). ***Comments:*** IMA No. 2000-041.

KARTASHOV, P., FERRARIS, G., IVALDI, G., SOKOLOVA, E., and McCAMMON, C. A. (2002) Ferriallanite-(Ce), $CaCeFe^{3+}AlFe^{2+}(SiO_4)(Si_2O_7)O(OH)$, a new member of the epidote group: description, X-ray and Mössbauer study. *Canadian Mineralogist* **40**, 1641–1648.

Ferronordite-(La)

Orthorhombic

$Na_3Sr(La,Ce)FeSi_6O_{17}$

Locality: Bol'shoi Punkaruaiv Mt., Lovozero alkaline massif, Kola Peninsula, Russia.

Occurrence: In ussingite cores of two hyperagpaitic pegmatites. Associated minerals are: aegirine, epistolite, sphalerite, steenstrupine-(Ce) and altered serandite.

General appearance: Tabular crystals up to 8 x 5 x 1 mm and spherulites 1.5 cm in diameter.

Physical, chemical and crystallographic properties: *Luster:* vitreous. *Diaphaneity:* transparent. *Color:* colorless to pale brown. *Streak:* white. *Luminescence:* nonfluorescent. *Hardness:* 5. *Tenacity:* brittle. *Cleavage:* {100} perfect. *Fracture:* uneven. *Density:* 3.54 g/cm³ (meas.), 3.58 g/cm³ (calc.). ***Crystallography:*** Orthorhombic, *Pcca*, *a* 14.440, *b* 5.191, *c* 19.86 Å, *V* 1489 Å³, Z 4, *a:b:c* = 2.7817:1:3.8259. Morphology: mainly {100}. Twinning: none observed. ***X-ray powder diffraction data:*** 7.20 (40) (200), 4.21 (100) (210), 3.323 (82) (312), 2.964 (88) (410), 2.873 (99) (314), 2.595 (58) (020), 2.442 (44) (406). ***Optical data:*** Biaxial (−), α 1.624, β 1.637, γ 1.644, 2V(meas.) 60°, 2V(calc.) 72°; dispersion r > v, weak; nonpleochroic; orientation, X = *a*, Y = *c*, Z = *b*. ***Chemical analytical data:*** Means of four sets of electron microprobe data: Na_2O 11.23, MgO 0.30, CaO 0.53, MnO 2.50, FeO 3.75, ZnO 2.29, SrO 12.69, BaO 0.36, Al_2O_3 0.14, La_2O_3 11.36, Ce_2O_3 8.21, Pr_2O_3 1.00, Nd_2O_3 0.89, SiO_2 44.06, Total 99.31 wt.%. Empirical formula: $(Na_{2.93}Ca_{0.08})_{\Sigma 3.01}(Sr_{0.99}Ba_{0.02})_{\Sigma 1.01}(La_{0.56}Ce_{0.40}Pr_{0.05}Nd_{0.04})_{\Sigma 1.05}(Fe_{0.42}Mn_{0.28}$-$Zn_{0.23}Mg_{0.06})_{\Sigma 0.99}(Si_{5.92}Al_{0.02})_{\Sigma 5.94}O_{17.00}$. ***Relationship to other species:*** It is the La-dominant analogue of ferronordite-(Ce).

Name: For the relationship with ferronordite-(Ce). ***Comments:*** IMA No. 2000-015.

PEKOV, I. V., CHUKANOV, N. V., TURCHKOVA, A. G., and GRISHIN, V. G. (2001) Ferronordite-(La), $Na_3Sr(La,Ce)FeSi_6O_{17}$, a new mineral of the nordite group from Lovozero massif, Kola Peninsula. *Zapiski Vserossiyskogo Mineralogicheskogo Obshchestva* **130(2)**, 53–58.

Madagascar liddicoatite, with fantastic gradations of color running through the triangles, courtesy of Dieter Decker. There was a wall of back-lit tourmalines behind glass which was quite spectacular. In fact, it's my opinion that all liddicoatites are extremely exciting: they are like modern art. The School of Mines in Paris brought a Namibian slice that measures perhaps 2.5 by 3.5 feet, showing tourmalines in the middle of the quartz.

Over on the other side there were six elongated, back-lit glass cases, perhaps 1.5 by 5 feet, these also filled with slices of liddicoatite in various forms, showing the gradations of colors; for me the most striking part of this display was a series of slices from one crystal—23 of them in a U-shaped array, showing phenomenal color gradation from red and pink, to yellow and green inside the pink, to vibrant triangles of darker green and pale green winding up with pink centers. Another array showed four windows of four different tourmaline crystals in various colors: this one was labeled "Dyer Collection—Tourmalines of Madagascar."

We arrived in the Entrance room before the exit, and on my right was Keith Proctor's famous "Rose of Itatiaia" elbaite. In the last section before the exit there were 13 hexagonal cases displaying tourmaline crystals from Gilgit, Pakistan and Minas Gerais, Brazil. These were small cabinet-sized specimens, mostly with matrix and mostly excellent. Two cases were dedicated to Elba, Italy—perhaps 40 specimens, quite an exciting selection to see.

Continuing in Hall 6, among the commercial exhibits there was a nice display of Ceylon (Sri Lanka) gemstones, and in one case there were many crystals of sapphire and zircon displayed by *Amarasinghe*, which company also brings displays to Tucson. In a 40 x 40-foot professional booth by *Mineralien Zentrum, Hamburg* was a setup mostly of extraordinary fossils, but also several cases of minerals. An older collection just purchased by this dealership contains cabinet to large cabinet-size specimens including a Guerrero amethyst, adamite and fluorite; the finest specimen here was a so-called "flower," an amethyst from Brazil, but get this—the two flowers, one 18 inches and the other perhaps 24 inches in diameter, are perfectly circular. This specimen was being held on reserve for a buyer.

For lunch on Friday we went to the café in the corner of Hall 6, and next to the café was *Jenny's Mineral Shop* (Staatstr, 65, D-67483 Edesheim, Germany), where several specimens of **cave pearls** from Romania were on sale. Victor Yount selected one and I selected another. They are brand new. Right next to Jenny's Mineral Shop was *Sikora Artur* (H.-Wieland-Str. 183, Munich 81735), where the specialty item was **man-made zincite**. Next to that came an offering of colored alabaster nightlights; then began a group of Moroccan dealers and meteorite sellers. Passing a stand of shockingly colored man-made chalcanthite might have been enough to make you rethink mineral collecting. Munich is a potpourri of everything related to natural history.

All in all, the 2003 Munich Show exemplified the best in minerals from around the world. In fact, it always does, and this is why I am drawn back, year after year.

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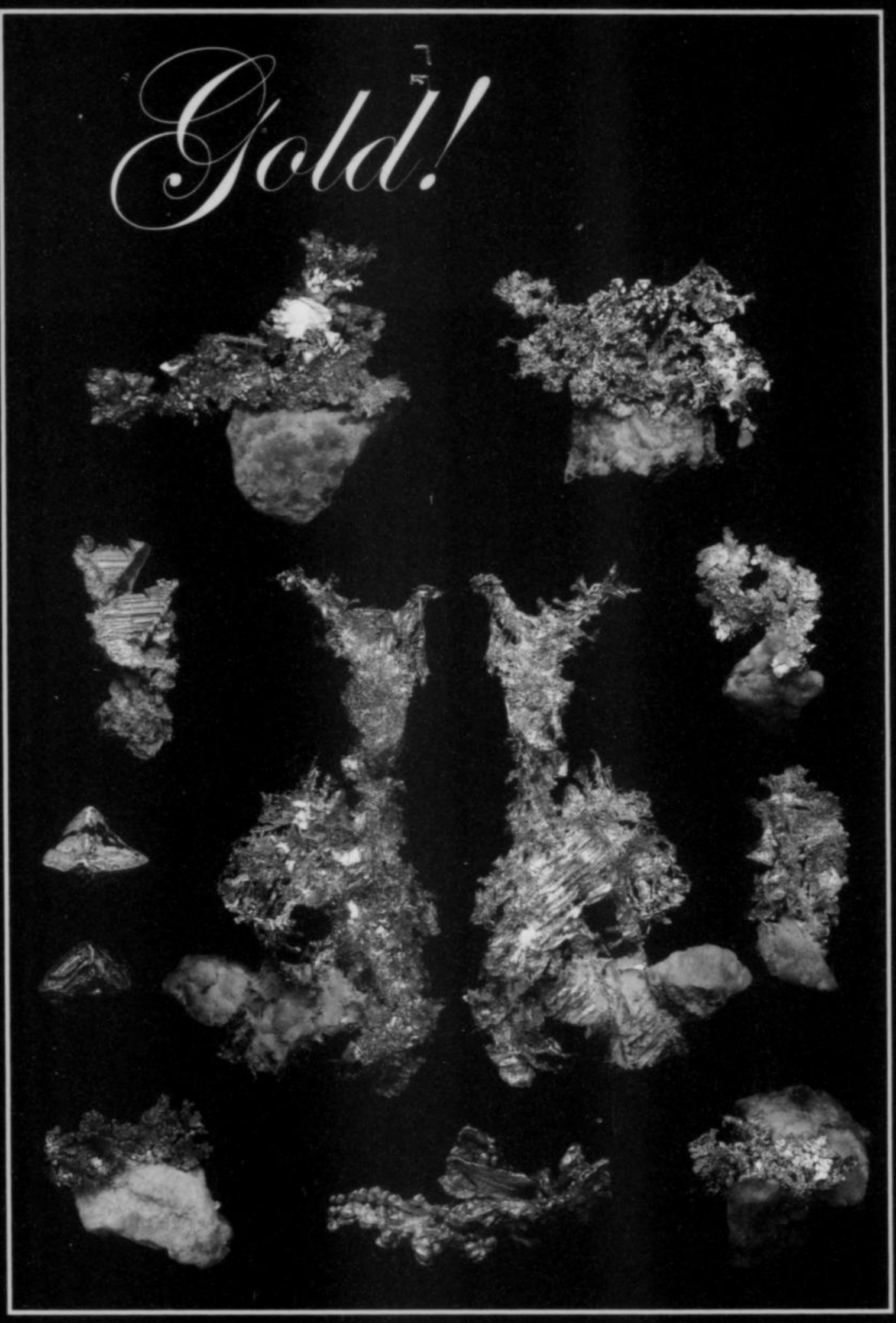

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