THE MINERALOGICAL RECORD

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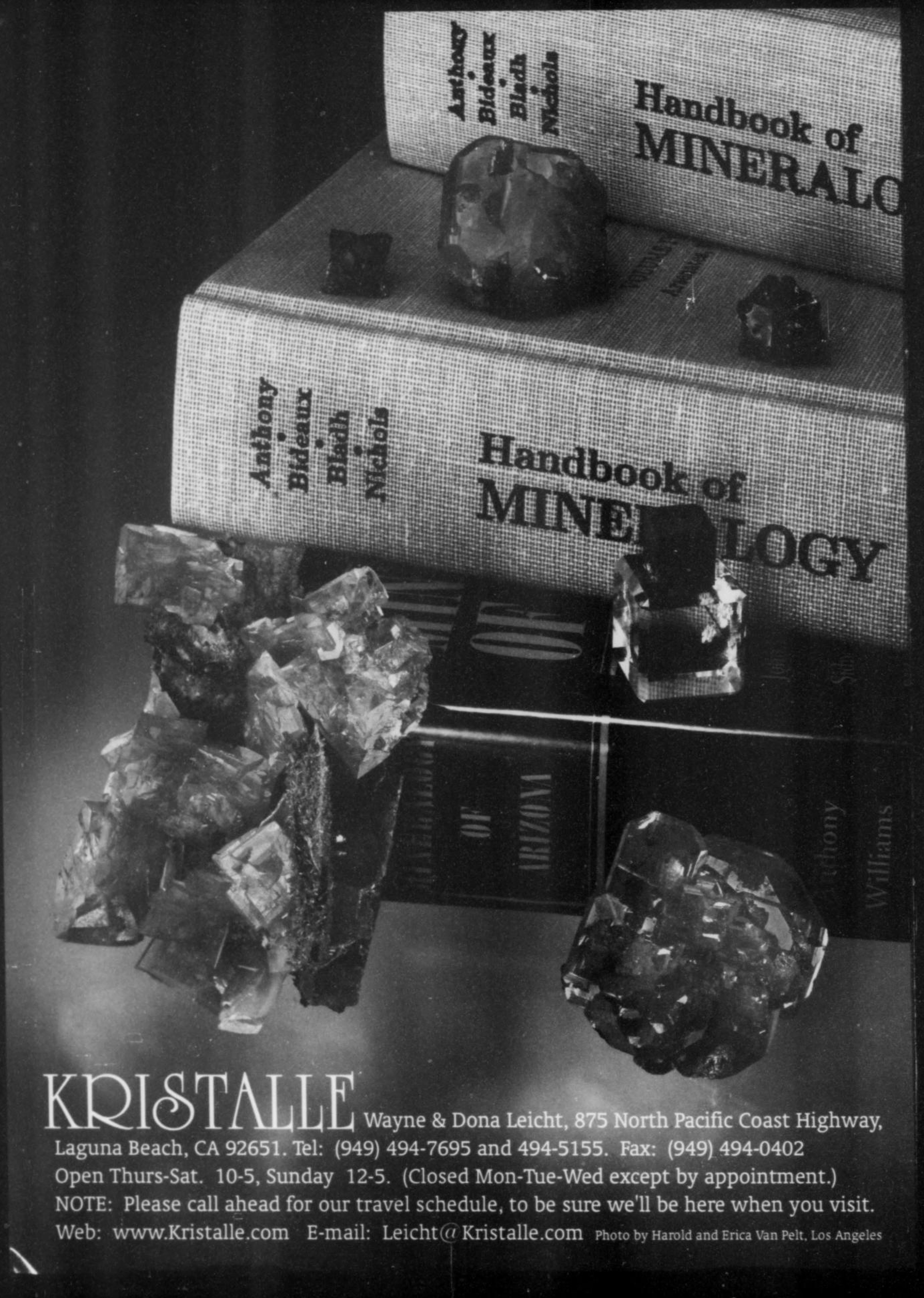
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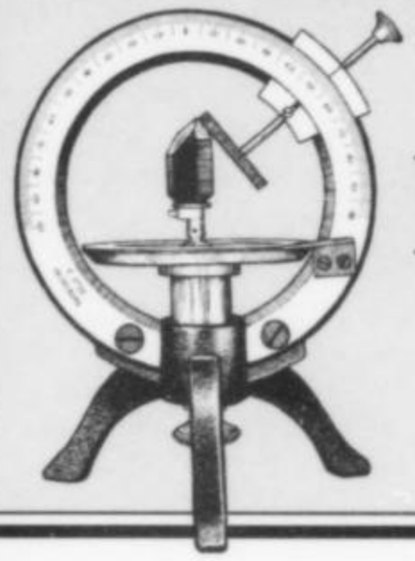

THE MINERALOGICAL RECORD

May–June 2005 Volume Thirty-six, Number Three

Articles

Columns

COVER:
FLUORNATROMICROLITE, probably the finest specimen known of any microlite-group species; 1.7-cm crystal in lepidolite, from Paprock, Afghanistan. Rob Lavinsky (The Arkenstone) specimen, now in the Paul Stahl collection; Jeff Scovil photo.
See Tom Moore's report on the 2005 Tucson Show beginning on page 285.

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*Continued on p. 312

notes from the EDITORS

Mining Engineer Shortage

The decline in the number of American colleges and universities emphasizing or teaching mineralogy may be having an effect on at least one profession: mining engineering. Mining engineers obviously have to know their mineralogy, particularly when working in the field. The industrial demand for minerals continues to grow while the number of new graduates in mining engineering has fallen so low that it is no longer sufficient to replace the number who retire.

"The mining engineering workforce is short by 300%," says University of Arizona Mining Engineering department chairman Mary Poulton. "There are three times more jobs available than there are [graduating] students to fill them." Only 86 mining engineers graduated nationwide last year, and the competition among corporations wanting to hire them is intense. Starting salaries of $50,000 to $80,000 are common.

Leigh Freeman of Downing Teal, Inc. (an executive placement service) says: "Our research shows that the [United States] needs to graduate 300 mining engineers per year for the next 12 years, simply to replace the ones that will be retiring." Even more will be needed to cover actual growth in the industry. Universities will therefore need to enroll a total of 500 students in mining engineering every year, he said.

There is high demand for mining engineers in all sectors of the industry, Poulton said. Coal mining, heavy construction (especially in developing countries such as China), aggregate engineering and metal mining all offer opportunities; copper has risen from 60 cents to $1.40/pound since 2001. Graduates can work indoors, outdoors, and around the world in a hands-on profession. Young people with a hobbyist interest in mineralogy and an inclination toward engineering might find the profession to be ideal.

Enhancement Codes

Mineral dealers and collectors might be interested to know that the Federal Trade Commission (FTC) requires the clear identification of synthetic gemstone specimens and the full disclosure of any treatment done to a natural gemstone in cases where (1) the treatment is non-permanent, or (2) the treatment requires special care in order to retain the enhancement, or (3) ***the treatment has a material effect on the value of the specimen***. In cases where enhancement is only suspected (as for gem species which are routinely heat-treated at the source), the FTC states that "It is prudent and appropriate to disclose gemstone treatments rather than remain silent when there is a possibility that the stones have been treated." Violators are subject to FTC enforcement action, civil penalties and trade sanctions.

The FTC has apparently not thought of extending this regulation to all mineral specimens in general (yet), but it does indeed apply to all mineral specimens having potential gem value. Mineral dealers who fail to provide full enhancement disclosures in writing for specimens of gem minerals are in violation of current FTC regulations.

The American Gem Trade Association requires that its members disclose all enhancement treatments in print and on all invoices and other commercial documents (such as labels). For convenience they have established a code for the various possible enhancement processes, and these codes can be applied to labels. They are as follows:

N = Not enhanced
B = Bleached
C = Coated
D = Dyed
F = Filled
H = Heated
HP = Heated and pressure-treated
I = Impregnated
L = Laser-treated
O = Oiled or resin-impregnated
R = Irradiated
U = Diffusion-treated
W = Waxed (opaque minerals)

The above codes are intended by the AGTA for use only in transactions *between* dealers. "This information must also be provided to the consuming public, in writing using plain language; abbreviations and codes are not sufficient." (See the AGTA's *Gemstone Information Manual* 8th edition.)

Additional information may be obtained from the American Gem Trade Association, 3030 LBJ Freeway, Suite 840, Dallas, TX 75234 (www.agta.org), and the Jewelers Vigilance Committee, Inc., 25 West 45th Street, suite 400, New York, NY 10036.

Axis at www.MineralogicalRecord.com

As announced in the previous issue, *The Mineralogical Record* now publishes an online, peer-reviewed journal of mineralogy which is accessible free of charge on our new website at www.MineralogicalRecord.com. *Axis* is designed to permit the publication of more articles and papers than can be accommodated by *The Mineralogical Record* magazine. We have subtitled it "An Eclectic Journal of Mineralogy" to reflect its wide scope. Papers may be submitted in the following areas:

Descriptive mineralogy
Specimen mineralogy
Topographical mineralogy
History of mineralogy
History of mineral collecting
Museology (mineral museums)
Mineral collecting techniques
Social and cultural aspects of mineralogy
Mineral photography techniques
Mining history (mineralogy related)
Mineralogically related biographies
Geo-Literary studies
Mineral-related art and artists
Mineral-related travelogs

Rapid processing and publication will be an advantage; however, a high level of care will be accorded to the review process (to assure uniformly high quality), and authors will be given assistance with the editing and illustrating of their papers, as needed. Visit the website and click on *Axis Author Guidelines* for details regarding the form of submitted text and illustrations.

Recently Posted on *Axis*

DUNNING, G. E., and COOPER, J. F. Jr. (2005) Mineralogy of the Spring Creek area, Last Chance Mining District, Plumas County, California. *Axis*, volume 1, number 1, pages 1–30.

First discovered between 1905 and 1909, the mines of the Last Chance mining district produced significant quantities of copper and molybdenum until closing in the 1920's. Extensive collecting at the abandoned mines has revealed over 65 mineral species in a complex polymetallic quartz vein system, including bismutoferrite, bismutostibiconite, clinobisvanite, koechlinite, namibite, schumacherite, posnjakite, wroewolfeite, idaite, cornwallite, clinoclase, cornubite and lindgrenite.

WILSON, W. E. (2005) Advanced lighting techniques for mineral photography. *Axis*, volume 1, number 2, pages 1–36.

Mineral photography at the master level requires, among other things, a complete understanding and command of the way light interacts with opaque, translucent and transparent specimens and their surrounding environment. The photographer must take control of every aspect of this interaction, carefully, patiently and intelligently manipulating each one to serve his artistic vision and scientific sensibilities.

De FOURESTIER, J. (2005) The mineralogy of Star Trek. *Axis*, volume 1, number 3, pages 0–00.

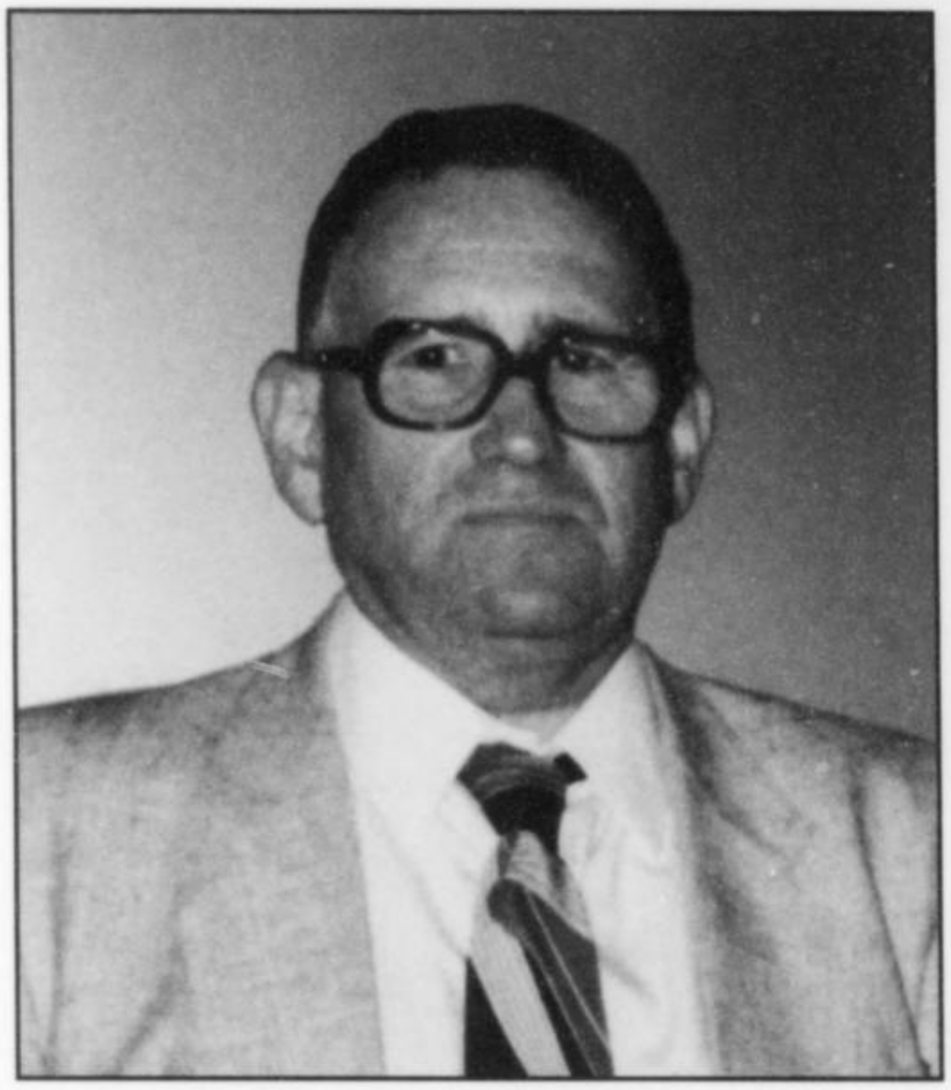
While most mineralogy papers treat serious mineralogy, this paper examines the mineralogy created for the imaginary universe of Star Trek *in which many of us have grown up. It is meant for fun, but as Stephen Hawking wrote, "Today's science fiction is often tomorrow's science fact. The physics that underlies* Star Trek *is surely worth investigating. To confine our attention to terrestrial matters would limit the human spirit." (Krauss, 1995).*

Died, Joseph J. Lhoest, 68

Joseph Lhoest, prominent Belgian mineral collector and author, was born June 27, 1934 in Liège, Belgium and died April 27, 2003. He attended medical school at the University of Liège and received his M.D. degree there in general surgery. In 1963 he was recruited by Union Minière du Haut Katanga mining company to work in their company hospitals in the Belgian Congo (later called Zaire and currently known as the Democratic Republic of the Congo). He initially served in hospitals and infirmaries near the East Group and Central Group mines at Likasi, Kipushi, Lubumbashi, Kakanda and Kambove, but spent most of his career (in the 1970's and 1980's) at the large hospital at Kolwezi, near the West Group of famous mines, including the Musonoi, Kamoto, Mutoshi, Mupine, Dikuluwe and Mashamba East and West mines.

During these years Joseph and his wife, Marcelline, became fascinated with minerals and almost immediately became enthusiastic mineral collectors. They and their sons would go on picnics to the mines so that they could collect minerals. Collecting by company staff in the quarries and dumps was tolerated in those days but was rather rare. Staff members most often liked to visit mines where the pit had penetrated the water table, because they could then enjoy a swim in the pools that formed. The Star of the Congo mine near Lubumbashi, in particular, (famous among mineralogists for its abundant cornetite) became a popular recreational lake.

Joseph was blessed with a remarkable memory. He soon developed a thorough knowledge of Katanga mineralogy and became recognized as an important local mineral collector. Having gained the trust of the miners, he was able to acquire mineral specimens from them to add to the growing family collection. From his



Joseph J. Lhoest (1934–2003)

convenient location in Kolwezi City he could visit all of the mines of the West Group. The family's mineralogical interests extended from exquisite display specimens to systematic reference and research pieces. The "gem" of their collection he considered to be his exceptional, 1-cm rosette of deep yellow shabaite from the Kamoto East mine. This beautiful matrix specimen was pictured in *Lapis* in March 1992.

In 1982 Joseph and Marcelline began attending the famous Tucson Gem and Mineral Show, and occasionally also the Denver Show. Joseph left Katanga in 1985 and returned to Liège, where he resumed his medical practice. From 1987 through 2002 he and Marcelline were regular attendees at Tucson, and traveled widely to European shows as well.

Joseph's mineralogical expertise was widely respected and sought after by those who knew him, especially with regard to copper, cobalt and uranium minerals. He never dealt in mineral specimens but was expert in the identification of Katanga unknowns. He had a jovial nature and an intellectual spirit, and enjoyed writing both technical and popular articles about his years in Africa. In retirement in the 1990's he wrote important articles on Katanga mineralogy, including especially his favorite locality, the mineralogically complex Kipushi mine. He wrote "La collection des . . . chantillons minéralogiques du Shaba" ["The collection of mineralogical specimens of Shaba (Katanga)"] for the Association des Géologues Amateurs de Belgique's *Minbul* magazine in 1989—a monograph on the descriptive mineralogy, geology and mining history of the Katanga mines. This is an important work, and his accurate map of the mines has been widely reproduced by other authors who have continued the study of Katanga minerals. Joseph also wrote "The Mashamba West mine, Shaba, Zaire" (with coauthors G. Gauthier and V. King) for *The Mineralogical Record* in 1991, and "The Kipushi mine, Shaba, Zaire," also for *The Mineralogical Record*, in 1995. Other works of his have appeared in Flemish, especially in *Geonieuws* (Antwerp), and in German in *Lapis*.

Joseph is survived by his wife and his three sons, Serge, Alexandre and Jean-Marc, with whom the family mineral collection will remain.

Gilbert Gauthier

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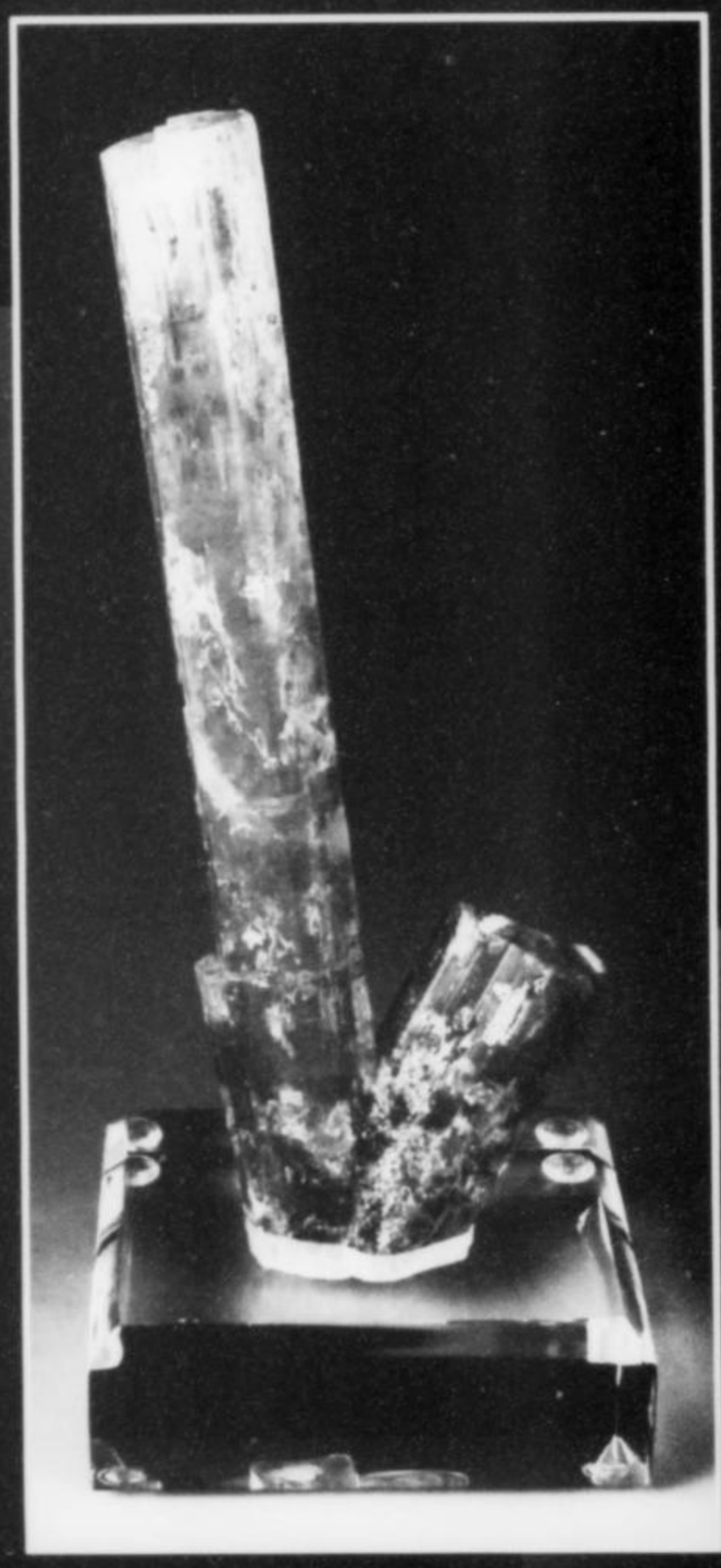

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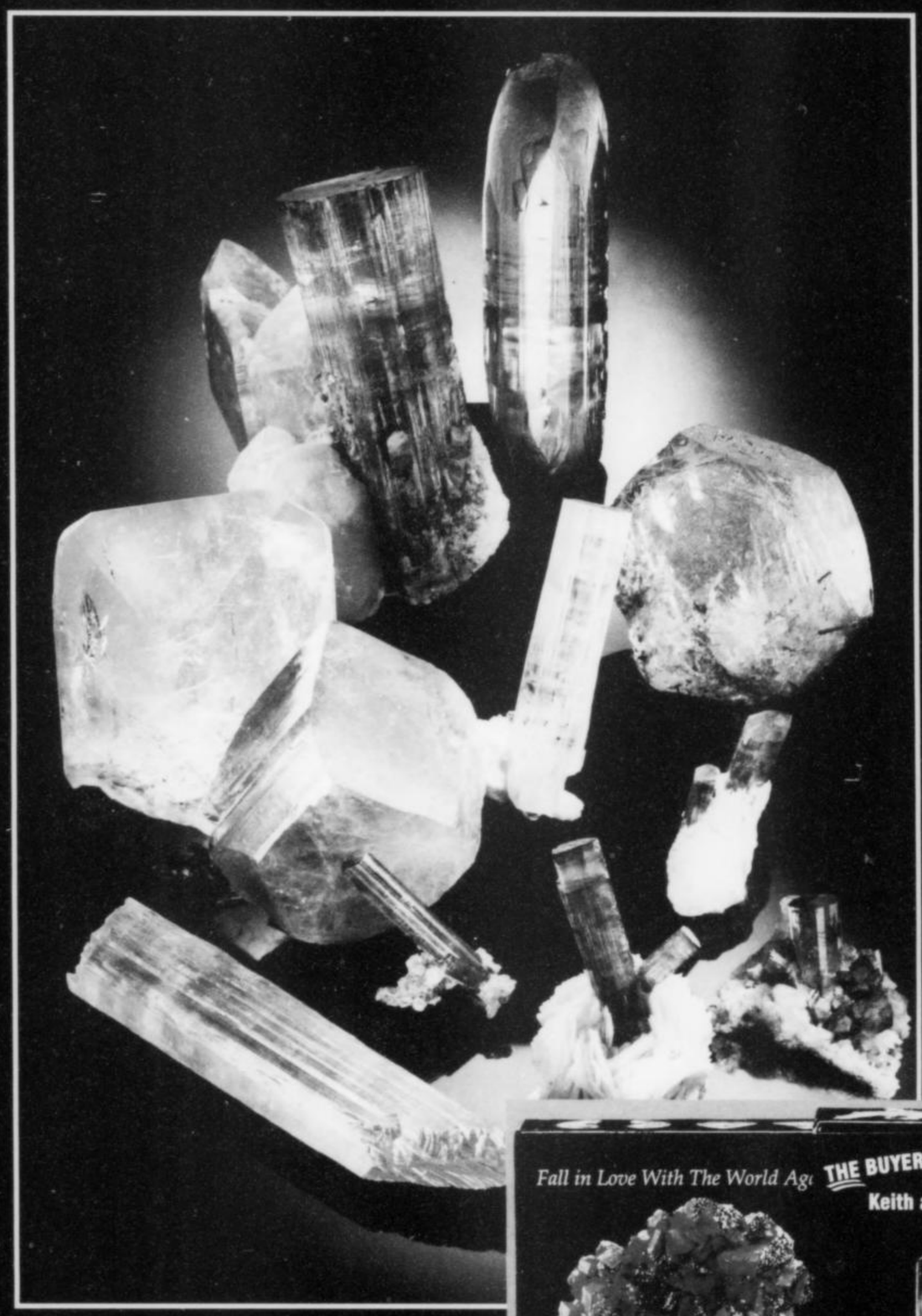

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Jeff Scovil photo.

The Devonshire Mineral Collection

of Chatsworth House

An 18th Century Survivor and its Restoration

Michael P. Cooper
33 Rosetta Road
Nottingham NG7 7GX, England

Assembled nearly 200 years ago, the mineral collection of one of English Society's most remarkable woman has recently been reassembled and painstakingly restored to its original order. The collection, including additions made by her son, contains an impressive variety of classic 18th and 19th-century specimens, many of which carry fascinating stories now being revealed through historical research.

INTRODUCTION

In 1992 the Russell Society celebrated its 20th anniversary. Since its creation from the mineralogical night classes of Bob King and Roger Harker, the society, named after that doyen of British mineral collectors Sir Arthur Russell (1878–1964), had risen to become the premier British society for the mineralogical *amateur*. The original Leicester-based society had spawned several semi-autonomous regional branches, each of which in turn would host the Annual General Meeting and Dinner weekend. On the 20th such occasion it was felt proper that the weekend be sponsored by the original Central Branch, and plans were made to keep the delegates happy. It is traditional for the host branch to arrange field trips to fruitful collecting sites but, these being few and far between in central England, and the majority of local members being well acquainted with those within easy distance, a novelty was sought that would stimulate wider interest. The weekend's theme being "Collecting Minerals," a visit to a local collection was in order, and visiting the mineral collection of the Duke of Devonshire at Chatsworth House was suggested by Franz Werner. No committee member had seen it, nor knew of its scope, but rumor had it that the collection was both extensive and historic. Past Dukes of Devonshire were well known as mine owners and supporters of the local mining and lapidary industries, and the present Duke was known to have purchased minerals at Sotheby's auctions in the 1970's.

Overtures were made to Chatsworth House and a positive, though guarded, response was quick to return. The author and society members Philip Jackson and Roy Starkey were sent to reconnoiter the collection and discuss the logistics of a mass visit. Phil arrived first; when we joined him he was holding a large prism of Russian aquamarine which he had just removed from a cardboard box of specimens, and he was looking, frankly, rather shell-shocked. We began opening a few more boxes. We were all astonished by what we found: first, another superb old-time Russian aquamarine crystal about 15 cm long, then a series of old Cornish specimens. A suite of superb Derbyshire galenas was to follow, along with many other local and foreign classics among a mass of rocks and ore samples. But our excitement was tempered

Figure 1. **Chatsworth House in the autumn. The Wyatville extension is mostly hidden in the trees on the left of the main house. Photo by permission of the Duke of Devonshire and the Trustees of the Chatsworth Settlement.**

with regret, as this was far from an organized collection. Specimens were stored in a basement cupboard in piles of cardboard boxes, others were jumbled in two late-18th-century glass-fronted cabinets on the floor above, and hundreds more filled a row of wall cases running the length of a nearby corridor (the "Cavendish Passage"). Decay and dilapidation were everywhere apparent. Dust and dirt and the ravages of pyrite disease had taken their toll; the bottoms of boxes were found—too late—to be home to loose number labels which could no longer be even tentatively assigned to the specimens from which they had fallen. Some pieces had labels held to them with perished rubber bands, notable mostly for their inaccuracy: one water-rolled galena pebble (probably from a Derbyshire cave deposit) was labeled "matlockite." Specimens crumbled between our fingers, and brittle labels fell away as specimens were lifted from their yellowed newspaper wrapping.

Here was a fascinating and historic collection on the verge of extinction. Among Chatsworth's wonderful heritage overall, a few rocks (no matter how exciting to us) had long been considered to be of little importance. One can hardly regard their lowly treatment as a failure of intent; it's a matter of priorities. And yet despite the collection's condition there was a feeling that it was somehow nearly all here, that little had actually been lost. Within the great house of Chatsworth little is ever actually thrown away—items may fade from view or pass from the memory of owners and staff, but somewhere they await eventual rediscovery. In a centuries-old house containing 175 rooms, 21 kitchens, 17 staircases and an infinity of nooks and crannies (see Duchess of Devonshire, 1982; 2002), there is plenty of space for a few rocks to hide.

The original catalogs of the collection, long unseen, had been rediscovered some years previously in an old box in the Estate Office and were produced for our inspection. The author's name sprang from the title pages of these two volumes and an accompanying manuscript book inscribed *Catalogue of the External Characters of Fossils. By White Watson F.L.S. Bakewell, Derbyshire. 1798.* Watson was a pioneer of local geology, and a gifted lapidary; he was one of the most interesting figures in late 18th century

Figure 2. **Georgiana, Duchess of Devonshire, the famous portrait by Thomas Gainsborough in Chatsworth House. Photo by permission of the Duke of Devonshire and the Trustees of the Chatsworth Settlement.**

Figure 3. **Portrait medallion of Georgiana by Josiah Wedgwood. Nottingham City Museums and Galleries.**

Derbyshire geology. We were quickly able to match numbered specimens to entries in these 200-year-old handwritten volumes. Our excitement was palpable, and the receptive interest of Chatsworth staff in our enthusiasm was reassuring.

On subsequent visits, specimens were selected and cleaned for display to the membership. On the day of the "field trip" in April, a large table in a small basement library was covered with interesting and spectacular specimens: Derbyshire galena and fluorite, Watson's inlaid "tablets," French axinite and prehnite, Russian gem crystals and copper minerals. For the occasion the "Duke's Emerald"—a huge Brazilian crystal, once the largest known—and two amazing silver specimens in small glass cases were produced from the strongroom. Eyes popped. These last priceless pieces were new to us all.

The AGM weekend and visit to Chatsworth House was a great success. The table of specimens glittered temptingly and everyone found something to interest them; even luminaries such as Bob Symes of the British Museum (Natural History), French collector Eric Asselborn, and gemologist Bob Howie were impressed. After the event, the specimens were left on the table for the Duke and Duchess to see, since no one in modern Chatsworth had seen these things cleaned and laid out like this.

It was with deep concern that we went home that day. Having

Figure 4. **The 6th Duke of Devonshire, by Sir George Hayter, 1816. Chatsworth House. Photo by permission of the Duke of Devonshire and the Trustees of the Chatsworth Settlement.**

seen what was to hand, having noted the precarious state of the labeling and the decay, and now having drawn the attention of fingers untutored in the handling of delicate minerals to such a range of historically important material, we were worried it would not last much longer without intervention. A need to ensure the preservation of the collection began to be generally felt. Over the next weeks a plan of action was drawn up and a proposal made to Chatsworth to inventory the collection, store it properly and restore it as far as possible to its original arrangement. Well, to cut the story short, the Chatsworth curatorial staff were supportive, the Duke and Duchess enthusiastic, and work began. At the time we had no idea that we would still be doing it 10 years later, or that the discovery of so many fascinating stories was in store for us.

HISTORY

Georgiana, Duchess of Devonshire

The Devonshire Mineral Collection was begun by one of the most remarkable women ever to grace English high society. Georgiana[1] Spencer was born on the 7th of June 1757, daughter of John Spencer (1st Earl Spencer), and Georgiana Poyntz, in the Spencers' great and ancient house of Althorp. The family was one of the most powerful in the country, yet Georgiana was destined for even greater things. When she was but a child she was introduced to the adolescent William Cavendish, the 5th Duke of Devonshire, head of the most powerful family in the land outside of Royalty, who quickly fell for her youthful charms. William Cavendish was descended from Bess of Hardwick (1518–1608), who survived four husbands to become so immensely wealthy that she could devote her entire life to "building great houses with a passion that bordered on the obsessive" (Masters, 1981). It has been said that only Elizabeth I of England had greater personal wealth. Bess's second husband was Sir William Cavendish, a close advisor to Henry VIII and the only one of her husbands by whom Bess had children. Sir William began building Chatsworth House in 1551, but did not live to see it completed. After his death in 1577 Bess continued the work which was finally finished in the 1580s. She bequeathed Chatsworth to her son Henry Cavendish, who sold it to his younger brother, William, who became 1st Earl of Devonshire in 1618. Wealth, property, power and title continued to accumulate in the family. The Devonshire Dukedom was bestowed upon the 4th Earl by a grateful William III in 1694. Between 1686 and 1707 he remodeled Chatsworth, leaving the form of the main house essentially as it is today. His great-grandson, the 4th Duke, married

[1] The Devonshire set pronounced her name "Jor-Jayna."

a daughter of the Earl of Burlington, thereby adding to the family estates Lismore Castle in Ireland, Chiswick House, and Burlington House in London's Piccadilly, the last now the home of a galaxy of learned societies including the Linnaean Society, the Royal Academy, the Royal Astronomical Society and, appropriately here, the Geological Society.

Two days before her 17th birthday Georgiana was awakened with the surprising news that she was to wed the Duke that very day. The couple's courtship had been the subject of much fascinated gossip, but the conclusion had been a carefully guarded secret for fear of the attention a public event would arouse. The quiet ceremony was attended by her grandmother, Lady Cowper, the Duke's sister the Duchess of Portland (herself a great collector), and his brother, Lord Richard Cavendish. This deliberately low-key event was the beginning of a life that was to be lived in the full glare of private and public speculation and scrutiny, to survive infidelity, tragedy and scandal, and to end prematurely in agony. Parallels with the tragic life of a more recent member of the Spencer family are unavoidable.

Georgiana was an extraordinary woman. As the new Duchess of Devonshire she was guaranteed celebrity, but her intelligence and sense of style, her personal magnetism and enthusiasm, made her a very real force in 18th-century society. She was loved—often passionately and sometimes improperly—by almost everyone who knew her. Her fascination and delight in the interwoven worlds of high society and politics quickly became more than mere enjoyment of fashion, frivolity and the trappings and personalities of her powerful milieu; Georgiana wanted to contribute, and was well able to do so, although as a woman she was expected to play supporting roles. Her abilities were soon recognized and her opinions and patronage eagerly sought and freely given. Politicians, writers, and aristocrats fell under her spell, and the common people loved her and delighted in the gossip, scurrilous or otherwise, that followed her every move. Under her influence, her circle of family, friends and acquaintances drove the absurdities of the fashionable world (known as the *ton*) to new heights and was the inspiration for Sheridan's 1777 hit play *School for Scandal.*

But Georgiana's innocent abilities had a fatal flaw: an addiction to gambling. Her debts reached such enormous proportions that she hid their true size from everyone. Terrified that her husband would discover her financial problems, she turned to friends and relatives for support, but even their frequent contributions and the indulgence of her banker, Thomas Coutts[2] (she owed him £20,000 by the late 1790s, the equivalent today of £1.2m!!), barely blunted the edge of the fearsome debt. Although the scale of the liability was unusual, gambling debts were themselves hardly atypical in high society. It was a time when remarkable excess, political and sexual intrigue, absurd fashions and passions were accepted, indeed were almost *de rigeur.* The worst, possibly even the only, crime was being caught.

Georgiana's marriage was not an unqualified success. The Duke's notoriously dull character was unlocked only by his mistress Elizabeth "Bess" Foster, leaving him with little passion and favor for his wife. Bess shared the Devonshires' homes and holidays for many years, bearing the Duke's children (though their father's identity was kept from them to the last) while at the same time being one of Georgiana's closest friends. This unusual *menage à trois* caused little stir, but when Georgiana became pregnant by *her* lover it was a scandal. This event was to help precipitate Georgiana's active interest in mineralogy, and so we will abruptly leave much of the remainder of Georgiana's remarkable life unsaid. Some of the tale is hinted at in the current work, which concentrates on one of the less sensational, if personally important, aspects of her life. The rest of her story, and that of the Devonshire circle in general—"this vale of tears and laughter"—has been told many times. The finest biographies are those of Leveson Gower (1944), Brian Masters (1981) and Amanda Foreman (1998); and the lives of the Cavendishes in general can be found in Pearson (1983), to which the interested reader is urged to turn.

Georgiana's Minerals

Georgiana began collecting minerals in the closing years of the 18th century, not long before illness and infirmity were to restrict her social activities. At the time she was exiled in Europe, banished from her husband's house as a result of her absurd gambling debts and the discovery of her affair with the politician Charles Grey. In Montpelier she gave birth to Grey's daughter, melodramatically writing a farewell note to her son in her own blood on the night before her confinement in case she should not survive the ordeal. The child was taken from her immediately to be raised by Grey's family in Northumberland. The loss blighted Georgiana's life; though she supported her daughter as an elder friend, she never told her the truth of her birth.

While in France, Georgiana began to study natural science, partly as a means of supporting and contributing to her children's education, and almost certainly as an escape from her sad state. Quite apart from any innate interest in the subject (she already professed a fascination with geology) she may have been influenced not only by the considerable vogue for natural history collecting at the time, but also by the eminent mineralogists among her many acquaintances abroad. The earliest references to the subject are in letters home to her 9-year-old daughter Georgiana or "Little G." and in her Exile Journal (J/18/67/2, Castle Howard, Carlisle). "I am beginning to . . . study mineralogy that I may be able to go to Lever's with you," she wrote from Nice in April 1792. (The museum, or *Holophusikon*, of Sir Ashton Lever in London was one of the wonders of the age.) Her first lessons in natural history and mineralogy came from an unidentified Dr. Dreux or Drew.[3] "He will not come to one," she wrote, "as he is busy with his sick people–the day we saw him at a cabinet of natural history we were delighted with him." While sailing from Nice to Genoa her boat was forced by bad weather to put in at Monaco, where Georgiana went for long walks on which she collected mineral specimens (Leveson Gower, 1944). She had become fascinated by the study of mineralogy for its own sake.

Her band of English travelers attracted more and more friends as they crossed Europe and made a party of their separation from home. Reaching Geneva in May 1792, Georgiana met with the Swiss botanist and geologist Horace Benedict de Saussure (1740–1799): "a great Philosopher . . . a most interesting and amiable man–much attached to his wife and has two sons & a beautiful daughter." He gave her "two bits of Granite he picked up from the

[2] Coutts bequeathed the majority of his considerable fortune to his grand-daughter Baroness Angela Burdett-Coutts (1814–1906) who became one of the Victorian era's greatest philanthropists. She gave away some £3m during her life, but also found time to amass a considerable mineral collection, employing mineral dealer James Tennant (1818–1881), Professor of Geology at King's College, London, to curate it.

[3] A William Drew [sic] was at one time her personal physician, and that of her friend and fellow mineral collector Lady Holland (Wright, 1989), though there is no mention of his name in the catalog of her papers at Chatsworth House. A Dr. Drew was among a company of friends of Georgiana whom Blagden met in Lausanne in 1792 (de Beer, 1950).

summit of Mont Blance [sic], which I shall preserve as great treasures" (Georgiana to her daughter Georgiana 5 June 1792, quoted by Leveson Gower, 1944). In Lausanne, Georgiana and her sister Harriet took private lessons in mineralogy and chemistry with Henri Struve (1751–1826), Professor of Chemistry at the Academy (de Beer, 1951), accompanied on occasion by the historian Edward Gibbon (1737–1794), possibly more from his devotion to Georgiana than to mineralogy. Another associate was Henry Pelham, who remarked of his companions in September 1792: "Chemistry and mineralogy in the morning and drawing all the evening; in short nothing can be more instructive or pleasant than their society" (Foreman, 1998). Other members of the group included Lord and Lady Palmerston, who observed that Georgiana had "*taken extremely to mineralogy*" (Connell, 1957). It was through Palmerston that Georgiana was introduced to the scientist Sir Charles Blagden (1748–1820), the secretary of the Royal Society. Georgiana and Blagden became life-long friends and he did much to encourage her interests in chemistry and mineralogy. While at Lake Geneva in 1792 he also accompanied her to Struve's lectures, but was not impressed: "[he] seems a dull Swiss, who knows well enough the objects of his attention, but without any imagination; he speaks not amiss in conversation, but in lecturing hesitates excessively." In discussion with Gibbon, Blagden and others about experiments in chemistry and the nervous system of animals, Georgiana revealed "she was quite wild with studies of that nature," and that "now she came to towns with very different ideas from her former ones, to see the men of science & eminence" (de Beer, 1950). She had come to the right place. While at Lake Geneva in the few weeks mid-August to mid-September 1792 Blagden met no fewer than eight Fellows of the Royal Society along with several other notable continental scientists. And Gibbon ("very clever but remarkably ugly" according to Georgiana) had lived in Lausanne on and off since being withdrawn from Oxford following his conversion to Roman Catholicism in 1753. Here he completed his masterwork *The Decline and Fall of the Roman Empire*.

Despite her enthusiasm for science in general "my favourite of all favourites is mineralogy" she said in June 1792, "and I have already a pretty Collection of my own collecting" (Leveson Gower, 1944). An undated letter to her banker, Thomas Coutts, which must have followed shortly after her experiences in Lausanne, shows Georgiana's growing devotion to her new hobby:

> From the necessity of [finding?] some occupation thus separated from my Dear Children & family—I amused myself last summer in studying natural history—not only as an object for the moment but as one likely of being productive of advantage & amusement to my Dear Children & to me in the country. But as I do not allow myself to purchase any specimens I contented myself with a little collection of minerals which I left to a professor at Lausanne to write me this catalogue & which I had collected myself. I did not propose sending them to England till Spring—But he has sent them to your Direction—they are two Cases . . . will you let them stand in your strong room till I return—for I prize them far above their value. . . . I am quite anxious & uneasy least any thing should have happened to my poor Cabinet by its being sent too soon for it is grown a great amusement to me . . . my reason for wishing them to stay at yr house is the fear of their being deranged at Devonshire house; as I wish to put them in order myself. (Coutts Archive, no. 9918)

En route to Rome and Naples in April 1793, Georgiana described her hotel room as "full of great pieces of Spar which I have picked up." In Naples she described in a letter to Little G. her continuing fascination with mineralogy:

> I have made great additions here to my collection of minerals—I shall have a most complete collection to study. I don't allow myself to buy—as I am not rich enough, but people have been very good to me & have given me many specimens—indeed ever so small a piece satisfies me—& when I say I don't allow myself to buy I mean I don't allow myself to lay out above 3 or 4£ in a place. I bought a collection of Marble at Florence for half a guinea [10s 6d] & here the productions of Vesuvius for 2½; but as I don't mind scrambling I pick up a great deal myself. You wd. laugh to see me climbing up hills with a hammer in my hand—& seeing me with 3 or 4 Natural Philosophers ev'ry morning. I have some great curiositys, but when I return you shall help me arrange my Cabinet.
>
> In Earths I have ye following curiositys—some fine specimens of Rock Christal—one piece with a substance in it that looks like gold thread—call'd les cheveux de Venus [Venus's Hair]. I have some marble with a shell that looks like fire [Lumachella marble]. I have some spar that looks like mother of pearl—and I have one little christal that looks like a cluster of beautiful pearls—these I carry with me, but my larger boxes are to go to England by Sea & I fear will never arrive safe." (quoted by Leveson Gower, 1944)

Georgiana was invited to meetings between Blagden, Sir Joseph Banks, Sir William Hamilton and others who gathered to study Vesuvius and other natural and artificial wonders of the area. Hamilton (1730–1803) was Ambassador to Naples, a noted early vulcanologist and art collector, and uncle of the renowned mineral collector Charles Greville (1749–1809). This was one of the happiest periods of her life. Freed of the urge to gamble, she preferred to spend her days at the house of Father Gian Vincenzo Petrini (1725–1814), professor, curator of the mineral collection and later Director of "Collegio Nazareno" in Rome. His house was a home to visiting scientists, and there she continued her discussions with Charles Blagden. Surrounded by an eminent and friendly company, Georgiana nurtured her fascination with geology and mineralogy, and climbed to the summit of Vesuvius to watch the vapors rising from the crater. Another associate on her continental tour was the scientist, statesman and sometime spy Benjamin Thompson, Count Rumford (1753–1814), who on August 2, 1793 broke a specimen of rock from the "very top of the highest point of Mount St. Gothard" and presented it to the Duchess at Bern, Switzerland on August 21, 1793, shortly before Georgiana's long-awaited return to England and reunion with her family.

Georgiana had been much affected by her long exile. Gone was the star of the *haut monde*, the notorious gambler with the reckless nature. In its place was a more studious and humble personality, devoted to her children, reconciled to some degree to the Duke, and spending long hours studying chemistry and mineralogy in a back room of Devonshire House. Blagden was a frequent companion and was sufficiently excited by her acquisition of a specimen of "elastic marble" from Italy to report it to Sir Joseph Banks in August 1794 (Foreman, 1998: 292). [Two specimens of "elastic sandstone" remain in the collection (F-50 and F-51), but specimen G-10a "Elastic Marble (on a board)" has not yet been found.] In 1793, with Lady Elizabeth Webster (1771–1845, formerly Vassall; later Lady Holland), herself an assiduous collector of minerals, she was attending Dr. Bryan Higgins' lectures at his School of Chemistry in Greek St., Soho (Wright, 1989). The chemist and physician

Thomas Beddoes, after a visit from the Duchess in 1793, wrote to Erasmus Darwin that she "manifested . . . a knowledge of modern chemistry superior to that he should have supposed 'any duchess, or any lady in England was possessed of'" (Stock 1811). Her mother, Georgiana's sternest critic, noted:

> she has a genius for it [mineralogy]. Padre Patrini [*sic*], one of the first men in that line in Italy, and Sir Ch. Blagden have both assured me . . . that the degree of knowledge the Dss has acquired and her observations were very extraordinary. Mr Cavendish too I find is delighted with her. He calls upon her frequently. (Foreman, 1998: 292).

This was the noted chemist and physicist Henry Cavendish (1713–1810), a second cousin of the Duke's, and the intellectual star of the line. But Georgiana's new-found stability and happiness were not to last. She had long been a victim of fearsome migraines, and in early 1796 the condition forced her to take to her bed where the pain behind her eyes was soon to be revealed as the symptom of a far worse malady. In a few days her right eye swelled "to the size of an apricot" and a galaxy of medical talent was quickly called to her bedside. Although she was numbed by opium, and bolstered by past survival of painful childbirth and miscarriage, the ensuing treatment was horrific for patient and onlookers alike: at one time a tourniquet around her neck was used to force the blood into her head and leeches were applied to her eyeball. Her children were dispatched to Chiswick to be out of earshot of their mother's screams. A telling comment from her sister Harriet sums up the situation: "After hearing what I did tonight I can bear anything" (Foreman, 1998).

She was to recover, and although her eye was lost and her appearance disfigured, her resolve and fortitude were increased. Her old interest in politics was rekindled, and her passion for mineralogy continued, though we have only fragmentary evidence of it. White Watson was employed for nine weeks, April to June 1799, to catalog her now substantial collections at Chiswick. On the same trip to London he also arranged the mineral collection of Lady Henrietta Bessborough (Georgiana's sister) in Cavendish Square (Watson's *Commonplace Book*, Hugh Torrens, *pers. comm.*). Five years later he performed the same task on Georgiana's specimens at Chatsworth. In the late 18th century J. M. Hedinger dedicated *A Short Description of Castleton . . . its natural curiosities and mineral productions* to Georgiana, noting her "very peculiar Attention . . . long shown to the Mineral Kingdom" and her "wish of promoting the Science of Chemistry, connected with Mineralogy." (The book ran from its 5th to its 26th editions between *ca.* 1800 and 1839; the earlier editions I have been unable to find.) In 1799, when the collector William Day was hoping to sell his mineral collection, which the Count de Bournon had recommended as a fine basis for "a person of fortune to form a Cabinet of English Minerals," Day expressed the hope that Charles Greville would recommend it to the Duchess of Devonshire (W. Day to Philip Rashleigh, 1799, Rashleigh Papers R5757/1/93, Cornwall Record Office, Truro), but this evidently came to nothing and his collection was acquired by author and collector James Sowerby after his death.

Other than the scattered fragments assembled above, and her collection itself, there is, unfortunately, little contemporary evidence of her collecting habits or the depth of her involvement in the hobby or science. Nothing purely mineralogical is known to survive in her own papers and very little reference to her from any of the other important figures involved with the Chatsworth mineral collections has been found. The 18th century mineralogy texts now in the Chatsworth library were probably part of the great library of Henry Cavendish (Harvey, 1980), which Henry's heir Lord Cavendish gave to the 6th Duke (e.g. Johann Gesner's *Tractatus Physicus de Petrificatis*, 1758 and Torbern Bergman's *Sciagraphia Regni Mineralis Secundum Principia Proxima Digesti*, 1783).

Many of Georgiana's specimens are rather dull and unattractive to the modern collector; typical of a systematic collection rather than a display of the exceptional; obviously acquired with more regard for their place within some mineralogical scheme than for their aesthetic qualities. This may seem unexpected in a society hostess whose early involvement with fashion and frivolity was so often satirized and censured, whose homes were filled with the marvels of art, whose husband was one of the richest men in the country, well able to afford the premium that rarity and beauty acquire. It supports the idea that she had a genuine interest in the systematics of the subject, though it may equally demonstrate a lack of sophistication.

Towards the end of the 18th century Georgiana finally confessed to the Duke the full magnitude of her debts and he determined to settle them. Once word of this got out yet more creditors emerged with claims, and even poor Georgiana was hard-pressed to separate the genuine from the opportunist liars hoping for some easy money. She died in agony on 30 March 1806 after a dreadful final illness, aged only 49. After her death the Duke married his mistress Bess, to the disgust of the family, but a few years later he also died and Bess was banished by Georgiana's son, who, antagonized by her unreasonable claims to house and property, paid off his step-mother to remove herself from the household. Despite this rift he determined to support her and her children, and was true to his word; she was, after all, his mother's closest friend and the love of his father's life.[4]

"Hart," The 6th Duke

When Georgiana returned to England after her long exile her 3½-year-old son William, known as Hart from his courtesy title of the Marquess of Hartington, was a stranger to her. He was a strikingly good-looking and attentive boy, yet fiercely independent and prone to passions and sulks. To Georgiana's great relief, in time the two were reconciled, though only a few years together were left to them. He was born in Paris in 1790—a quite remarkable place for his mother to be in such troubled times, and an episode that stimulated an enormous amount of speculative gossip.[5] Little more than two months after Hart came of age his father died, and he inherited title, estates, great houses, possessions and wealth almost beyond belief. With this vast fortune came much responsibility, and the necessity to settle his parents' affairs. Georgiana's gambling debts still stood at over £100,000, and mismanagement of his father's estates by the aged family solicitor had resulted in further encumbrances. Hart had to arrange settlement of the debts as well as an annuity for his step-mother and her children. Hart became Lord-Lieutenant of Derbyshire within weeks of his father's death and made his maiden speech in the House of Lords in January 1812.

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[4] Elizabeth has recently been rehabilitated in a new book which draws on many unpublished family papers: *Elizabeth and Georgiana. The Duke of Devonshire and his two Duchesses* by Caroline Chapman and Jane Dormer. John Murray, London, 2002.

[5] Paris seems to have been a convenient place for the birth of the illegitimate children of the British aristocracy: James Macie (1765–1829), the illegitimate son of the Duke of Northumberland, was born there. He changed his name to Smithson in 1801 and is best known as the founder of the Smithsonian Institution.

His passion for collecting was quick to surface, as was the almost genetic tendency for extending and refurbishing his remarkable portfolio of real estate: Chatsworth and the semi-derelict Lismore attracted much of this attention. Immediately after his succession he spent £50,000 on coins and medals, but soon tired of them, finding them insufficiently rewarding as collectibles. In 1844 he sold them at a huge loss for £7,056 to finance maintenance on his properties. He did, however, remain true to his love of books, though claiming that a lack of learning made him unworthy of his own collection. This too was a family trait: his father had been a great bibliophile and reader, Georgiana delighted in books, and her brother the 2nd Earl Spencer has been described as "the greatest collector of incunabula and early printed books who has ever lived" (Lees-Milne, 1991). Hart bought expansively at many of the greatest book sales of the 19th century. When he brought his books together at Chatsworth he found the existing library too small to accommodate them and had the 1st Duke's Long Gallery gutted to take bookshelves, incidentally weakening the structure of the house through the injudicious modifications. This architectural disaster aside, the present library is a fine space and makes a lasting impression on today's visitor, being opulent and grand, yet still attractively domestic. The Chatsworth Library now contains over 50,000 volumes.

In London in 1816 Hart met the Grand Duke Nicholas of Russia, destined to become the Tsar of All the Russias. The two young men struck up an immediate, deep and lasting friendship. The Duke invited Nicholas to Chatsworth and the invitation was immediately accepted. For a few days they toured, shot, and talked together into the night, enjoying a care-free relationship that was often to be recalled but never to be repeated as the constraints of state and status tightened around them both with the passing of the years. Nicholas returned to London, and the Duke followed his new friend in early 1817. They did the social round and dined together frequently. When Nicholas left England to return home to his bride-to-be, he invited Hart along. The two traveled separately, but met up often en route. Hart stayed for several weeks in St. Petersburg and was much struck by the beauty of the city. He dined with the Emperor Alexander I and was feted by the Russian nobility. After the royal wedding he traveled back to England via Italy and France and thence to Chatsworth. In 1818 he was setting to at Chatsworth with great determination. The architect Jeffry Wyatt (later Sir Jeffry Wyatville), fresh from his successes at Longleat, was called in, and together they planned a formidable extension to the house to accommodate Hart's collections and his intentions for grand entertainments. Wyatt also compensated for the architectural failings of the library. He was wholly unimpressed with the window the Duke had made from slabs of "Blue John" fluorite, as the Duke relates in his *Handbook* (1844–45):

> The Derbyshire spar in the window is made of beautiful specimens: it shows how fine a thing might be made of the material. The stones were intended for a cabinet of minerals, and from their shape could only be arranged in a formal and not graceful pattern; and much did Sir Jeffry condemn the whole thing, which he pronounced to be the exact resemblance of his grandmother's counterpane.

This window was moved by the late Duke from the Theatre to the "West Sub-Corridor."

Hart's appetite for foreign travel and culture whetted by his trip to Russia, tours of Italy soon followed, in search of Italian art, especially marble sculpture to which the Duke devoted a fortune and much effort. His fascination with Italian decorative stone led him to the Italian lawyer Faustino Corsi (1771–1845), who, in his *Catalogo ragionato* . . . of 1825, notes that the Duke of Devonshire had "honored his collection with a visit, and also enriched it with precious gifts." Corsi, in addition to having judicial responsibility for the Vatican police, was an expert on the decorative stones of antiquity (Cooke and Price, *in press*: 87–88). His collection of 1000 slabs was purchased by Stephen Jarrett and presented to the University of Oxford in 1827, and is now in the Oxford University Museum of Natural History. Currently the subject of intensive research, it contains 16 polished slabs of Derbyshire stones, including "Duke's Red," Ashford Black Marble, Rosewood Marble, various fossil limestones, and fluorites including Blue John. The "Duke's Red" is a beautiful hematitic limestone found in a limited deposit at Youlgreave in Derbyshire in the 1820s. The Duke used it extensively in table tops and other lapidary work for Chatsworth, where the remaining world's supply of this unique stone lies piled in a basement corridor.

Hart's influence on the Derbyshire "petrifaction" industry was enormous, especially through the use of local stone and workmanship in the fitting out of the Wyatt extensions to Chatsworth (Brighton, 1995), where the results of Hart's artistic collecting and patronage adorn the Sculpture Gallery. The noted and fashionable sculptor Francis Chantrey (1781–1841) was a friend and a frequent visitor to Chatsworth. As owner of one of the finest private collections of minerals in the country, Chantrey may have fired the Duke's enthusiasm for a subject which youthful lessons from White Watson had failed to kindle.

The rest of the Duke's full and fascinating life need not concern us here (see Lees-Milne, 1981), save for his appointment as Britain's Ambassador Extraordinary to Russia on Nicholas's succession to the throne in 1826. In itself an important step in Hart's life, the event is also remarkable in another way. On the very day he left for Russia his new head gardener arrived at Chatsworth. At 4:30 in the morning Joseph Paxton, then 23 years old, arrived at the House, having traveled overnight from London. As related by Lees-Milne (1981), before the end of the day, having scaled a gate to get into the estate, he had walked all around the grounds, examined the house, set the men to work at 6 o'clock, and fallen in love with the housekeeper's niece (whom he married within 8 months). He was to remain in the Duke's employ for the rest of his life, becoming one of his most trusted friends, manager of his vast estates and his financial advisor—as well as one of the most celebrated architects of the age and a knight of the realm. His was the deciding hand in the refurbishment of Lismore Castle, but his most lasting contribution to British culture was the design of the Crystal Palace for the Great Exhibition of 1851. It was a remarkably adventurous building, all prefabricated glass and cast iron inspired by the leaf structure of a huge water-lily which Paxton had been the first to encourage to flower in England in his Chatsworth greenhouse. Like the latter-day Millennium Dome the Crystal Palace was not to everyone's taste—John Ruskin likened it to a row of monstrous cucumber frames—but unlike the Dome almost everyone else was delighted with it, and the Exhibition was a huge success, setting in train a plethora of Great International Exhibitions around the world (Leapman, 2001; Greenhalgh, 1988). Of interest to us here is the array of minerals on display, either on the stands of mineral dealers or in large national and international contributions from government bodies, private collectors and mining companies anxious to prove the value and novelty of their properties. Specimens from the Duke's collection were included.

Hart died in his sleep 7 years later in 1858, having made a lasting mark. His books, his beloved sculpture and objects d'art adorn the house still—reminders of the last of Chatsworth's great collectors to enjoy such freedom to indulge his personal passions.

The Duke's Minerals

We have little other than the specimens themselves to give us an insight into the Duke's interest in mineralogy. No catalog of the collection from the Duke's time exists, though there are a few short lists of items acquired *ca.* 1817–1827. None of his specimens are systematically cataloged, though many bear handwritten or printed labels of one sort or another. Although there are thus relatively few that can be definitely assigned to him, many of these are quite superb. The earliest record of his collecting is that of Hart buying specimens from White Watson in 1809: Watson's cashbooks record a "Tablet of Ironstones and coals" purchased by the Marquis of Hartington for £6.0.0. Unfortunately this cannot be found today—perhaps it was a gift for another. We know too that he bought from Henry Heuland (1778–1856), the leading dealer of the day, in 1820 and 1833 (Duke's private account book, Chatsworth archives), and attended a Heuland sale in May 1834, as shown in an annotated auction catalog in the library of the Natural History Museum in London. Lecturer and mineral dealer Prof. James Tennant (1808–1881) is known to have stayed at Chatsworth working on the collection, though we do not know what he did and only one specimen can be attributed to him (it bears his label and must date from after 1840).[6] The Duke had sufficient confidence in him to entrust him with the "Duke's Emerald," to exhibit at his stand in the Great Exhibition at Crystal Palace in 1851, along with the Simplon Tunnel quartz crystals still on display in the Chatsworth Sculpture Gallery (Anon, 1852). Whether these were acquired during the building of the tunnel in the early 1800s no one knows. They had pride of place in one of the main avenues of the exhibition.

Other than the Heuland specimens described below, Hart's most inspired purchases were from the sale of the collection of Sir Alexander Crichton FRS, MD, FRCS, FLS, FGS (1763–1856). The polymathic Crichton was physician to Emperor Alexander of Russia from 1803 to 1814, and was well respected for his work on insanity. Fuller details of his life are given in an anonymous obituary in the *Geological Magazine* (1857), by Tansey (1984), Appleby (1999), and in the *Dictionary of National Biography*; his contributions to geology comprise papers on fossils and geology in the *Annals of Philosophy* and *Geological Transactions*. The rare mineral crichtonite, from Bourg D'Oisans, Isère, France, was named in his honor by de Bournon in 1813. Although subsequently long believed to be merely a variety of the much commoner ilmenite, its species status was reaffirmed by work in the 20th century. Crichton's collection contained several fine specimens of the mineral.

In 1818, Crichton's mineral collection was described by Joseph F. Wagner as the finest in Russia:

> without doubt the magnificent and rich collection of Sr. Excellenz des wirklichen Etats-Rathes und Ritters und K. Leibartzes, [his Excellency States Counsellor, Knight and Royal Physician], Herren von Crichton, takes precedence. Not just because it contains the significant quantity of more than 4000 specimens, but also because all it contains is valuable and rare. One finds nothing therein that cannot claim to be unusual; all is carefully chosen with the purest taste and finest delicacy. The most beautiful and sumptuous blooms of the mineral kingdom are gathered here in a single whole. The collection is still being increased whereby it gains in classical

[6] There is a letter dated 2nd July 1847 in the BM(NH) Mineralogy Correspondence Archive from Tennant addressed from Chatsworth. Unfortunately he does not mention the reason for his visit.

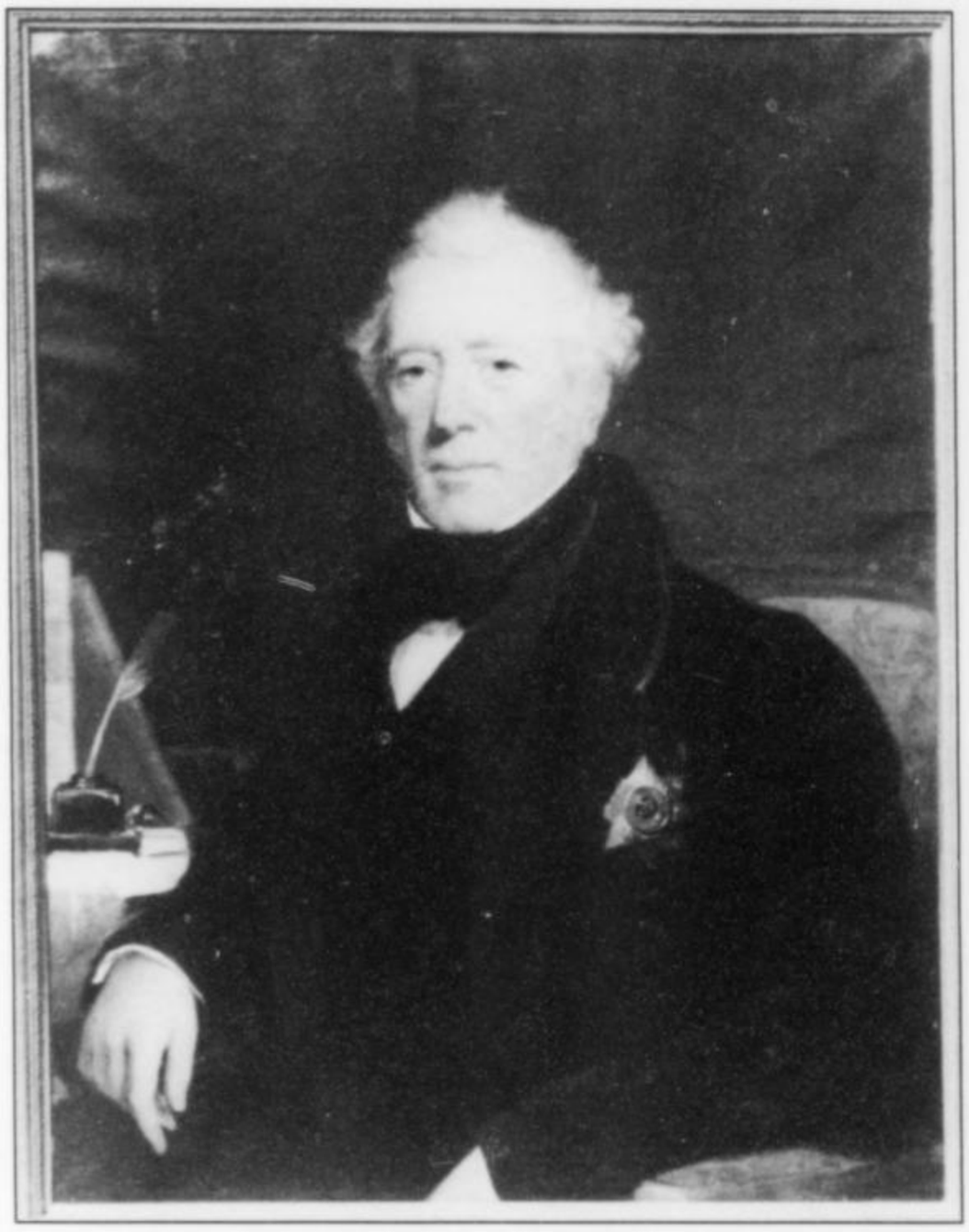


Figure 5. **Sir Alexander Crichton. Undated portrait by Henry Room. Reproduced courtesy of Mr. A. C. Crichton.**

NOTIZEN

ÜBER DIE

MINERALIEN-SAMMLUNG

SR. EXCELLENZ DES HERREN

DRS ALEXANDER'S von CRICHTON,

WIRKLICHEN STAATSRATHES, KAIS. RUSS. LEIBARZTES, GENERAL-STAB-DOCTOR'S DES MEDICINAL-CIVIL-WESENS, RITTERS DES HEIL. WLADIMIR'S ZWEYTER CLASSE, UND VIELER GELEHRTEN GESELLSCHAFTEN MITGLIEDES.

Von JOSEPH FRIEDRICH WAGNER,

Akademischen Mahler'n, der Kaiserlichen Gesellschaft der Naturforscher zu Moskwa, der mineralogischen Gesellschaften zu St. Petersburg und zu Jena Mitgliede.

MOSKWA,

GEDRUCKT BEY AUGUST SEMEN,

BUCHDRUCKER DER KAISERLICHEN MEDICINISCH-CHIRURGISCHEN AKADEMIE.

M. DCCC. XVIII.

Figure 6. **Title page from Sowerby's 1827 sale of Alexander Crichton's collection.**

SIR ALEXANDER CRICHTON'S
MINERALS.

CATALOGUE

OF A

Magnificent Collection of Minerals,

AND

PRECIOUS STONES,

FORMED WITH UNREMITTING ATTENTION AND AT UNSPARING EXPENCE
DURING THIRTY YEARS,

By SIR ALEXANDER CRICHTON, M. D. F. R. S. &c.

Which will be Sold by Auction,

BY

MR. G. B. SOWERBY,

AT HIS ROOM,

No. 107, QUADRANT, REGENT STREET,

On FRIDAY, APRIL 20th, 1827,

AND FOLLOWING DAYS,

At Half-past Twelve o'Clock precisely each Day.

Catalogues may be had at 156, Regent Street, and at the Room, where the Collection may be viewed several Days previous, and Mornings of Sale.

STERLING, Printer, 20, Ironmonger Lane, Cheapside.

Figure 7. **Title page from Sowerby's 1827 sale of Alexander Crichton's collection.**

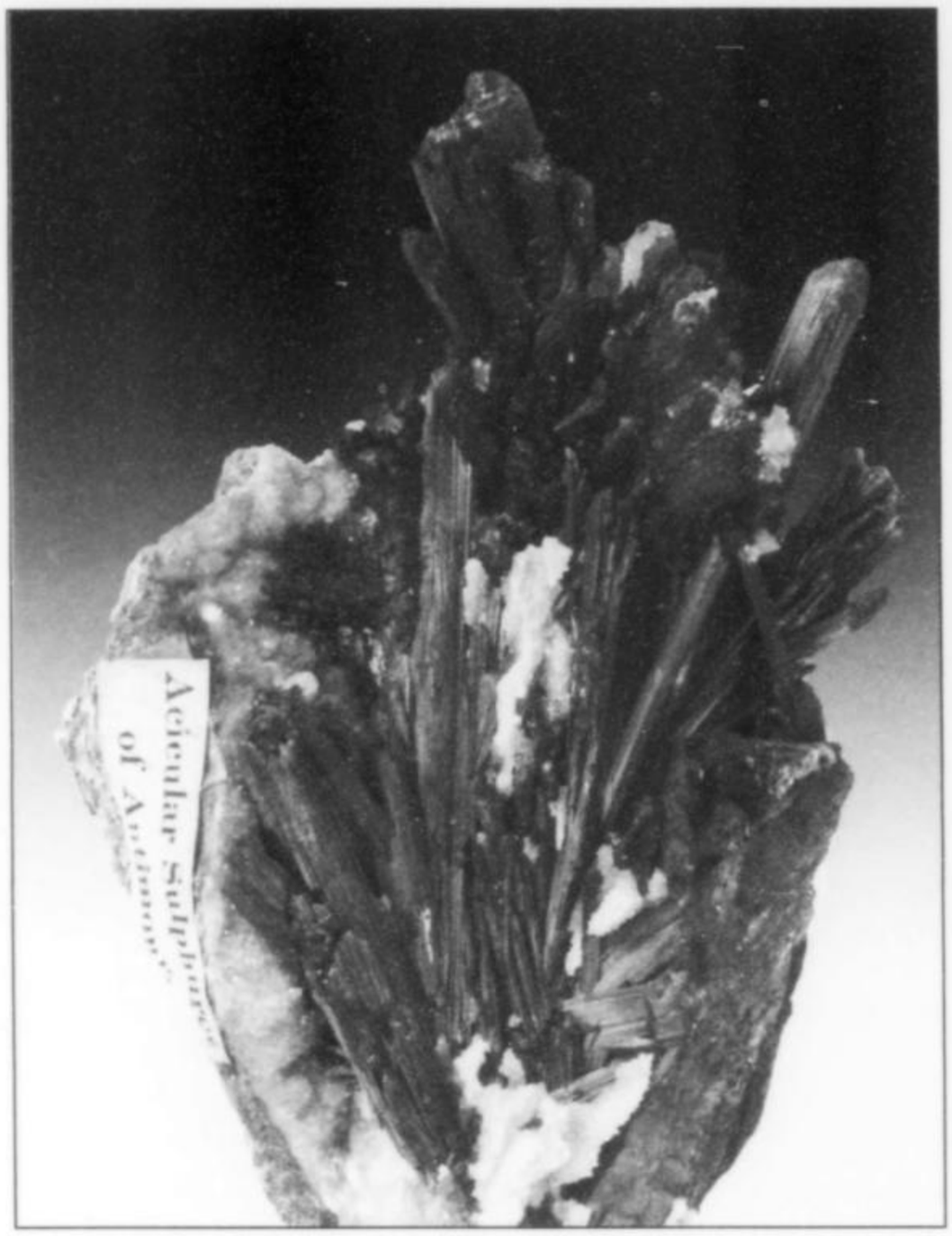


Figure 8. **Stibnite with a "species" label suspected to be typical of specimens from the Crichton Collection.**

> completeness along with the value of its treasures. One can say of the collection that it is in step with the times and the science. (Wagner, 1818)

Wagner tells us that the Duke of Devonshire gave Crichton specimens for his collection. An "extraordinarily beautiful" tourmaline with apatite in Crichton's collection, from the then-new occurrence at Bovey Tracey in Devon, is described as a gift from the Duke (Wagner, 1818: 7). A pocket book of the Duke's dating from shortly before 1817 lists "Minerals given me by Doctor Creighton [*sic*] in exchange for Cornish and Derbyshire ones." There are 18 specimens listed, many of which seem to be of good quality. Though we have been unable so far to reconcile them with extant specimens, a recently discovered loose label repeats the same description as one entry on this list so presumably the specimens returned to England with the Duke. Whether the two men first met in England or Russia we can't tell, but in his *Handbook to Chatsworth and Hardwick* (1844: 45–46) the Duke mentions the existence in the Devonshire Collection of "specimens I added, and some that Dr. Creighton assisted me in procuring at St. Petersburg, where I gave some Derbyshire and Cornwall ores in exchange."

Crichton retired from his post in Russia on health grounds in 1819 and returned to London. He received many Russian and other honors and in 1821 was knighted by George IV. His marvelous mineral collection was auctioned in London by George Brettingham Sowerby (1788–1854) in 2721 lots over a period of 16 days from April 20, 1827. Embrey (1976) suspected, from similarities of style, that Sowerby's catalog was influenced by the dealer Henry Heuland—that Heuland had assisted either with the sale descriptions or with Crichton's own cataloging. From long experience of Heuland's descriptive style in letters to Philip Rashleigh and in his sale catalogs I can strongly agree with this view (Cooper 2001). Certainly Heuland was an important source of specimens for Crichton—a list of recent acquisitions from "Herr Heyland" is given on p. 73 of Wagner's work as a service to other collectors unfamiliar with the dealer's material. Whether Crichton acquired pieces directly from Heuland in London or via his partnership with mineral dealers Sitnikoff and Co. in St. Petersburg is not recorded. Among the most recently discovered specimens is a fine **stibnite** with a label we suspect indicates it is part of the Crichton collection. This label overlays an earlier one (numbered "10.") which strongly resembles Heuland's typical number labels.

As a result of the sale of his collection, some of Crichton's specimens ended up in the collection of Isaac Walker (1794–1853) (Embrey, 1976; Embrey and Symes, 1987), which was later acquired by dealer James Gregory and sold piecemeal. F. N. A. Fleischmann purchased many of them and presented them to the BM(NH) along with a copy (perhaps Walker's own) of the Crichton sale catalog. Other buyers included one Diana Maria Dondeswell (as noted in the part of the catalog of her collection in an annotated copy of Mawe's *A New descriptive catalogue of minerals . . .* (1818) in the collection of Nick Carruth) and Sir George Tuthill (1722–1835), a graduate of the Freiberg Mining Academy. Tuthill's large collection was bought by Francis Chantrey after Tuthill's death. When Chantrey died a few years later, Heuland bought it from his widow and attempted to sell it entire to Prince Albert, but Queen Victoria intervened and prevented the purchase (Allingham, 1924). Heuland then sold it at auction, netting some 4 times the asking price for the whole collection. As a result, much of the collection then left the country. Many

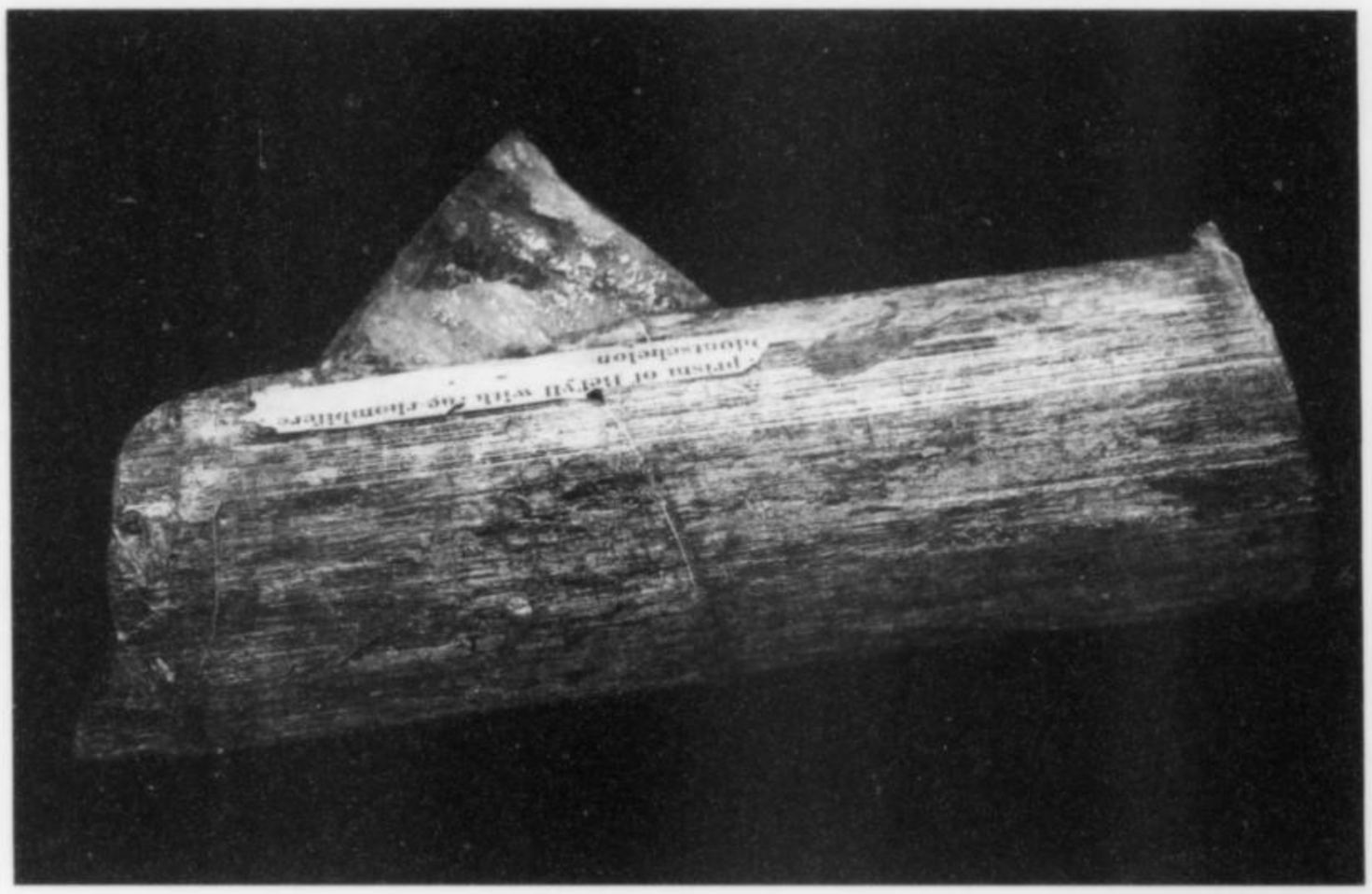


Figure 9. **Aquamarine, [Shirlovaya Mountain], Adun Chilon, Siberia. 4.5 × 15 cm. Lot 2025 from the Crichton Collection sale: "A beautiful and perfect hexahedral prism of Beryl with the rhombifère modification, and of great length, Odontschelon." Sold for 8 guineas. Photo by Mick Cooper and Franz Werner.**

specimens ended up in Gerard Troost's collection in America (Goldstein, 1984). Others appear to have been offered for sale in New York in 1846 "during the session of the *American Naturalists* the first week in September." The specimens had been "purchased by a gentleman in London, long distinguished for his devotion to Mineralogy, by whom they were sent to a friend in this country" (Nick Carruth Collection). A further 250 specimens from the Crichton sale were acquired by the Leeds Literary and Philosophical Society, according to the Society's Annual Report for 1826–27. One "Tourmaline on quartz with cleavelandite" from Catherineberg, Siberia was singled out for special mention. Some or all of these specimens may survive in Leeds Museum (Hancock *et al.,* 1987), though only the tourmaline has been identified with certainty.

The Duke attended the Crichton sale, choosing the lots himself on the 4th and 7th of May (6th Duke's diary for 1827, Chatsworth Archives). His choice may have been influenced by a fondness for things Russian, though it was not confined to Russian specimens. A manuscript list of the purchased lots survives at Chatsworth (see below). To identify them, the entries in the sale catalog were carefully cut out and pasted onto the specimens. Two weeks after the sale, on the 19th of May, Hart records a visit to Heuland, though no mention is made of further purchases.

By the mid-19th century the Devonshire mineral collections seem to have been long neglected. As early as 1844 the Duke comments in his *Handbook*: "All these minerals [i.e. his mother's and his own] are in a disgraceful state of neglect and want of classification. Those collected by my Mother ought to be replaced in their former order, as they were in the days of White Watson of Bakewell, who in vain endeavored to hammer mineralogy into our youthful heads." The present Dowager Duchess relates: "The cases of Georgiana's minerals were [in the Mineral Room] when I first knew the house, and had to be passed when calling on Mr Thompson [the curator] in his lair. It was on one of these visits that Mr Thompson showed my sister Nancy the 'diseased' stones which had destroyed the paper they rested on and were beginning to eat into the wooden shelf. She was so struck by the idea of ill stones that she described them in one of her books."

> After breakfast we all flocked to the north passage, where there were hundreds of stones in glass-fronted cupboards. Petrified this and fossilized that, blue-john and lapis were the most exciting, large flints which looked as if they had been picked up by the side of the road, the least. Valuable, unique, they were a family legend. 'The minerals in the north passage

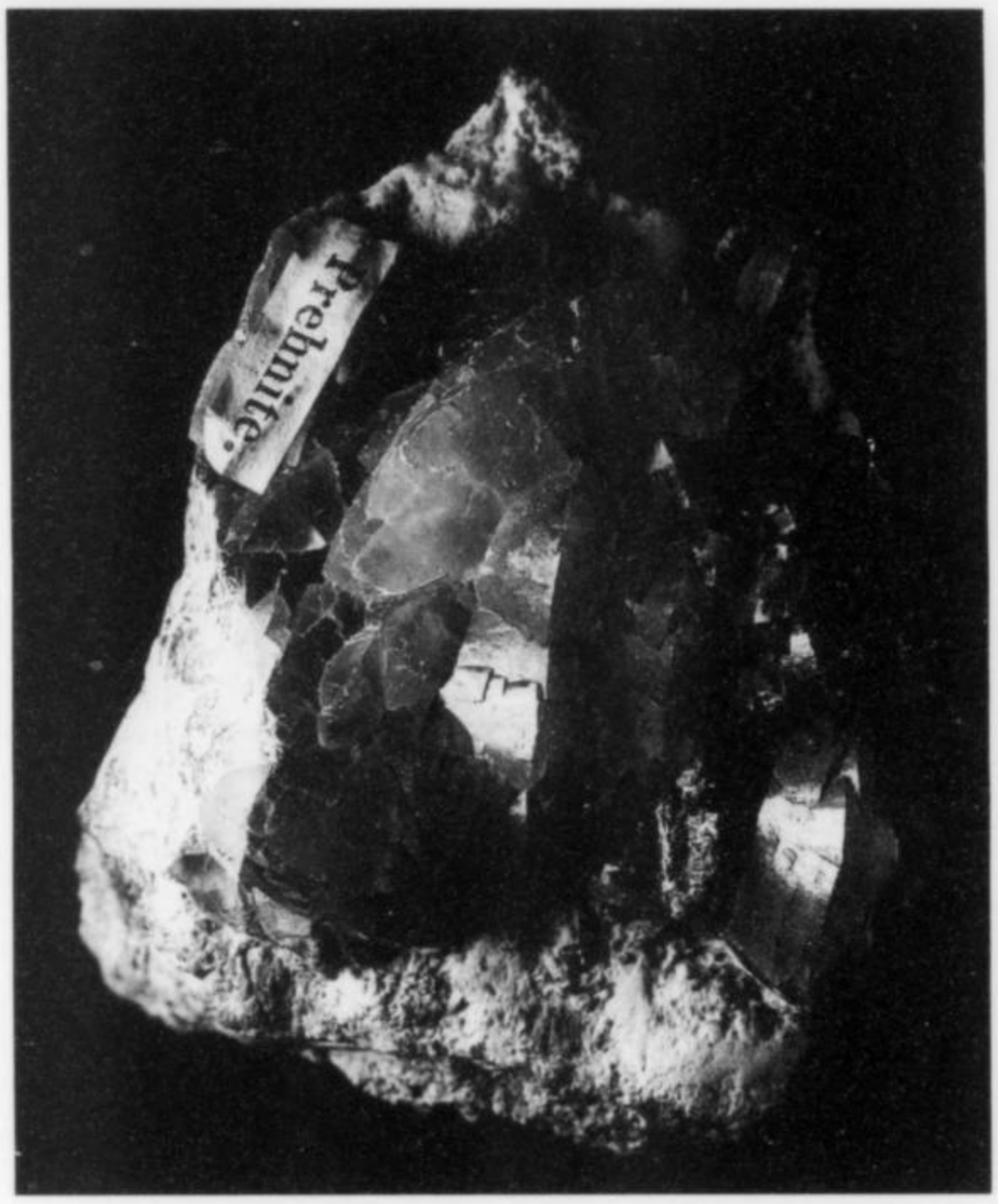
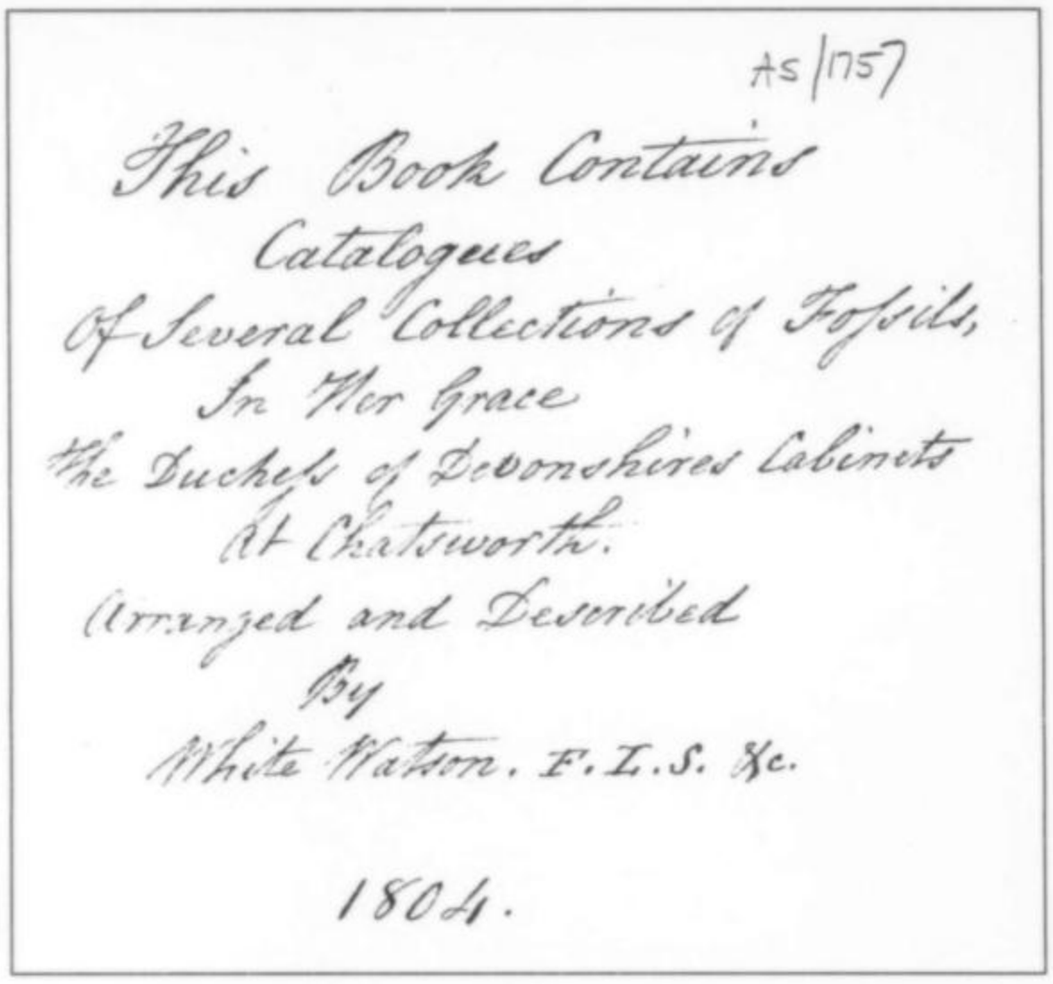


Figure 10. **Prehnite from La Combe de la Selle, Saint Christophe-En-Oisans, Isère, France; 7 × 7 × 7 cm, with crystals to 3.5 cm. A fine specimen from a classic locality. Although we cannot yet be certain, this specimen is probably Lot no. 1862 from the Crichton Sale (described as "A capital conchoidal Prehnite, Oisans in Dauphiny"—a common simplification of the true locality) for which the Duke paid 3 guineas. The attached label "Prehnite" we suspect is of a type common on Crichton specimens. Photo by Mick Cooper.**

are good enough for a museum.' We children revered them. Davey looked at them carefully, taking some over to the window and peering into them. Finally he heaved a great sigh and said: 'What a beautiful collection. I suppose you know

> they're all diseased?' 'Diseased?' 'Badly, and too far gone for treatment. In a year or two they'll all be dead—you might as well throw the whole lot away.' (Nancy Mitford, *The Pursuit of Love*, 1945)

Thankfully this fictional advice was not followed in fact. Nevertheless much of the collection certainly passed from view at times during its long life. After several years working on what was believed to be the whole of the surviving collection the house is still revealing further treasures to us. In January 2002, as the draft of this article was going through the final stages of editing by Wendell Wilson and Tom Moore, an e-mail from Chatsworth revealed that some 15 large boxes of specimens had turned up in a clear-out of one of the many attic rooms. Wendell rather reluctantly, but sympathetically, paused the editorial process until these new specimens had been examined. It was two long months before we could get to see this hoard as everywhere at Chatsworth was in turmoil to clean and refurbish the public rooms in time for the new public season. Eventually we were allowed back. The 15 boxes contained some 200 mineral specimens and about the same number of slabbed samples of decorative stones. Some of the slabs were Georgiana's, but the majority of the specimens were most certainly the 6th Duke's. They were wrapped in newspaper from the Summer of 1964 and almost certainly had not been seen in almost 40 years. To our delight, many bore labels from the Crichton collection, others had cut outs from other auction catalogues. There were Cornish and Russian specimens aplenty: chalcophyllite, torbernite, liroconite crystals to 1 cm, chalcocite crystals to 2 cm, olivenite, copper, crocoite, cerussite, feldspar crystals, etc. Many were filthy with fine-grained black dust. (I could not resist there and then washing a fine 15 cm Sicilian celestine to reveal a mass of flawless undamaged prisms to 2 cm on a mottled mass of gray rock and yellow sulfur.) Even though these specimens are fascinating, they were overshadowed somewhat by the most surprising find of all, a diorama of geological time in a glazed gilt-framed showcase about a meter long and 20 cm square standing on turned wooden feet. The diorama is composed of actual rock samples arranged in a numbered series of vertical strata, like a cross-section of a bizarre Earth, the landscape above dotted with small cast metal reptiles, *en cabochon* and facetted stones, and tiny trees, with a painted backdrop. Suddenly there is a lot more work to be done cleaning, cataloguing and researching in this increasingly remarkable collection!


As/1757

This Book Contains
Catalogues
Of Several Collections of Fossils,
In Her Grace
The Duchess of Devonshires Cabinets
At Chatsworth.
Arranged and Described
By
White Watson. F.L.S. &c.

1804.

Figure 11. **Title page of White Watson's catalog of Georgiana's collections at Chatsworth House, 1804.**

White Watson

Georgiana's "fossil" collections were originally stored at Chiswick and Chatsworth, and were arranged and cataloged there in 1799 and 1804 respectively by the mineral dealer and Derbyshire geologist, White Watson (1760–1835). Watson was born at Whiteley Wood Hall, near Sheffield, the son of Samuel Watson, a millstone manufacturer of Baslow, Derbyshire. His first name derived from the maiden name of his mother, Martha White. He left school at the age of 14 and went to live with his uncle Henry Watson, whose father Samuel was the master wood carver whose best work still adorns the rooms at Chatsworth House. He has been favorably compared with Grinling Gibbons. Henry was the founder of the Derbyshire stone-turning industry. Using water-powered machinery of his own making, which he patented in 1751, he established marble works on the outskirts of Ashford village in 1748. There, his novel machinery became one of the contemporary "Wonders of the Peak," an early marvel of the Industrial Revolution (Brighton, 1995; Tomlinson, 1996; Ford, 2000). The famous black and white marble flooring installed in the Great Hall at Chatsworth in 1779 was a product of this ingenuity. White Watson grew to become a true provincial polymath, an interesting and intelligent man whose "conversational powers made him a welcome guest"; a stone mason and carver in the family tradition, artist, writer, geologist, mineralogist, mineral and fossil dealer, teacher and gardener. His expertise with plants earned him a Fellowship of the Linnaean Society in 1795. He was a member of several other learned societies, including the Derby Philosophical Society (his application in 1800 was supported by Georgiana) and the short-lived British Mineralogical Society. His plagiarism of the work of John Farey (1766–1826) (Torrens, 1992; Ford and Torrens, 2001) and the unacknowledged use of his own work by William Martin (Watson, 1811) suggests a degree of contention with his peers and must temper the eulogy piled on him elsewhere. At the Duke of Rutland's Bath House in Bakewell, where he lived with his Uncle, he not only revolutionized the town's bathing facilities but also laid out the Bath grounds in an attempt to form a botanical garden. He married Ann Thorpe of Buckminster, Leicestershire, who was related to Sir Isaac Newton, in 1808. Despite his undoubted scientific and artistic talents Watson was often in financial trouble. At one time he borrowed £100 from the Duke of Devonshire and as late as 1833 he was desperate for money and trying to sell his "fossil" collection to ward off the threat of arrest (Riley and Torrens, 1980). Much has been written about his life: see Ford, 1960, 1995, 1996; Challenger, 1981; Brighton, 1981, 1982, 1983, 1994. He was the author of *The Strata of Derbyshire* (1811), which he dedicated to his patron the Duke of Devonshire.

In 1798 Watson was called upon by the Duchess to convert an earlier grotto at Chatsworth into a representation of a crystal-lined cavern. This he duly did, at a cost of £110 19s, including labor and specimens at £66 18s 9d (Watson's *Commonplace Book*, Hugh Torrens, *pers. comm.*). Watson lined the interior with "Derbyshire fossils . . . stalactite, calcareous crystallizations etc." Watson's grotto was dismantled in the 1830s by the 6th Duke and rebuilt with large calcite crystals and other specimens from the Duke's fabulously rich copper mines at Ecton Hill, Staffordshire.

From Watson's original handwritten catalogs it is apparent that many of Georgiana's specimens, especially those from Derbyshire, were supplied by him, but it is obvious from certain catalog entries and omissions that several collections were already in existence

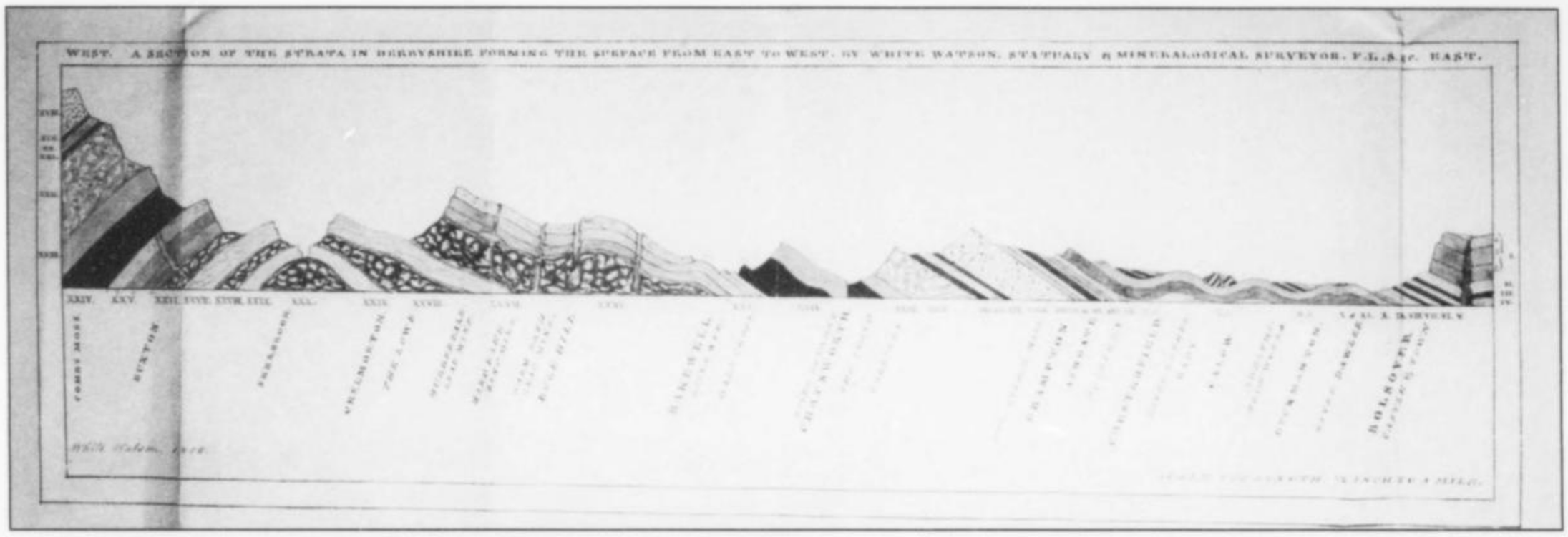


Figure 12. **Watercolor drawing of "The Strata in Derbyshire . . ." by White Watson, signed and dated 1810. The image is 15.5 × 49.5 cm. Photo by Mick Cooper and Franz Werner.**

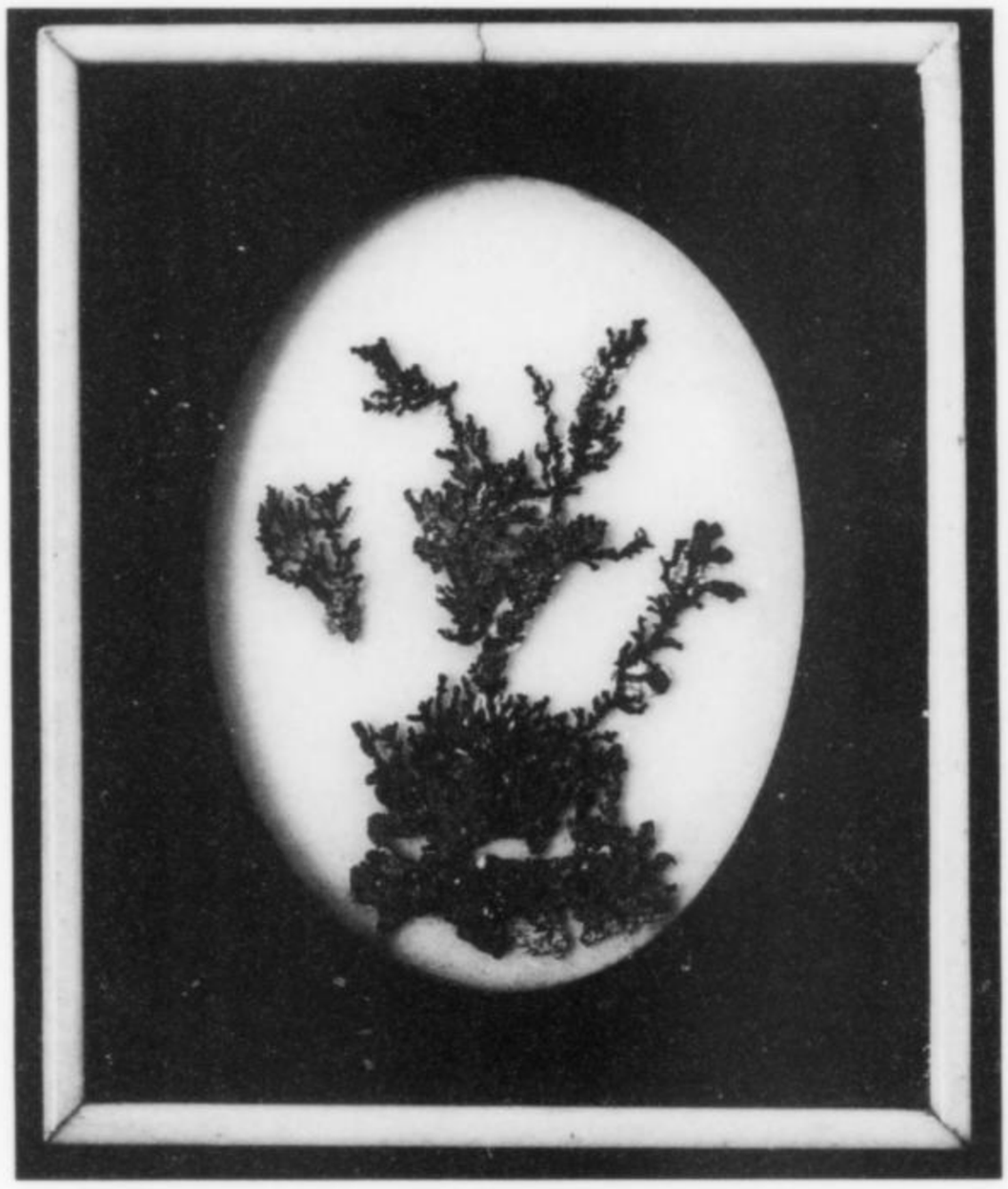
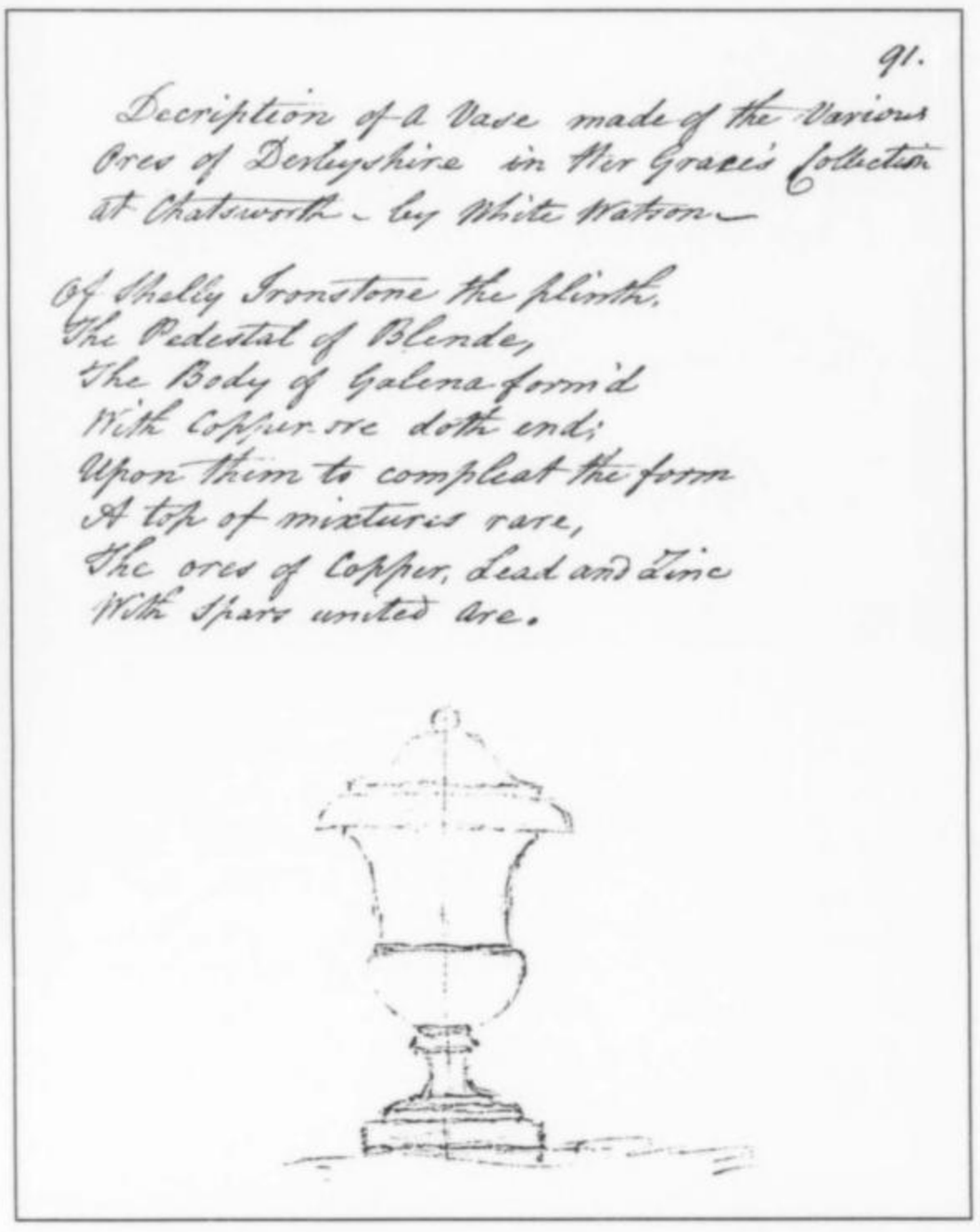


Figure 13. **Copper from Cornwall, England. "Arborescent Native Copper. Inlayed on an oval of White statuary marble, surrounded with black Marble and a white frame. by White Watson." Georgiana's Chatsworth collection, no. D-254; 1.8 × 12.5 × 15.2 cm.**



91.

Description of a Vase made of the Various Ores of Derbyshire in Her Grace's Collection at Chatsworth – by White Watson –

Of Shelly Ironstone the plinth,
The Pedestal of Blende,
The Body of Galena form'd
With Copper ore doth end;
Upon them to compleat the form
A top of mixtures rare,
The ores of Copper, Lead and Zinc
With Spars united are.

Figure 14. **Sketch of the lost vase of turned ores from Watson's catalog of Georgiana's Chatsworth collection.**

when he began his cataloging work. However, no trace has been found of any earlier catalogs. Watson also instructed the Duchess in mineralogy, and an interesting hand-written *Catalogue of External Characters of Fossils by White Watson F.L.S. Bakewell, Derbyshire. 1798* survives at Chatsworth. The first 29 pages of this book classify minerals according to certain characteristic physical properties: form, color, luster, density, etc. Pages 30–62 list "fossils" (minerals and rocks) by the classification used in Georgiana's catalogs. The book may also have been used to teach Georgiana's children mineralogy.

According to White Watson's cash books, he sold several interesting items to Chatsworth in addition to those known from the mineral collection catalogs, including:

- Tablet etc., Duke of Devonshire, £10.10.0, 7 Feb. 1808
- Tablet of a Section of the Strata of Derbyshire, Duke of D, £8.10.0, 6 March 1809
- Tablet of Ironstones and coals, Marquis of Hartington, £6.0.0, 7 Mar. 1809
- an Orthoceratite in black marble, Duke of D, £2, 7 Feb. 1818

Watson's inlaid "tablets" are his most famous relics. The best are geological cross sections of Derbyshire strata composed from the actual rocks in question, with lead veins carefully inlayed with lustrous strips of galena (Moyes, 1990; Ford, 1995, 1996). The "Section of the Strata of Derbyshire" is the largest and most

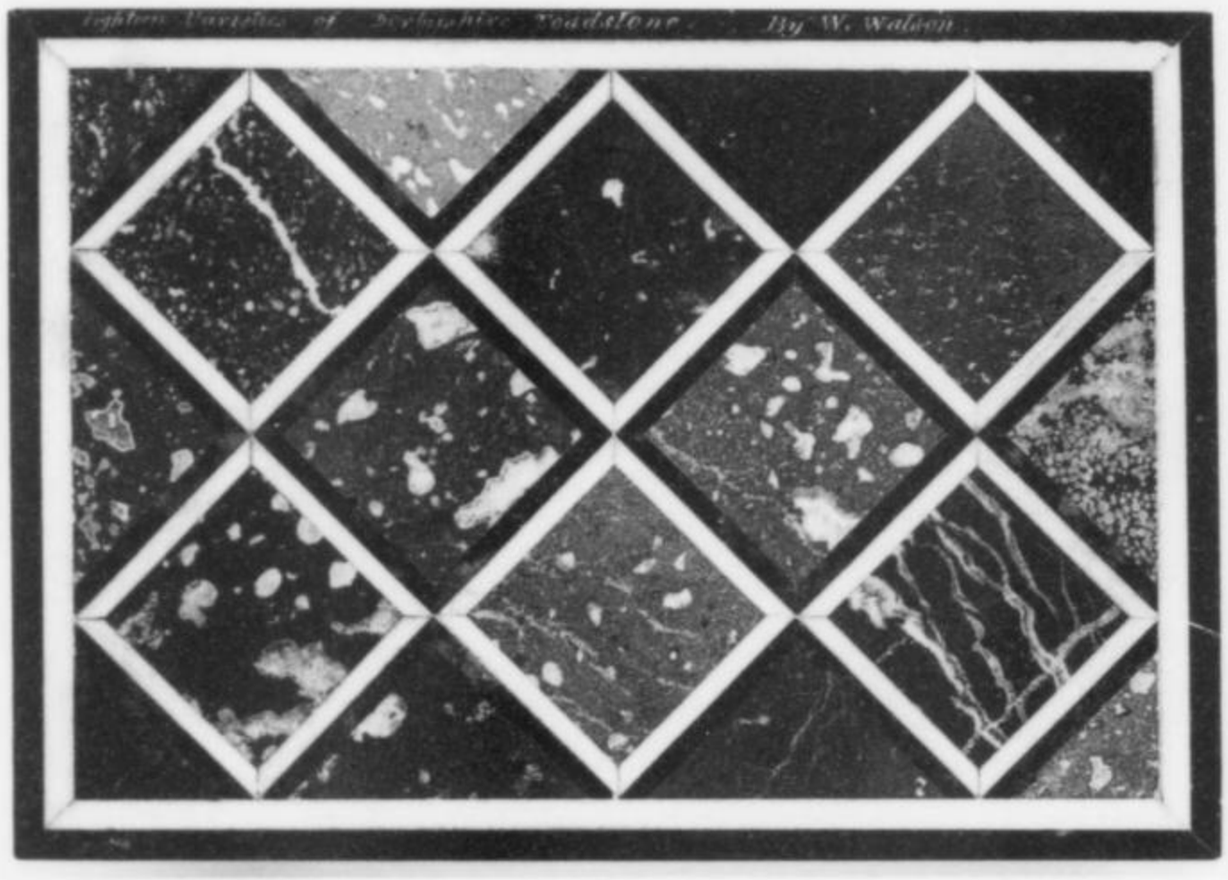


Figure 15. **"Eighteen varieties of Derbyshire Toadstone," inlaid tablet by White Watson. Undated but possibly *ca.* 1808.**

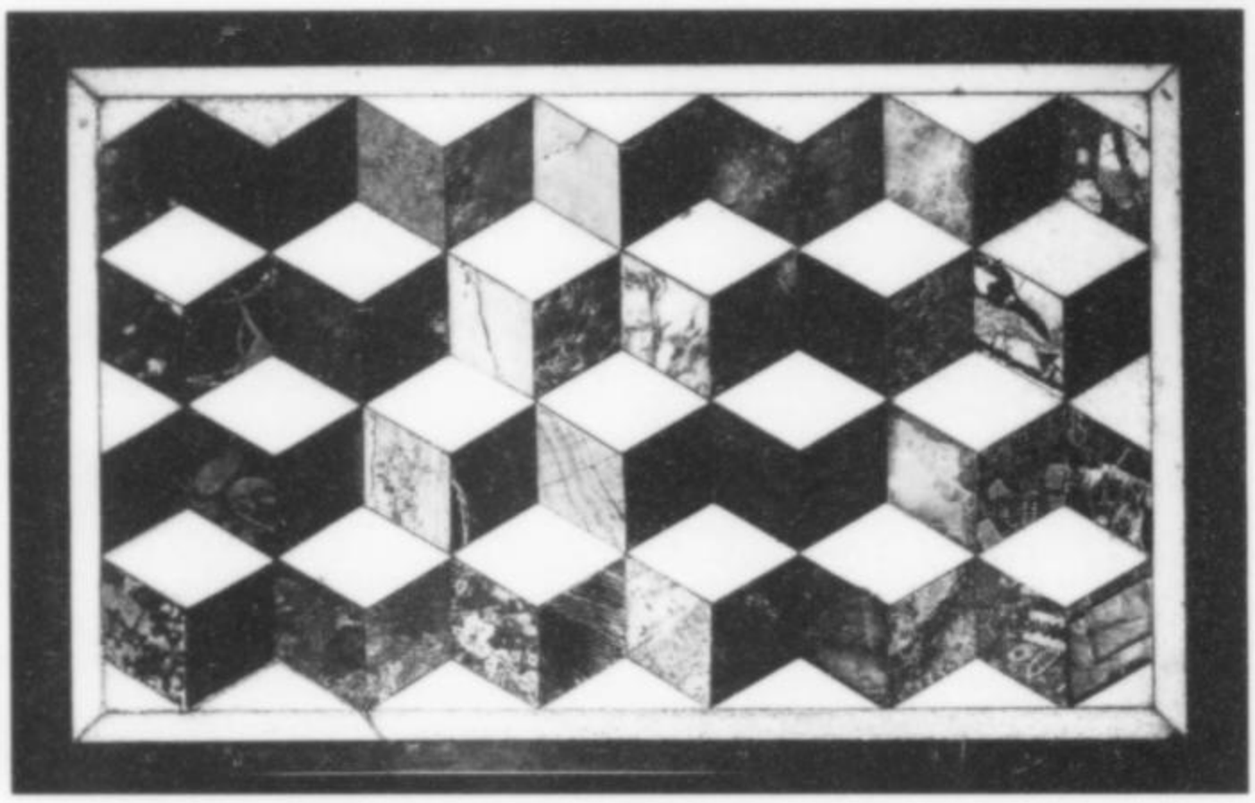


Figure 16. **"A Tablet composed of Derbyshire fossils in Perspective Cubes"; 16.5 × 27 cm. Signed and dated White Watson 1788. Watson described the make-up of this tablet in his 1804 catalog of Georgiana's Collection, using alphanumeric coordinates engraved on the edges of the tablet:**
From A to B: **(1) Rhomboidal double refracting carbonate of lime. (2) A breccia composed of fragments of limestone cemented by sulphate of baryte and carbonate of lime. (3) Black marble. (4) A calcareous breccia.**
From C to D: **(1) & (2) Entrochi grey marble. (3) A calcareous breccia. (4) Striped marble.**
E to F: **Four carbonates of lime.**
G to H: **Eight varieties of fluates of lime.**
I to K: **Seven varieties of sulphate of baryte, the 3rd sulphate of lime. Four ores of Lead, the 1st & 3rd Galena.**
L to M: **(2) Carbonate of lead. (4) Carbonate of lead disseminated in clay**
N to O: **(1) Copper ore from Ecton. (2) and (4) Blende, an ore of zinc. (3) Calamine &c.**
P to Q: **Four Iron ores: (1) Hamatities [sic]. (2) Ironstone containing petrified musel [sic] shells. (3) Ironstone containing septariae of ironspar. (4) Common Ironstone.**
R to S: **Four varieties of toadstone: (1), (2) & (4) Toadstone, amygdaloid. (3) Basalt. Blackstone. Ironstone.**
NB. The white is Italian marble, there being no proper substitute in Derbyshire.

impressive; examples reach 96 cm long. Of the three tablets above there is no trace of the "Section" or the "Ironstone and coals," and the only contender for the 1808 tablet is one composed of "eighteen varieties of toadstone" [a Derbyshire name for basalt] which we have but is not mentioned in any of the catalogs. The "Orthoceratite" is probably the unlabeled 26 × 11-cm cut and polished slab that we found with Georgiana's collection showing an *Orthocerus* section some 20 cm long in black limestone.

ARRANGEMENT AND CATALOGS

Watson listed Georgiana's minerals as ten separate collections, some of which may have been arranged by Watson, others of which appear already to have been arranged, and presumably cataloged, when he started his work. His catalogs survive in two hardbound notebooks, with five collections in each, registered as As/1757 and As/1758 in the Devonshire archive at Chatsworth. Each catalog (with one or two exceptions) is titled according to the arrangement of the collection described, and each specimen is assigned an individual serial number, starting at "1" in almost every separately headed list. This means that there are many repeat numbers in the collections. To assign a unique number to every item, the Russell Society project assigned the letters A–J to the Watson catalogs and the Watson catalog numbers have been prefixed by these letters to give the specimens unique identifiers. A related manuscript item (Catalog K), a loose gathering of a few pages, appears to be a draft of Catalog F though it contains a number of useful variant entries with extra information which didn't make it into the final work. Only the short catalogs B and E contain a complete series of entries, and A and C are particularly prone to gaps. The Russell Society project grouped all the remaining (non-Watson) labeled specimens according to the style of the labels they bore, and assigned them to nominal "catalogs," lettered from "L" onwards, for those that did not correlate to Watson's numbers. To our surprise we have identified 26 separate series of specimens and live in hope there will not be more. These later "catalogs" may represent suites of specimens acquired as a group from the same source, either as a discrete set of specimens or as a selection from a larger group, perhaps by purchase at an auction.

The Watson catalogs are classified internally according to certain characteristics of the specimens: catalogs A to E are arranged broadly by source (e.g. Derbyshire, Cornwall) and within

Figure 17. **Examples of number labels from the Devonshire Collections: (a) Type 9 (from Catalog H written in 1799) overlying a label applied by Bannister in 1936. The layering of the two labels is very misleading! (b) A typical Henry Heuland number label. (c) Two other types of labels from Georgiana's collection. (d) A label from the "R" series of Derbyshire lead minerals. (e) A label derived from the Crichton sale catalog ("lamellar Native Antimony . . .") overlying a "Species" label ("Antimony.")—possibly one of Crichton's original labels. (f) A telling fragment of a Crichton sale label.**

each catalog in a mineralogical classification into "argillaceous" minerals, "siliceous" minerals, "metals," etc. This "natural historical" system seems to have been invented by Watson. Several of the remaining catalogs lack an overall heading, although they are mineralogically arranged (sometimes rather irregularly) within each catalog. There are several stand-alone collections of similar style, i.e. mixtures of essentially the same types of minerals (e.g. catalogs F, G and H)—further support for the idea that Georgiana acquired them as separate collections already arranged.

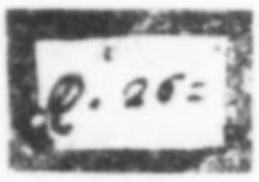
Most of Watson's catalogs are little more than basic inventories. Typical entries rarely contain any specimen description beyond an identification of the species present (in itself often vague). Locality information is highly variable and often scanty or missing. However, the catalog of *Derbyshire Fossils* (Catalog A), the most important of the ten collections, gives detailed specimen descriptions in most cases, sometimes pointing out almost insignificant properties of the specimens which have been extremely useful in reconciling specimens with the catalogs. Watson was not only on home ground with this catalog, but may have been the source of many of the specimens. However, yet again, locality information is often rudimentary.

Watson's catalogs reflect the arrangement of specimens in Georgiana's display cabinets as described by him in 1811:

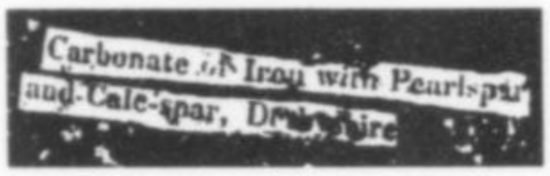
> At Chatsworth, is an excellent Collection of Fossils, which were collected by the late Duchess of Devonshire and arranged in two Cabinets; one containing the various productions of Derbyshire; amongst the nodules of Ironstone con-

Type 12 Large (ca 25mm square) paper labels with numbers written in a large hand. Rare. The numbers do not follow the Watson order. These may be labels from the private collection of Henry Heuland, auctioned in the 1830s by Heuland himself (see illustration of similar label in Russell, 1950)[20]

Type 13 ca 20x12mm paper labels with printed numbers with pronounced ascenders and descnders, followed by a full point. The labels have a thin ruled border (not always visible if the label cut too close), and are probably the complete versions of Type 1 labels. Common on specimens from the Chiswick collections (Catalogues F & G).



Type 14 ca 20x12mm paper labels with handwritten numbers of the "Q" series, i.e. numbers prefixed by the letter "Q." and generally terminated by an equals sign: "Q. 7 ="



Type 15: Crichton purchase labels. Some specimens bear printed labels cut from the Sowerby catalogue of the Crichton sale[21] . Many, but not all, can be matched to the listing in Catalogue L. In some cases, specimens bearing only fragments of labels showing the same typography as the Sowerby catalogue have been successfully matched to the Crichton list by searching for a matching section in the sale catalogue, but others, superficially similar, have not and their association is unclear. In one instance a small circular label was found on a Crichton specimen bearing the sale lot number of the piece.

[20] This seems increasingly unlikely now that more labels have been found and all are <10, suggesting a sequential and short series rather than the arbitrary spread likely to result from scattered purchases at a sale.

[21] Alexander Crichton's collection was sold by auction by G.B. Sowerby I of Regent St. See notes on Catalogue L.

Figure 18. **Sample page from the Russell Project's Label Typology.**

taining petrifactions, &c. No. 56, contains a perfect Compound radiated Flower, resembling a small Sunflower; and in No. 60, is the appearance of an insect, resembling an Apis.

The other Cabinet contains choice specimens from Cornwall and other Counties in this Kingdom, a select collection from Scotland, and a specimen of Shell-Limestone from Schallpenstadt in the Duchy of Brunswick, containing the head of an Enchrynus, of the fragments of which species of Petrifaction the Entrochal [crinoidal] "Marble of this County is formed" (Watson, 1811).

Watson's description correlates to Catalog A (the productions of Derbyshire); Catalog D (the Productions of Cornwall); Catalog C (Systematic collection of British Fossils); and Catalog E (Fossils from Scotland). These are the collections (plus a very small collection constituting Catalog B) listed in Watson's 1804 book of catalogs of the collections at Chatsworth. The 6th Duke's 1844 *Handbook* describes two cabinets in the "Mineral Room" at Chatsworth, "The right hand case contains her [Georgiana's] Derbyshire minerals . . . the other . . . foreign ones" (Cavendish, 1844) which suggests that by this time the Chatsworth and Chiswick collections had been brought together.

Georgiana's cabinets survive: a pair of matching bow-fronted glazed cabinets, each 155 cm wide by 265 cm high, but the confused assortment of minerals found in them at the beginning of the Russell Society project did not reflect the original arrangement. Their construction (by one James Frost) appears to have been organized by White Watson in 1797 and 1798 at a cost of about £24 each, and he completed the arrangement of their contents in 1799 (Watson's *Commonplace Book,* Hugh Torrens, *pers. comm.*). These cabinets have closely spaced, steeply sloping shelves each fitted with narrow horizontal strips of wood to support the specimens. Watson's *Commonplace Book* mentions expenses for "cloth" which suggests they were at one time lined, though they are now just plain white-painted wood. The collection must have been very crowded in this limited space (a rough calculation suggests that at most two-thirds of the British collection could have been crammed in), and specimens in the back rows or on the higher shelves would have been very difficult to see. Consequently, there would have been little space for display labels, and it was perhaps to facilitate reference to a separate catalog that many specimen number labels were attached to the display surface of the pieces. In 1998 Georgiana's cabinets were refurbished and placed in the Coffee Room of the new conference center in the Chatsworth Stable Block. A selection of specimens from the Devonshire Collections is displayed within them.

Of the Duke's collection no overall catalog survives, though there are several separate listings: the Crichton and Heuland purchases discussed below, a small notebook entitled *Catalogue of*

minerals Dec. 1817 (none of which we have yet been able to identify), a numbered list of 24 "Derbyshire mineral specimens" signed "W.J.P. Burton F.G.S." which have also evaded identification, and the scribbled list of 18 specimens exchanged with Crichton mentioned above.

According to Watson's *Commonplace Book*, the Chiswick Collection contained 1076 specimens in 1799, and the Chatsworth Collection about 1000 in 1804. Confirming these estimates is complicated by several factors: some specimens are not numbered, there are several *bis*-numbered entries (i.e. having the same number distinguished by the addition of letters, a, b, c and so on) and some catalogs contain gaps in the sequence which may or may not indicate missing specimens. Our analysis shows that Catalogs F–J (Chiswick Collection) account for 1076 entries, and 1036 specimens were indicated as extant when Watson did his work. Catalogs A–E (the Chatsworth Collection) have 1032 potential entries but only 858 specimens were described. Watson, therefore, found 1894 specimens from a potential total of 2137, and noted that the specimens at Chiswick also included "a large collection of lavas, etc. collected by Her Grace in Italy that were not cataloged or described" (Watson's *Commonplace Book,* Hugh Torrens, *pers. comm.*). Of the Duke's collection, the Crichton list numbers 75 pieces, there are 10 pieces in the 1820 Heuland purchase, and some 50 pieces in the other Russell Society catalogs which we assume to have been his. This gives a potential grand total of about 2250 known to have been in the collections at one time or another since 1799. In addition there is a considerable number of unlabeled and so far unreconciled specimens remaining at Chatsworth.

THE RESTORATION OF THE COLLECTION

The Russell Society's project plan committed Chatsworth to supply all required resources, including space to work and store the collection. Chatsworth also agreed to do all they could to maintain the collection long-term and promised to keep an eye open for anything pertaining to the collection: correspondence, documents, further specimens, etc. Much preparation was necessary. A computer database structure and inputting conventions were first devised. Photocopies of all the catalogs were made for us and sections of them distributed to several volunteer inputters, along with a set of the data-entry instructions to help analyze the data into pertinent fields. At Chatsworth a small room was assigned to us to store the collection, and we were granted out-of-season access to a larger room next door where we could lay out specimens to work on. We spent several enjoyable days combing the house for specimens and trucking them through the long stone corridors to our store room. At evening Russell Society meetings, innocent victims were coerced into folding hundreds of card trays—that is, willing volunteers cheerfully made card trays. Over many months, labeled and unlabeled specimens were separated from each other and the former were checked against the known catalogs. As work progressed we began to familiarize ourselves with the various label styles and realize their relative importance. Specimens with labels irreconcilable with the Watson lists were grouped into new "catalogs."

A label typology was developed and proved to be very useful. Each different style, based on size, font or handwriting, and type of inscription (whether just a number or words descriptive of the species or locality) was allotted a number. Some specimens bear several different labels which presumably resulted from several cataloging or re-cataloging efforts. Certain label styles proved to be characteristic of different Watson catalogs. For example the "Type 9" number labels only occur on items from Catalog H. Another style was eventually identified as one applied by Alan Bannister of the British Museum (Natural History) when he cataloged specimens from the Chiswick collection in 1936. Without this correlation between label style and catalog it may have been difficult to differentiate specimens with the same number and the same vague description, such as "copper ore."

Figure 19. **Catherine Foley sorting numbered specimens in 1993.**

In almost all cases, specimens bearing numbers appropriate to the Watson catalogs were matched unequivocally to their rightful entries therein, using Watson's descriptions and clues from the label styles. Tentative assignments have been made in cases where a Watson number is missing but the specimen bears a label or labels that suggest it belongs to a series of specimens once carrying both Watson numbers and labels from another series of numbered labels. The occasional coexistence of two numbering systems allows a lone non-Watson number to be tentatively correlated to a Watson number by assuming the specimens were in the Watson sequence when the other series of numbers was assigned. However, it must be borne in mind that the relationship between the two sets of numbers is a somewhat erratic one, and thus any assumed correlation cannot be accepted unless there is an unambiguous match between specimen and assumed catalog entry and the characters of any other reconciled specimens in the same sequence. To date we have reconciled almost 70% of Georgiana's collection as recorded by Watson, but if we discount catalogs I and J, which are missing in their entirety, the proportion jumps to 77%—a very satisfying figure for a 200-year-old collection.

At first we had no proper storage for the specimens and they had

Figure 20. **The author working on the collection in 1995. Photo by Frank Ince.**

Figure 21. **The author working on the collection in its new cabinets, 2001. Photo by Mick Cooper.**

Figure 22. **The collection in its new cabinets, 2001.**

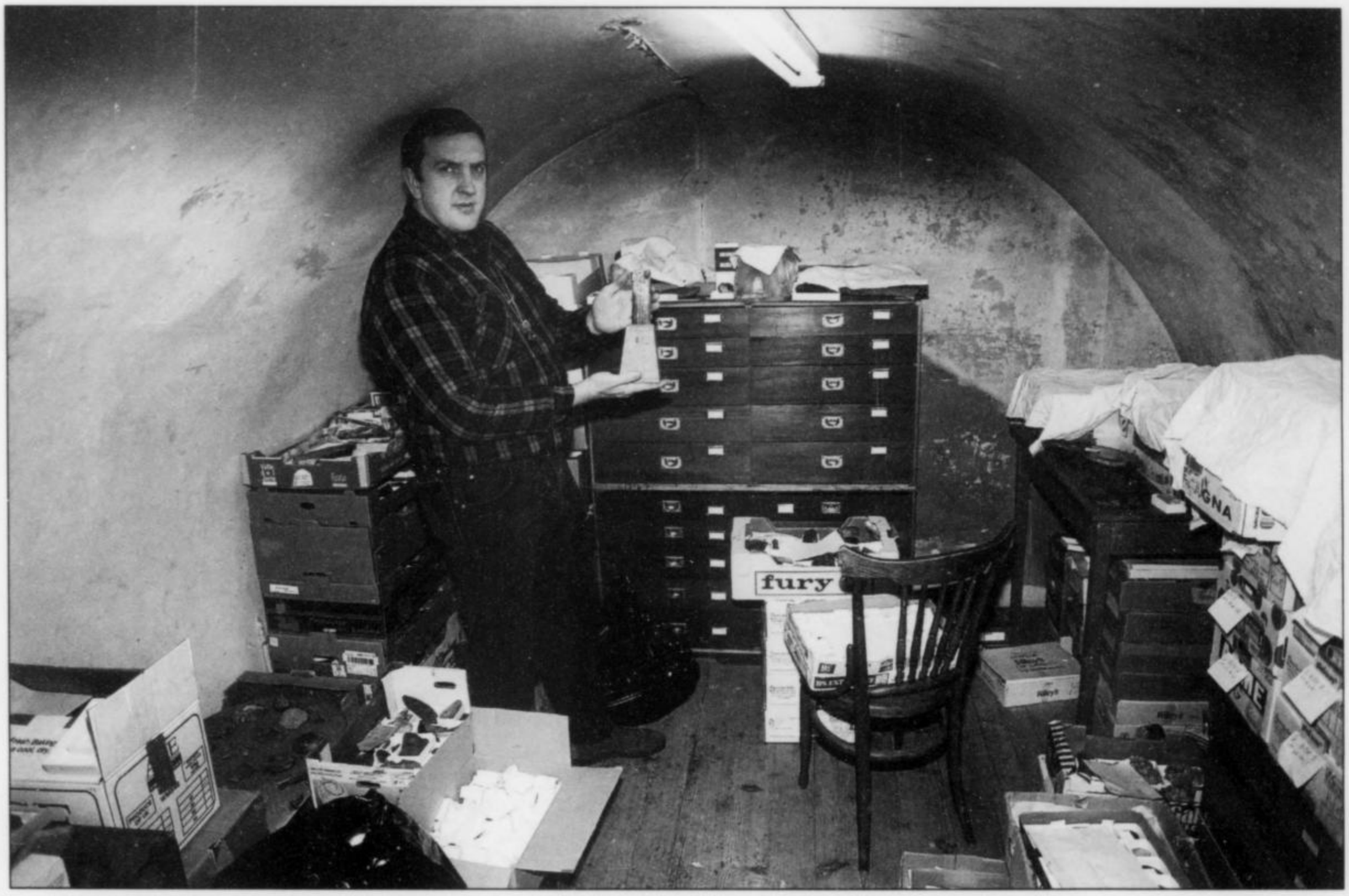


Figure 23. **The temporary store room, where we did our first work on the collection, while removing specimens to the new Hunterian cabinets in 1996. Keith Hughes holding the fine Ala "diopside" before it was removed from its oak support.**

Figure 24. **The ravages of pyrite disease: an exploded fluorite slab which we pieced together from scattered fragments to discover its original Watson number.**

to be packed into cardboard boxes as work progressed. Eventually, however, we were offered two magnificent old sets of drawers at a knockdown price by the Hunterian Museum in Glasgow, and Chatsworth agreed to buy them. These fine mahogany-stained pine units now house all of the labeled or otherwise provenanced specimens, the first time they have been in their original arrangement for well over a century. A large number of unlabeled specimens remain to be processed, some of which are of good quality. These will be added as work progresses.

When the database was more or less complete, a full set of labels was generated from it on archival paper and added to the collection trays, and we began the painstaking process of pasting new archival number labels onto the specimens, measuring and describing them in modern terms. In the fullness of time a new paper catalog will be generated from the database and bound. A copy will stay with the collection, and another will be deposited in the Mineralogy Library of the Natural History Museum in London.

HIGHLIGHTS OF THE COLLECTION

Catalog A

"*Catalogue of a Collection of Fossils, the Productions of Derbyshire, in Her Grace the Duchess of Devonshire's Cabinet at Chatsworth: Arranged According to the Order of the Respective Strata in which they are found; Accompanied with a Tablet Representing a Section of the strata in Derbyshire, with a Printed Explanation. By White Watson F.L.S. &c 1804*"

Numbered 1 to 569, of which Watson records 546 specimens. There is a superb series of about 30 excellent **galena**, **fluorite** and **sphalerite** specimens from the Gregory mine, Ashover, in Derbyshire, many of which seem to have come from the same find. The best show cuboctahedral galena crystals to 5 cm or so on colorless fluorite cubes with later, smaller, purple fluorite crystals and a sprinkling of minute **chalcopyrite** and **marcasite** crystals. They are surprisingly free from damage, given the fragile nature of the minerals present, and represent some of the finest Derbyshire galena specimens we have seen. The fluorite specimens comprise groups of colorless cubes to almost 5 cm, spangled with minute sulfide crystals or scatterings of larger, well-defined sphalerite crystals. Even more exciting is the existence on some of the specimens of minute crystals of a mineral carefully described by Watson as "Brown Lead ore, in small hexagonal prisms flat at the ends." When we searched for Watson's mineral, assuming it to be mimetite (an unusual associate of such specimens), we discovered instead a metallic gray mineral in six-sided orthorhombic prisms looking suspiciously like **enargite**. This species is of very rare occurrence in the British Isles where it was then only known as minute anhedral inclusions in other minerals and was quite unknown in Derbyshire. An X-ray diffraction analysis at the Natural

Figure 25. **Enargite: close up of a 2-mm group of crystals on the specimen shown in Figure 28.**

History Museum, London proved our suspicions correct, and the first occurrence of euhedral enargite crystals in the British Isles was confirmed some 200 years after Watson first set eyes on these almost insignificant prisms (Cooper, 1995). How much more time might have passed if Watson had not made his notes is impossible to tell, but it is highly unlikely that we would have made such a careful examination of these specimens without his guidance. Another Derbyshire specialty in the collection is "**Elastic Bitumen**" from Castleton, including one huge lump of this intriguing mineraloid some 30 cm across.

There are 30 of Watson's 40 specimens of **chalcopyrite** and other minerals from Ecton Hill in Staffordshire (nominally part of the Derbyshire Orefield, though in an adjoining county), including some **malachite** which is of rare occurrence there. The famous Ecton mines were worked on land that had belonged to the Cavendish family since the 16th century and were the scene of the first use of explosives in British mining history. The pipe-like orebody was fabulously rich, and sustained mining for several hundred years after its first serious working in the 17th century, attaining a celebrity that made a visit to it a must for interested travelers in Derbyshire. The workings became the deepest in the country as well as being among the most profitable. From 1760 to

Figure 26. **Chalcopyrite and malachite on massive barite from Ecton mine, Staffordshire; 9 × 13 cm. From Georgiana's Chatsworth collection, no. A-470. Photo by Mick Cooper.**

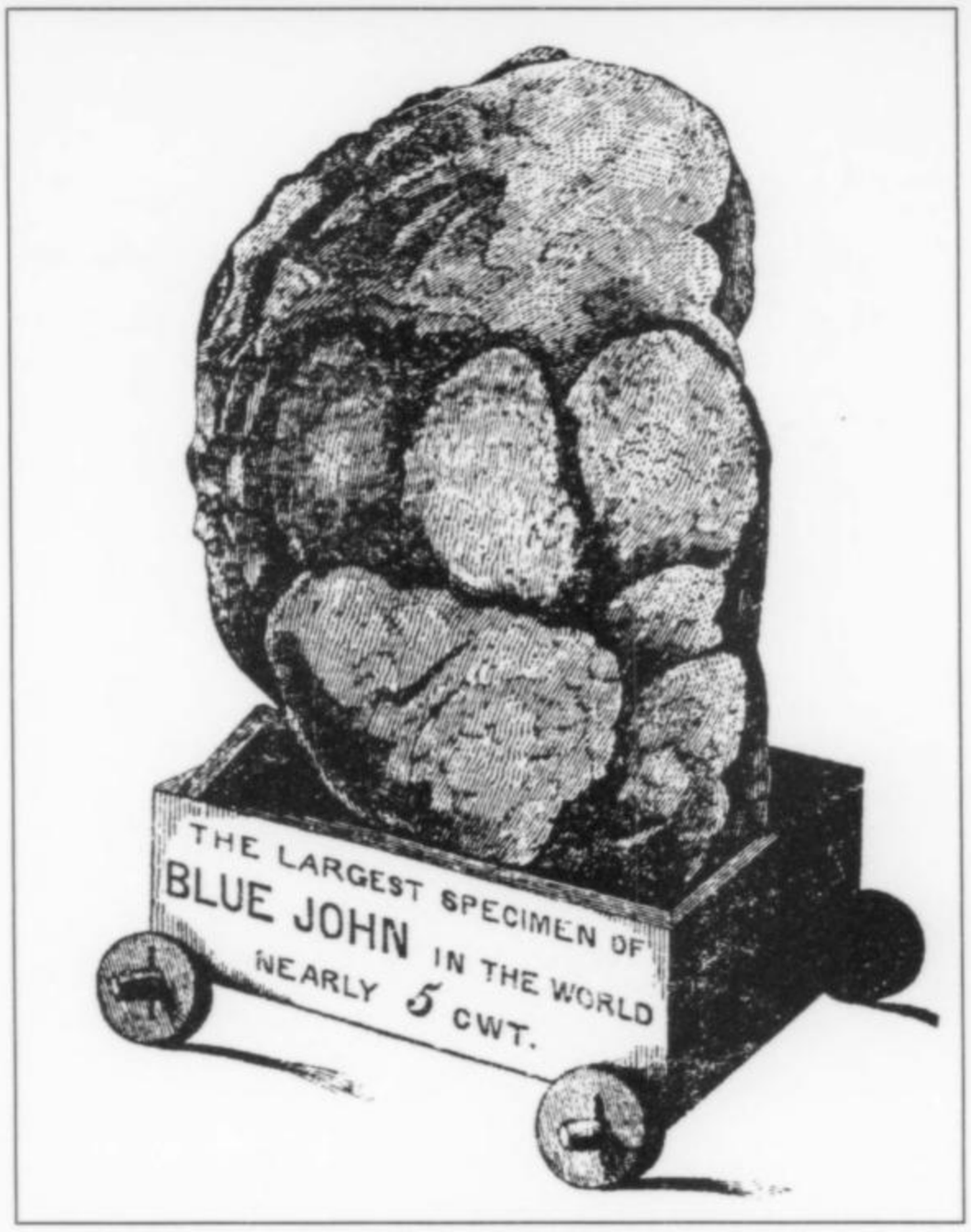


Figure 27. **"The Largest Specimen of Blue John in the World," from Adam (1851).**

1817 the operation was averaging £6000 clear profit a year. The 5th Duke of Devonshire used his considerable income from Ecton to refurbish Chatsworth House in the later 18th century and to build The Crescent at Buxton in 1780–84 (Robey and Porter, 1972). Unfortunately Georgiana's collection contains few of the sulfide-included **calcite** scalenohedra for which Ecton is renowned, though the House once contained an interesting suite of these in its "Grotto" which was lined with them during its refurbishment by the 6th Duke. Unfortunately these have been much damaged by vandals, and the room is now closed to the public. Specimens of calcite and chalcopyrite from Ecton were donated by the 6th Duke to the British Museum in 1820 (Fletcher, 1904). A specimen recently discovered among the 6th Duke's minerals is a fine Ecton calcite-chalcopyrite with a label suggesting it came from the Crichton collection. It may be one of the specimens the Duke exchanged with Crichton some ten years earlier, repatriated after a sojourn in St. Petersburg.

Surprisingly, there are few specimens of "**Blue John**" **fluorite** in the collection—this being one of the most famous mineral productions of Derbyshire. The most noteworthy are contained within a small suite of square slabs of fluorite of various appearances from several Derbyshire occurrences. The house of course contains some of the finest examples of worked Blue John in existence, including the largest turned from a single block, the well-known Devonshire Tazza (a shallow bowl on a pedestal), made for the 6th Duke by William Adam (*ca.* 1794–1873) of Matlock in 1842. "Its shallow bowl is twenty inches (50 cm) in diameter and was turned from a single piece of the Bull Beef vein of Blue John, mounted on a separate Blue John stem and base . . . No other tazza has challenged its supremacy" (Ford, 1992). The world's largest specimen of Blue John is also at Chatsworth. It was found in 1813 and displayed for a while in John Mawe's "Museum and Petrifaction Warehouse" in Matlock Bath before being bought by the 6th Duke for display in the Grand Conservatory at Chatsworth (Adam, 1851; Porteous, 1950).

Although several specimens of **coal** remain, the varieties of **peat** which begin the catalog are long gone. Also apparently missing is the "*Tablet Representing a Section of the strata in Derbyshire, with*

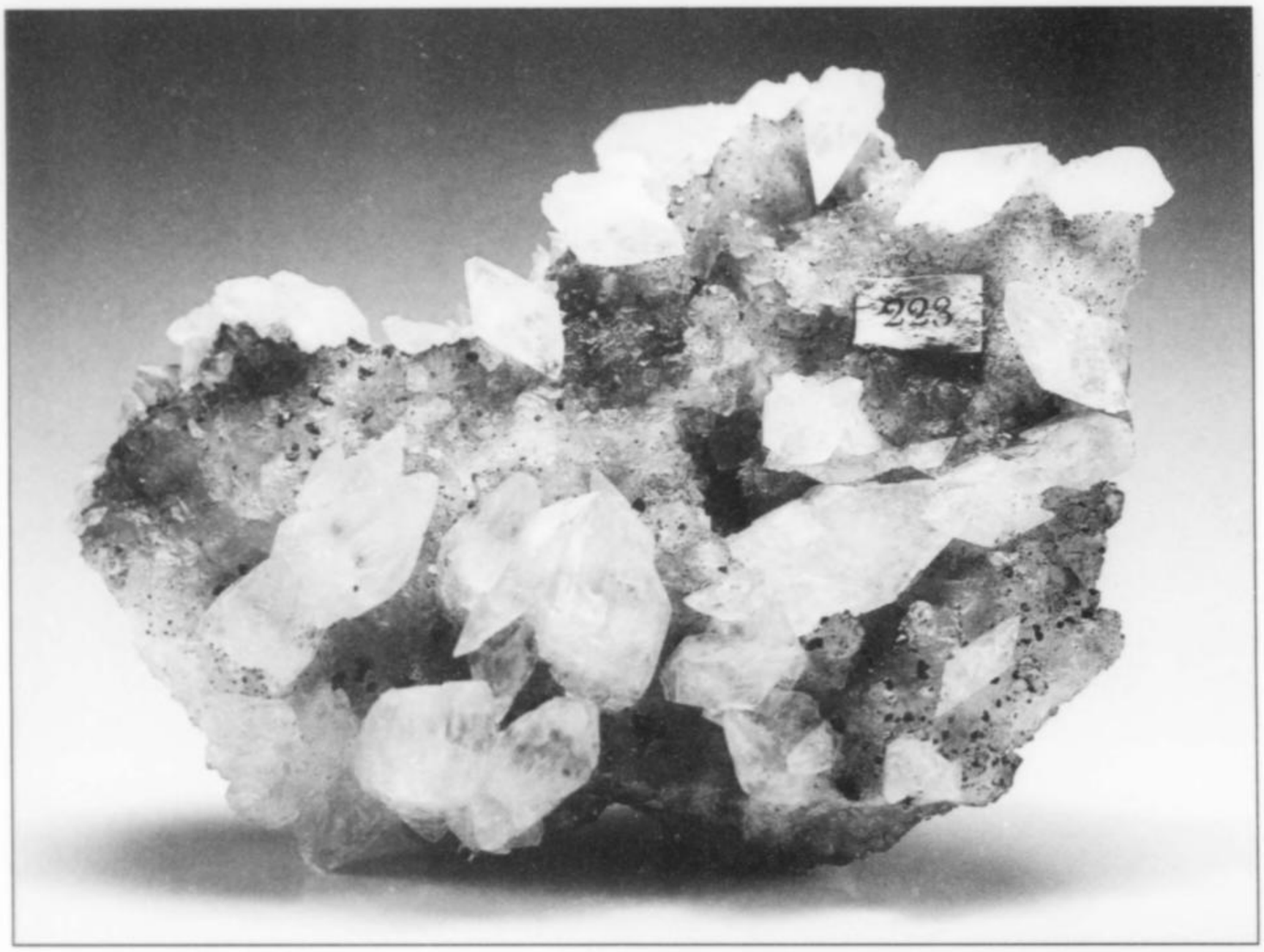


Figure 28. **Calcite on fluorite from the Gregory mine, Ashover, Derbyshire. The small dark crystals are pyrite and enargite. Georgiana's Chatsworth collection, no. A-223, described by Watson as "Twin crystals of Carbonate of Lime with crystals of Brown Lead ore in hexagonal prisms."**

Figure 29. **Galena, 5 cm crystal on fluorite, from the Gregory mine, Ashover, Derbyshire. Georgiana's Collection, no. A-430, described by Watson as "crystallized in cubes with the corners truncated, the planes of the truncations are pannelled." Photo by Mick Cooper.**

a Printed Explanation." There is no further mention of this item in the catalogs, nor any trace or recollection of it at Chatsworth. There may have been yet another such tablet at Chatsworth, for the 5th Duke paid for a "Section of the Strata" in 1809—5 years after the date on Catalog A. As compensation the collection contains a beautiful watercolor of the same section, some 50 cm long, from Combs Moss to Bolsover, signed and dated by White Watson 1810. However, we are glad to say that "*a Tablet composed of Derbyshire fossils in Perspective cubes . . . by White Watson*" has been preserved (Catalog A, pp. 89–90). It is composed of inlayed rhombs of Derbyshire rocks and minerals forming the classic stacked-cubes pattern and is signed and dated 1788. The catalog entry explains each inlayed piece using grid references inscribed on the edges of the tablet. However, there is neither trace nor recollection of the item described upon the following page, "*a Vase made of the various Ores of Derbyshire . . . By White Watson*" (Catalog A, p. 91), where there is a rough sketch of the vase along with a verse description. Given that it was likely to have been heavy and brittle, not to mention top-heavy, this unique item may not have survived the years:

Of Shelly Ironstone the plinth
The Pedestal of Blende,
The Body of Galena form'd
With Copper ore doth end;
Upon them to compleat the form
A top of mixtures rare,
The ores of Copper, Lead and Zinc
With Spars united are.

Catalog B

"*Catalogue of a Collection of Fossils Chiefly Volcanic and Pseudo volcanic from Dr. Townson.*" [White Watson, Chatsworth 1804]

Dr. Robert Townson (1763–1827) was an important English traveler, naturalist and geologist (Rózsa, 1999) who was an expert on the petrology of volcanic rocks. He was the author of, among other works, *The Philosophy of Mineralogy* (1789), which he dedicated to Georgiana (suggesting, incidentally, that her interest in the subject predated her lessons during her European exile). We still have 21 of Townson's 24 "pseudo-volcanic rocks," a third of which were baked **clays** and **marls** from a burning coal-field between Birmingham and Dudley in the Midlands of England. Many of the remainder are **basalts** from various British and Welsh localities. The realization of the volcanic origin of basalt was a relatively new idea at the time, and had been the subject of much contention with those that considered basalt of aqueous origin.

Catalog C

"*Catalogue of a Systematic Collection of British Fossils.*" [White Watson, Chatsworth 1804]

The numbered list of Catalog C ends at no. 177, though there are many gaps. Watson lists entries for only 83, of which 50 labeled pieces survive. Since the following catalog begins at 201, it may be that Catalog C was intended to contain 200. Of the survivors, almost all of Watson's 15 specimens of **galena**, **sphalerite**, **calcite** and **barite** from the Earl Ferrer's mine at Staunton Harold in Leicestershire remain in the collection. Although contemporary collectors were quick to recognize their value as cabinet specimens (mineral and shell dealer Jacob Forster was selling examples in his Paris shop in 1788 and included some in a sale he made to the Russian Academy of Sciences in 1805—see Cooper, 2001), the exquisite specimens from this unusual occurrence are now little known outside of local specialists (see King, 1983, 1993). The suite at Chatsworth includes some fine examples. Catalog C once contained several specimens of **witherite** from Anglezark in Lancashire, where it was first found in the late 18th century, though only Georgiana's specimens from Arkendale in Yorkshire have been identified to date. White Watson supplied Arkendale witherite specimens to James Sowerby which he first found here in September 1803 (Sowerby, 1804). Although generally not well crystallized these must have been mineralogically exciting things in Georgiana's day.

Catalog D

"*Catalogue of a Collection of Fossils The Productions of Cornwall.*" [White Watson, Chatsworth 1804]

Some 50% of the Cornish minerals are missing (82 remain out of a total of 167, originally numbered in continuation from Catalog C as 201 to 367), although many typically Cornish, though label-less, specimens remain in the collection. The latter include an attractive 2 cm **torbernite** plate on matrix, though no such specimen is listed by Watson and it may be one of the 6th Duke's additions. The majority of extant specimens from Georgiana's Cornish suite are **cassiterite**, **copper** and **cuprite**. Some of the latter were once good pieces, but have tarnished and darkened with the passage of time. The most interesting item in the catalog is No. D-254: *Arborescent Native Copper, Inlayed on an oval of White Statuary Marble, surrounded with black marble and a white frame by White Watson.* It is a rectangular slab of white marble upon which several flat pieces of arborescent copper have been glued (not "inlayed"); this arrangement is surrounded by an oval mount of black marble and the whole framed by a thin molding of white marble. The front is glazed. There is no maker's mark or other inscription. Overall dimensions 152 × 125 × 18 mm. This item is unique in Watson's known *oeuvre.*

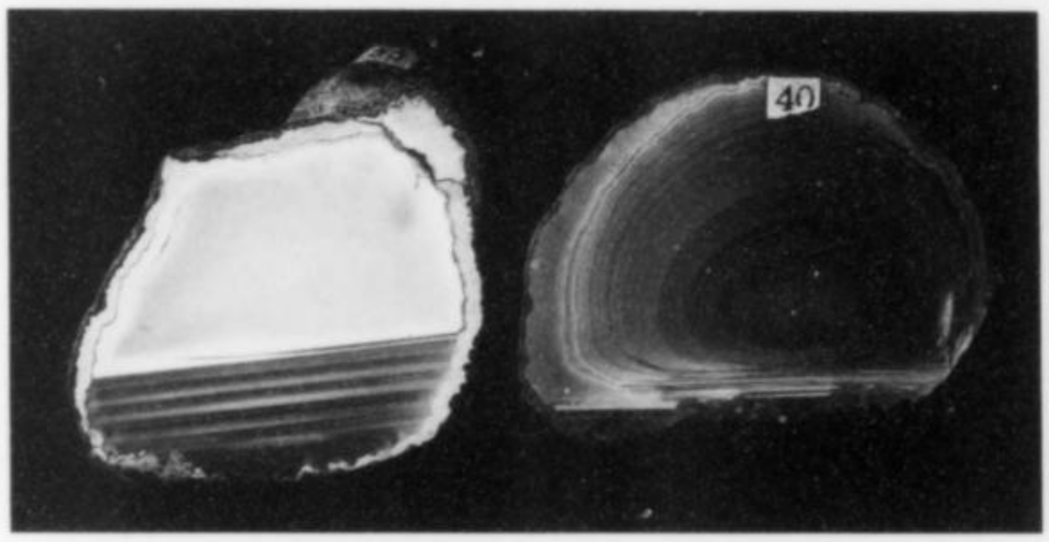


Figure 30. **Agates to 4 cm from Montrose, Scotland. Specimens numbered E-40 and E-55 from Georgiana's Chatsworth collection. Although now rare, and overshadowed by the larger specimens from modern occurrences in the Americas, Scottish agates are world-renowned for their exquisite patterning and delicate coloring. Georgiana's collection contains a small but superb suite of specimens from these classic occurrences. Photo by Mick Cooper.**

Catalog E

"*Catalogue of a Collection of Fossils from Scotland, chiefly polished.*" [White Watson, Chatsworth 1804]

This small collection of Scottish minerals is mostly composed of cut and polished samples of the small but exquisite **agate** pebbles and nodules for which Scotland is world-famous (MacPherson, 1989). The best here are those from Montrose. There are also a few small examples of the **smoky quartz** crystals known from the locality as "Cairngorms." We have 58 of an original 64 pieces.

Catalogs F and G

F: "*Catalogue of the Fossils in the Cabinet In the Closet adjoining Her Grace's Dressing Room.*"
G: "*Catalogue*" [*sic*]

There were 231 specimens in Catalog F of which 164 survive. Catalog G had 371 specimens of which 303 have been identified. It is probable that these are mostly specimens acquired by Georgiana during her European exile and may in part be those arranged for her by Henri Struve which she shipped back to Thomas Coutts' care pending her return to England. These Catalogs contain similar mixes of species, the majority of which are European, including many Alpine '**rock crystal**' and **smoky quartz** crystals (most rather damaged unfortunately), **kyanite** with **staurolite** ("Sappare with red Shorl in micaceous Shistus") typical of material from Pizzo Forno, Switzerland, and **adularia**. There is a lump of massive **pyromorphite** from Anglesey (a rarity for the locality), a drawerful of Elba **hematites** of middling quality (obviously a favorite species at the time), and a plethora of "Vesuvian Hyacinths in the Matrix," most of which is well-crystallized **vesuvianite** from

Vesuvius. There are a couple of well crystallized **golds**, and an "Eaglestone" which no self-respecting 18th century mineral collection should lack: these hollow rattling **ironstone nodules** were once supposed to be found in eagles' nests and were imbued with all manner of occult powers, from combating miscarriage to curing gout.

Other than the Watson tablet, the most elaborately described item in the whole collection is the first in Catalog F: "A stone which fell from the Clouds." Its entry is un-numbered so we've assigned it to F-0. The entry contains a detailed account of the occurrence of this rusty bean-shaped fragment (it weighs a mere 11.5 g) by "*Mr Santi, the Professor of Natural History at Pisa,*" who may—or may not—have supplied the specimen:

> On the 16th of June 1794, at Pienza near Radifocini [sic], a dark and dense Cloud was discovered at a great height above the horizon, coming from the South east, that is, in the direction of Mount Vesuvius, which may be about 200 horizontal miles distant—from their height the Cloud was heard to issue noises like the discharge of several batteries of Cannon: it then burst into flames, at which moment fell a Shower of Stones, for seven or eight miles round, while the Cloud gradually vanished—These stones are various, being composed of grayish Lava, exactly resembling what is found on Vesuvius, and Mr. Santi, who took infinite pains to investigate this Phenomenon, is perfectly convinced, that the Cloud rose from Vesuvius, which was at that moment disgorging fires.

Giorgio Santi (1746–1822) graduated in medicine from Siena University, and worked in France for many years, where he met with Boscovich, Lavoisier and Buffon. Back in Italy he became professor of chemistry and natural history at the University of Pisa, and Director of the Museum and Botanical Garden there. Like many other scientists, Santi was mistaken about the origin of the stone. It is undoubtedly part of the meteorite shower of San Giovanni d'Asso (or Lucignano d'Asso) near Siena. This fall was described by Ambrogio Soldani (1736–1808) and the meteorites were once known as "soldanites" or "giovannites." They are olivine and hypersthene chondrites. The Siena fall is extremely important in the history of meteorite science. In the eighteenth century most scientists scoffed at the notion that stones could fall from the sky. However, when the Siena meteorite fell, many of the eye-witnesses insisted it was extraterrestrial in origin. In contrast, many scientists argued it was more likely volcanic in origin (as per Santi's account), despite the fact that it looks nothing like the rocks from Vesuvius.

Chatsworth's tiny meteorite collection was doubled in size in 2002 with the discovery in an attic of a piece of "Pallas's Iron" purchased from the collection of Alexander Crichton in 1827. This is another of the world's most famous and seminal meteorites. The original 700 kg mass was discovered some 145 miles from Krasnojarsk, Siberia, in 1749 and excavated by Peter Simon Pallas (1741–1811)[7] of the St. Petersburg Academy of Sciences in 1772. The character of its discovery and its unusual composition (a mixture of nickel-iron and olivine) convinced fellow academician Ernst Chladni of its extraterrestrial origin, and he published his conclusions in 1794. The following year, 1795, a meteorite was seen to fall at Wold Cottage, Yorkshire, England, far from any active volcanoes, and this fall, combined with the Siena shower, finally convinced the scientific establishment of the extraterrestrial origin of meteorites.

[7] These types of meteorites are now known as pallasites.

Specimen F-219 is the piece of "Porphyry" obtained "from the very top of the highest point of the Mount St. Gothard" by Lieutenant General Count Rumford, already mentioned. Among the many achievements of his colorful life Benjamin Thompson, Count Rumford (1753–1814), was (briefly) a British soldier in the American War of Independence, a spy and a celebrated physicist. He founded the Royal Institution of Great Britain in 1799, of which Michael Faraday and Humphrey Davy were to be the most famous directors (see Brown, 1999). He has been described as one of the greatest applied scientists of all time and a founding father of thermodynamics.

Specimens of "*Sydneia or Terra Australis*" (F-158a) and **amazonite** (F-78a) were "*by Mr Hatchett*" according to their entries in Catalog K (a draft of Catalog F). This must be the chemist and mineral collector Charles Hatchett (1765–1847) who analyzed "*Sydneia*" in 1798. Liversidge (1882) describes the material as "of no importance" but says of Hatchett's paper that "it contains probably the first analyses of any mineral from this Colony." Sydneia had first been brought to England by Sir Joseph Banks, and was examined by Josiah Wedgwood (1790) for its potential for porcelain manufacture. Owing in part to the use of impure reagents, Wedgwood concluded that the mineral contained a new element to which the name Sydney Earth or Syndneia was given. Further work by Martin Klaproth and Hatchett concluded it was merely an impure clay (probably kaolin) derived from the decomposition of granite (Vallance, 1986).

F-142 is labeled "Foxite" and appears to be a silky mat of iron-stained "**byssolite**" on matrix. This previously unrecorded synonym describes the specimen perfectly from its resemblance to red fox fur.

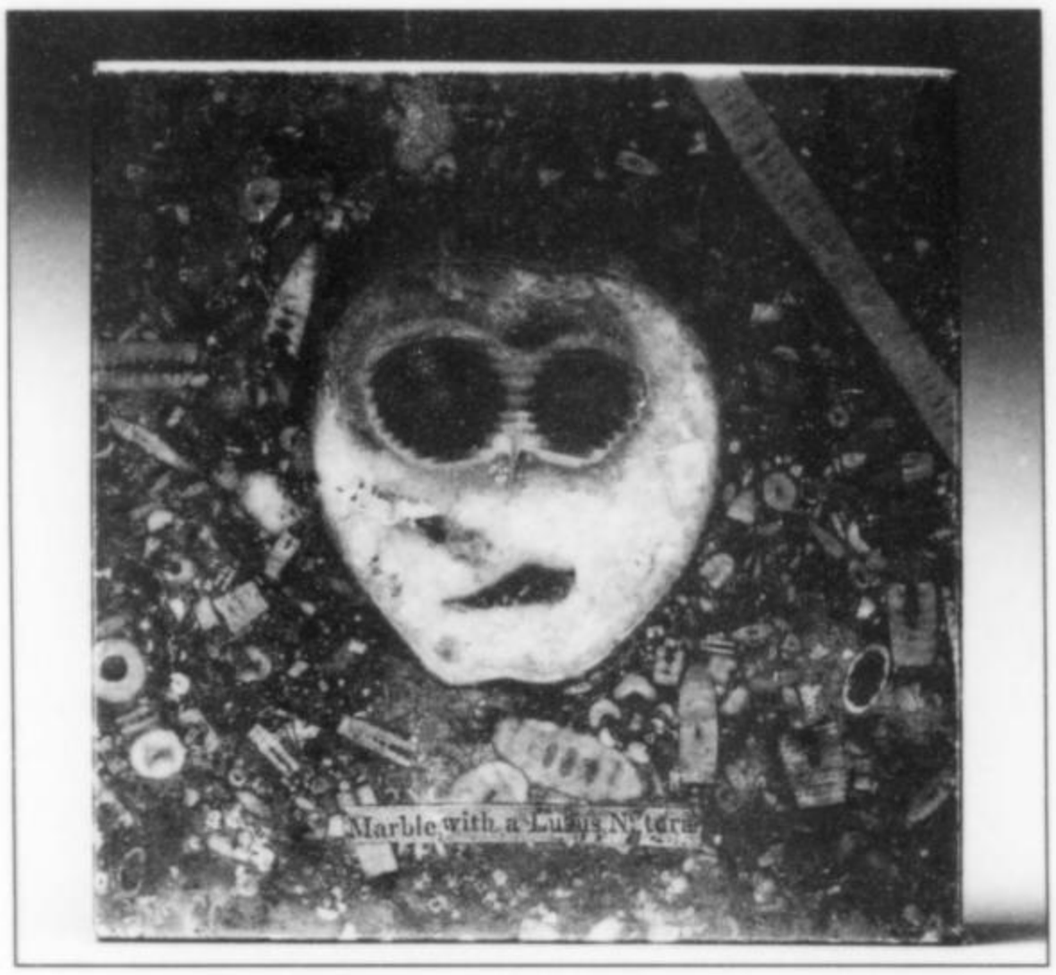


Figure 31. **A fine "Lusus Naturae," a strange shape resembling a face in crinoidal limestone, possibly from the Crichton Collection.**

Catalog H

"*Catalogue of Fossils Arranged by*" [*sic*]. [White Watson, Chiswick, 1799]

This relatively large collection has survived almost entire (we have 290 of its 351 pieces), a circumstance probably wholly due to the unprepossessing character of most of its specimens. The readily recognizable and coarsely printed number labels have also proved to be remarkably stable over the last 200 years. The collection

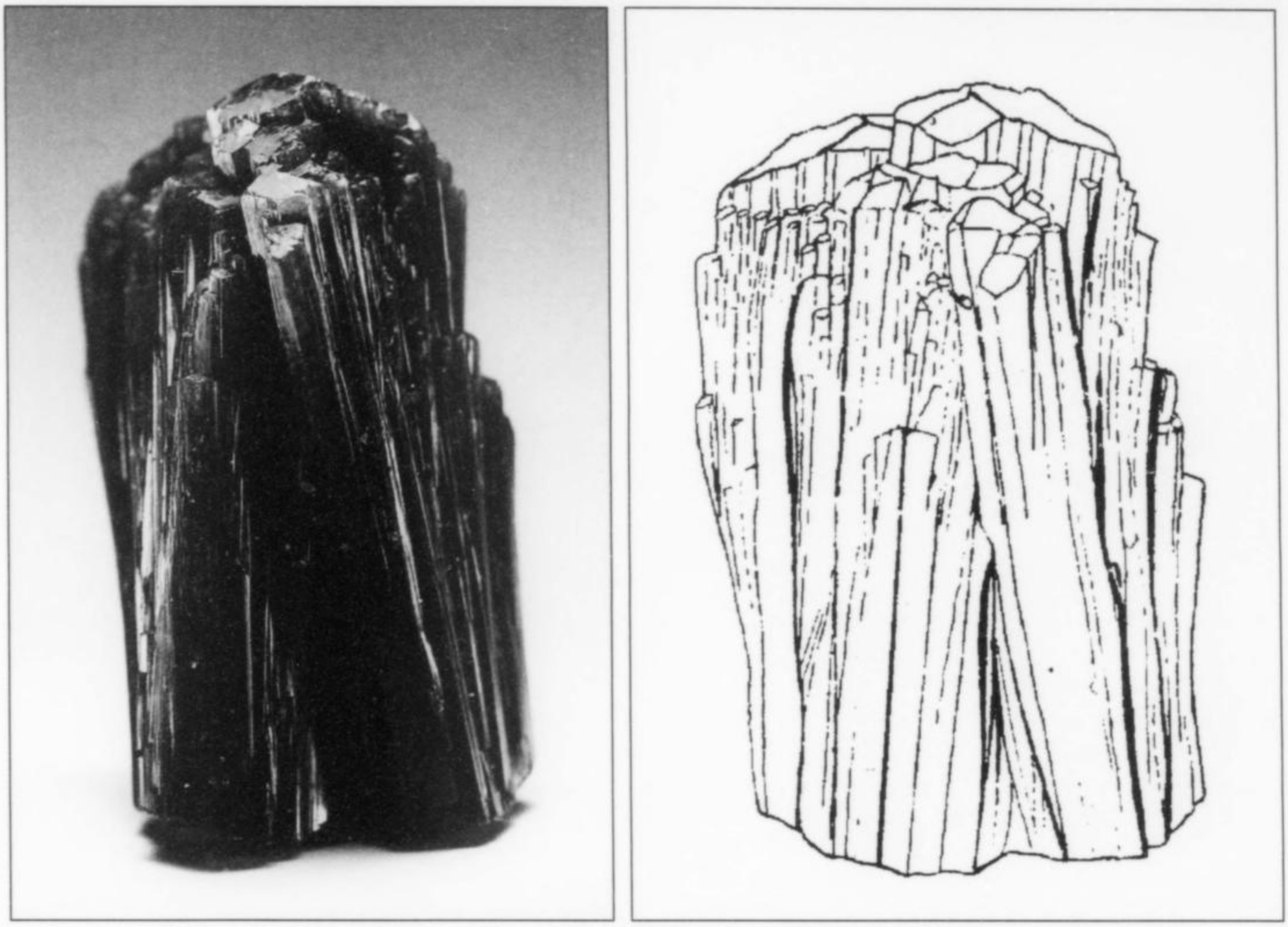


Figure 32. **Tourmaline from [Shaitansk?] Miask, Siberia, Russia. Lot 2082 ("A [most select] group of tridecimal Green Tourmaline, very large and fine," from the sale of the Alexander Crichton collection. Purchased on the 13th day's sale, Friday, May 4th, 1827, for 10 guineas.** ***Left:*** **photo by Mick Cooper.** ***Right:*** **illustration from Wagner (1818), Plate 11, Figure 2.**

contains many duplicate samples of **massive ore** from various unnamed copper and gold deposits, including much copper-impregnated sandstone from "the horizontal strata near Trigmuka"—wherever that may be . . .

Catalog I

"*Catalogue of the Marble and Silicious Stones cut in squares of 2 & 5/8 inches and polished.*" [White Watson, Chiswick, 1799]

Catalog J

"*Handsome Silicious Hardstones.*" [White Watson, Chiswick, 1799]

Until the 2002 find of slabs among the 6th Duke's specimens discovered in a neglected attic, nothing was known from catalogs I and J and we suspected they were used by the 6th Duke for lapidary purposes. There are 130 slabs listed in Catalogue I, and a quick check of those recently to hand shows that a few dozen may be identifiable among the new find. Time will tell. There are several hundred other small numbered slabs or tesserae of decorative stone in the collection that cannot be matched to these catalogs. These may be later material acquired by the 6th Duke as samples or mementos of his European tours, the smaller ones probably being intended for mosaic or inlay work. The Duke was passionately fond of such work, examples of which abound in the table tops and sculpture plinths at Chatsworth.

Catalog K

"*Catalogue of Fossils &ca in the Closet of Her Grace the Duchess of Devonshire adjoining to the dressing room at Chiswick taken in May 1799 by White Watson.*"

This is a loose gathering of a few pages and appears to be a rough draft of Catalog F.

Catalog L: The Crichton Collection (1827)

Some of our most exciting and satisfying pieces of detective work involved the specimens from the Crichton collection. Most of the Duke's acquisitions are described in an 8-page manuscript list of "*Minerals bought at Sir Alexander Crichton's Sale.*" This notes 67 lots containing 75 (or 76) described specimens, purchased by the Duke for £315.2s., and we were able to match several of these entries from the simple fact that someone had cut them from the sale catalog and glued them to the specimens. But not all specimens to hand with these kinds of labels appeared in the list. The similarity of their labels to those on the known Crichton specimens convinced us they were Crichton pieces, but the only way to be sure was to track down their entries in the 4,000+ lots in Sowerby's catalog. This was a laborious, though admittedly a most interesting, exercise, and resulted in the identification of all but one of the suspect pieces. It is almost certain that Franz Werner and the author have now read Sowerby's catalog more carefully than anyone in its 175-year history. How these extra pieces came to be at Chatsworth is unknown. It's possible they were bought by another at the sale (Heuland perhaps?) and acquired by the Duke at a later date.

Franz Werner became our forensic expert checking the suspect Crichton labels by comparing the wording or fragmentary letters on both front and back of the labels with entries in the Sowerby sale catalogue. The first success was a particularly fine group of the marvelous "**Sand calcite**" crystals from the famous occurrence at Fontainbleau in France. The remains of the label ("*Inverse Fontainbleau Sa*") being slightly loose, Franz was able to see the letters "ia." from the end of a line of print on the reverse. The back of the page bearing Lot 51, one of the several catalog entries for

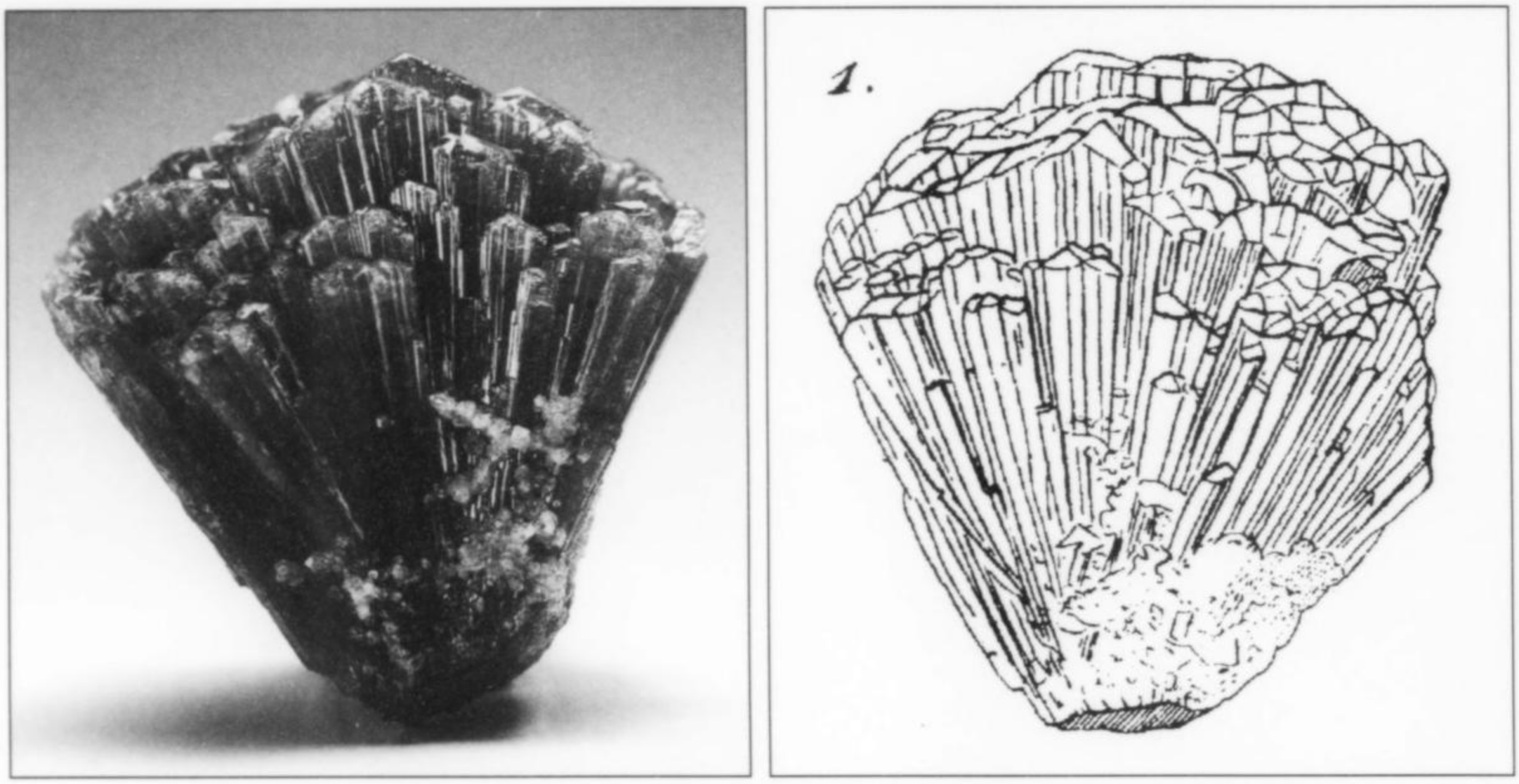


Figure 33. **Elbaite from Shaitansk, Siberia, Russia: A 4 × 4-cm radiating mass of elongated prisms of deep raspberry-red elbaite; a variety formerly known as "sibirite." The light sprinkling of pale ivory-colored sparkling crystals on one side of the specimen appears to be the rare mineral rhodizite. Purchased for £20 9s 6d on Friday, May 4th, 1827, the 13th day of the sale of the Alexander Crichton collection (Lot 2087).** ***Left:*** **photo by Mick Cooper.** ***Right:*** **the engraving of the specimen in Fig. 33 from Wagner (1818) (Plate XI, Fig. 1).**

Fontainbleau specimens, featured a specimen from "Westphalia." Franz measured the pages of our photocopy of the Sowerby catalog and found that the last characters of this line were in exactly the right position to appear under the exact same portion of our Fontainbleau specimen as the label it bore. Incredibly this magnificent specimen, along with a **gypsum** from Bex [Switzerland], was sold for 6d (7½ cents)! A similar process was applied to identify Lot 2265, a slab of the classic red and green banded "**Ribbon Jasper**" from Siberia. At the beginning of the project such a specimen—just one of several candidates for Lot 2265 (known to have been bought by the Duke)—was found mounted in an oak block with a Dymotape label "Red Jasper." At first the ferociously stubborn cement used to mount the specimen shrugged off all our attempts to free the specimen from its ugly prison. In Nov. 2000 the application of the vicious solvent methylene chloride enabled us to remove it from the block, and a minute fragment of label was found embedded in the cement remaining inside the mount. It bears the letters "zil" and is the end of the reverse of a label that was once glued to the specimen. There is an elongated rectangular mark on the specimen that must be the trace left by the long-disappeared label. On the page behind the entry for Lot 2265 in the Crichton sale catalog, exactly in line with the beginning of the entry, is the word "Brazil." As a clincher, the entry for Lot 2265 is exactly the same size as the stain on the specimen. The moral? Never clean your specimens until you are sure the dirt has revealed all its secrets.

Several other specimens were reconciled from minute fragments of labels which were all that remained of the original cut-outs from the Sowerby catalog. A broken nodule sprinkled with small **celestine** crystals bore only the string "eudon," but this was enough to convince us it was part of Lot 1765: "*Dioxinite Sulphate of Strontian on Flint, Bas Meudon, near Paris*" Meudon is the "type locality" for dioxynite, described from here by Haüy (*Traité de Minéralogie*) in 1822. The fragment of paper adhering to a chunk of black obsidian had only "*an, M*" on it but it was enough: Lot 2367 "*Chatoyant fibrous Obsidi***an, M***exico, rare and fine*."

Although these finds were satisfying, the most exciting identification was that of a pair of Russian **tourmaline** specimens. These had appeared in our work room between visits with a note that they had been found in the house "during a clear out of some old cupboards." One was a superb example of the rare raspberry-red "sibirite" elbaite from Shaitansk, near Mursinsk, in the eastern Urals, and the other was a lustrous bunched mass of very dark green prisms. Neither had labels of any kind. The Crichton purchase list noted two such specimens, lots 2087 and 2082 from the Sowerby sale, respectively a "Group of prismatic Rubellite of a beautiful red colour, Siberia" (£10.10) [say £515 in today's money] and "A Group of Tridecimal Green Tourmaline, very fine (Miask)" (£20.9.6) [about £1000], but without any other evidence there was no way we could match them unequivocally with these newly-found specimens. Through correspondence with Wendell Wilson of the *Mineralogical Record*, I learned there was a contemporary description of Crichton's collection published in German by Joseph Wagner in 1818. A photocopy of Wagner's catalog, courtesy of the Mineralogical Record Library, was duly delivered to my door. The back of the catalog contained several life-size engravings of prize specimens from Crichton's collection. And, yes, there were our tourmalines perfectly delineated by the engraver's burin. At that moment, 200 years of history were returned to these two small, and now highly significant, specimens. To add yet further spice, the sprinkling of pale ivory-white sparkling crystals on one side of the "sibirite" spray appears to be the extremely rare **rhodizite**, a characteristic associate of sibirite from Shaitansk, which is the co-type locality. According to Wagner (1818), sibirite was discovered near Shaitansk in about 1815 by Mohr, Director of the Royal Gem Works of Catherinenberg. Though the locality was soon exhausted,

it created a sensation and specimens changed hands for huge sums, especially matrix specimens on feldspar. A specimen acquired by the Royal Mine Corps in St. Petersburg (now the Mining Institute), was estimated to be worth over 10,000 Rubles (£1250 at contemporary prices, say a quarter of a million US dollars today). Wagner thought himself lucky to obtain a specimen "on which a beautiful crystal of about 1½ inches is intergrown with Adular," for which he paid 1000 Rubles. He considered Crichton's suite of sibirite reason enough alone to visit the collection, irrespective of its other merits.

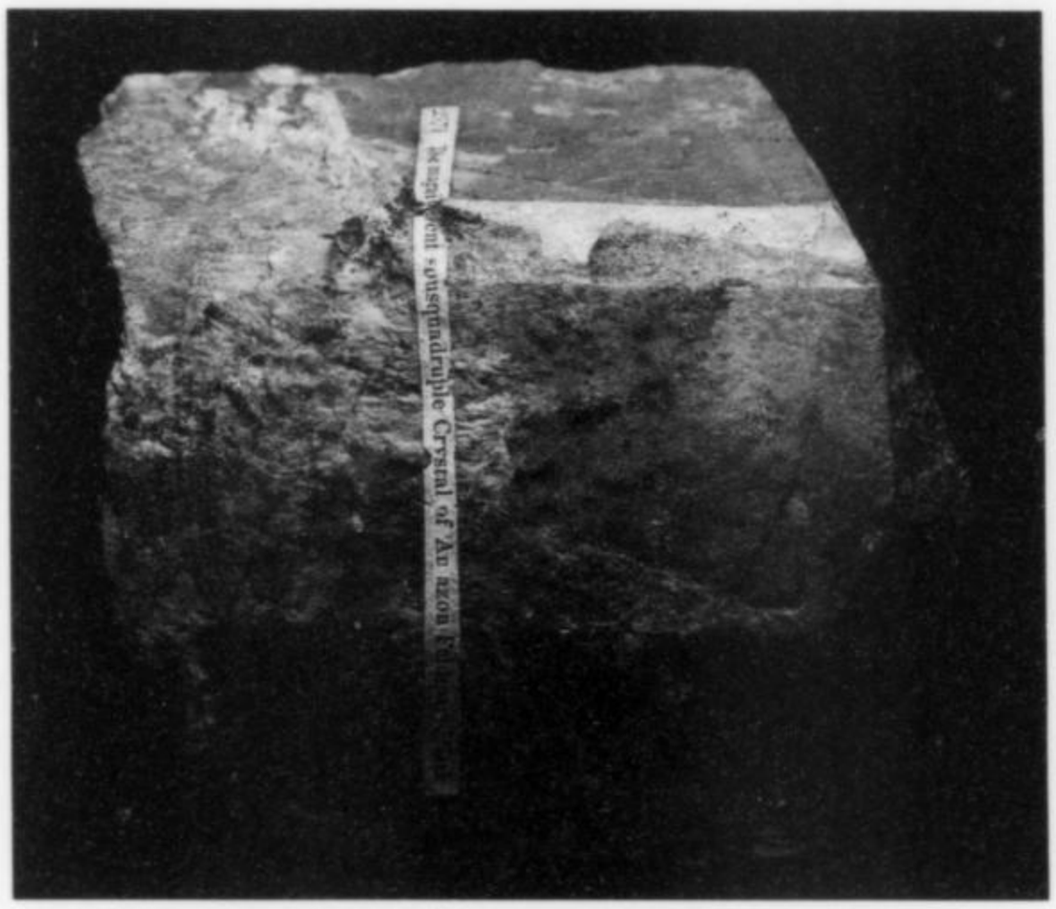


Figure 34. **Amazonite from Miask, Siberia, Russia. Purchased for 6½ guineas on the 16th day of the sale of Alexander Crichton's collection, Tuesday, May 8th, 1827. Lot 2571: "The magnificent sousquadruple Crystal of Amazon Feldspar." In its day one of the two finest crystals known. Illustrated life-size in Wagner (1818: plate IX). Photo by Mick Cooper and Franz Werner.**

Identifiable from its label and its reproduction by Wagner is a large **amazonite** feldspar crystal described in the Sowerby catalog (lot number 2571) as "The Magnificent sousquadruple Crystal of Amazon Feldspar" and featured life-size in plate IX by Wagner, who considered it one of the two finest crystals known. The Duke paid £6.16.6 for it.

A further 20 or so Crichton sale specimens turned up in the 2002 "attic discovery"—half of them being extra to the known list of purchases. Conveniently, a few bore small circular labels with their lot numbers written in faded ink. Among them Lot 1877, the "brilliant wine coloured Heavy Spar [**barite**], Przibram," was disappointingly pale (faded perhaps?), but we were pleased to find Lot 1738 "A select specimen of foliated native silver in slacky Hydrate of Copper, Chili," which may have been one of the many specimens sent to London by Heuland's brothers from Peru on their famous mineralogical tour of South America in 1795–1800 (Cooper, 2001). No less than 3 (unlabeled) contenders appeared from their 40-year-old newspaper wrappings for Lot 2124 "Chromate of Lead of remarkable beauty, with Phosphate of Lead and Vauquelinite, Beresoff" known to have been acquired by the Duke. Lot 1792 "Mammillated cupriferous Zinc, fine and rare, Nertschinsk" turned out to be **aurichalcite** on gossan, but there is still no sign of the intriguing Lot 2384 "An Aquamarine, one half rose red the other green, Ceylon, considered one of the rarest mineral substances." It is probably a cut stone and an investigation of the Chatsworth jewels may be revealing.

Catalog M

"*Catalogue of minerals and rocks at Chatsworth, 1936.*"

A catalog, predominantly of specimens from Catalogs F and G, made by F. Alan Bannister of the British Museum (Natural History) in 1936. His fee for the work was 5 guineas: "you must allow me to say," wrote F. Thompson, the Chatsworth curator, on hearing this, "that five guineas for three days strenuous and responsible work is absurd. Five guineas a day would be more like it." Bannister applied his own characteristic hand-written number labels to the specimens he worked on. Only seven pages of Bannister's typescript catalog survive, covering specimens M-1 to M-150. The highest Bannister number found to date on a specimen is 425.

Catalog N

Catalog N is a list made for insurance purposes in 1980 by Brian Lloyd for Christie's auction house. Brian is now the proprietor of the UK's longest-lived mineral and fossil dealership Gregory, Bottley & Lloyd of London.

Catalog O

Catalog O consists of specimens with "Type 16" labels. We dubbed these "Species Labels" as they are printed labels bearing just the species name in bold type, terminated by a bold full stop (e.g. "Calcareous Spar.") and bearing no printing on the reverse. There are some 40 to 50 specimens with these labels, which may have been printed specifically to label specimens. Some of them are glued to specimens from the Crichton sale. In one case the Crichton sale label is glued over the Type 16 label, suggesting that they predated the sale and may thus have been Crichton's own. It is possible that all the Catalog O specimens are from this source, possibly items in a lot additional to those described in the sale catalog. The suite of "attic specimens" found in 2002 contains many specimens with these labels, alongside several important and unequivocally Crichton pieces. The most curious of this new suite is a faked piece of **malachite** *pornographia*, consisting of a malachite stalactite carefully attached to a globular specimen of the same mineral. Henry Heuland referred to such specimens as "priapite"—after the Roman god Priapus, another mineral name that has escaped the synonym hunters. It may be Lot 1961 from the Crichton sale, coyly described as: "Malachite in stalactitical and globular concretions, Gumoscheffsky," which raised £2 on the 13th day of the sale.

Catalog P

Catalog P is devoted to specimens with modern circular self-adhesive labels printed with numbers in black or red ink. Their origin and purpose is unknown. Few have survived, their failure being almost certainly due to the notoriously poor long-term adhesion of such labels. (Those of you using such labels on your collections today, take note! Even when they adhere when first applied—and they may not if the surface is powdery—the glue eventually migrates into the paper and they fall off.)

Catalog Q

Catalog Q involves specimens with "Type 14" labels: hand-written numbers prefixed by the letter "Q." Only five such labels are known, the lowest number being 4 and the highest 26. Those to hand are all from Catalogs F and G and are probably a suite of pieces obtained by Georgiana during her European exile.

Catalog R

Catalog R is an unusual suite of specimens with "Type 7" labels: hand-written numbers prefixed by the letter "R." Only 7 such labels

are known, the lowest number being 2 and the highest 12. They all appear to be Derbyshire lead minerals, several are large hernia-inducing masses of solid **galena** with central cavities spanned by bladed **anglesite** crystals. The largest of the latter is 7 cm long! They have been tentatively attributed to the Golconda mine.

Catalog S

Catalog S is defined by the attached printed labels with species name and, usually, a locality.

Catalog T

The printed labels of Catalog T, with species name, are similar to, but not identical with, Catalog S labels. Both S and T labels (like those of Catalog O) may have been cut from publications intended for the use of collectors as specimen labels.

Catalog U

Catalog U refers to specimens with hand-written numbers on shaped labels with blue patterned borders, some with scalloped edges ("Types 4, 5 and 6"). These are restricted to specimens from Catalog A and run in sequence from 707 to 790 with a few gaps. What became of the first 706 we have no idea!

Catalog V

Catalog V involves specimens with "Type 11" labels. Only two specimens have been found, one of which is the "*Foxite, on the matrix*" already mentioned.

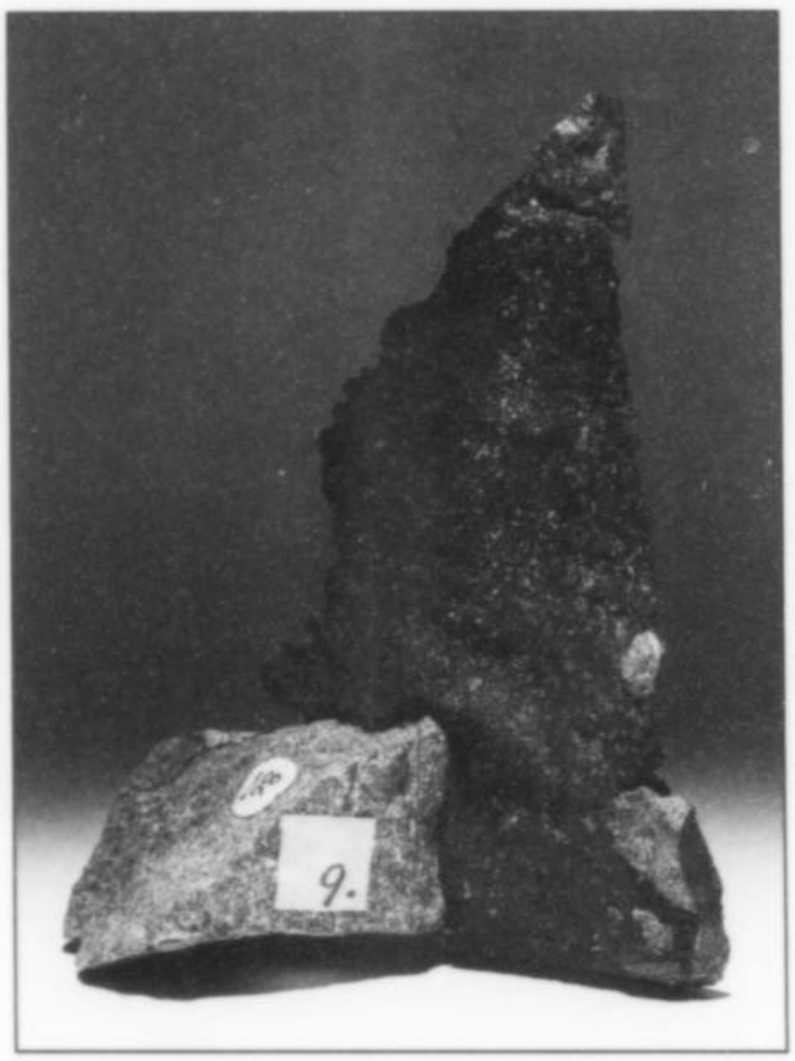


Figure 35. **Silver from the Juliana Haab mine, Kongsberg, Norway. A paper-thin sheet of blackened silver partly embedded in matrix; 19 cm high. Sold by Henry Heuland, April 6, 1820, and described by him as "Très large feuille d'Argent natif, adhérant à une roche calcaire metallifère d'une grain très fin." Photo by Mick Cooper and Ian Fraser-Martin, by courtesy of the Trustees of the Chatsworth Estate.**

Catalog W: Heuland Specimens

The Silver Vault at Chatsworth is home to two of the most remarkable pieces in the collection. From the outset, one of these two fine **native silvers** was obviously a fine silver wire from

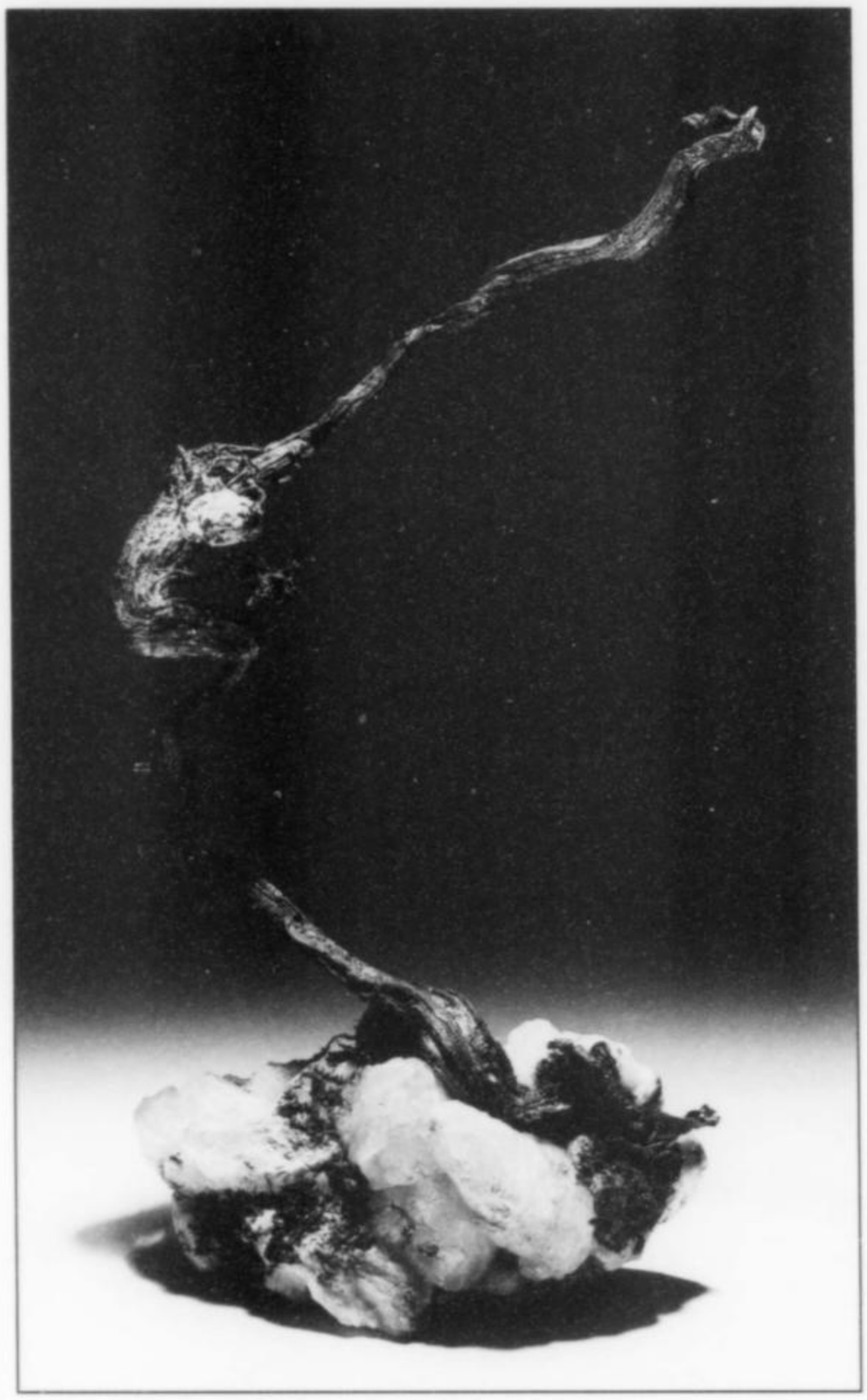


Figure 36. **Silver, Ilsoé mine, Kongsberg, Norway. A twisted and curved silver wire protruding from crystallized calcite matrix; 23 cm high. Sold by Henry Heuland, April 6, 1820, and described by him as "Rameaux d'Argent natif d'un volume extraordinaire." Photo by Mick Cooper and Ian Fraser-Martin, by courtesy of the Trustees of the Chatsworth Estate.**

Kongsberg. It is over 25 cm long and curls like a plume of metallic smoke, still lustrous, from a mass of crystallized white calcite. The other is a thin sail-like triangular sheet of tarnished metal 19 cm high clasped at the base by a block of gray rock. This latter specimen, in common with a small group of other pieces we had put together during our initial arrangement, bore a label characteristic of those used by Henry Heuland: large paper squares with an off-center number in a bold hand. At the time we could go no further with this suspicion, but serendipity was to take us in hand. It had been our habit to use a photocopy of the original Watson catalogs on our working trips to Chatsworth House, but one day I neglected to bring them with me. Luckily, as it was a weekday trip, we were able to borrow the originals for the day, and while paging through one of them I discovered slipped in the back of one of them a previously un-noticed envelope entitled "old mineral labels." Within were the brittle remains of a list written in French in Heuland's characteristic hand. The list had been cut into strips, and parts had been lost, but enough remained to show it was a

numbered description of ten specimens including two Kongsberg silvers, a Greenland **tourmaline**, a Saxony **fluorite**, a slab of **rose quartz**, and a German **pyrargyrite**. All of these pieces were instantly recognizable as those in the suspected Heuland suite! And all, with the exception of the silver wire, bore the same Heuland numbers as those on the list. The description of a silver wire on one fragment of paper left no doubt that here was the missing label for the second Silver Vault specimen: "*Rameaux d'Argent natif d'un volume extraordinaire, supporté par une chaux carbonatée lamellaire; de la mine Ilsoë à Kongsberg en Norvège*"—"A branch of native silver of an extraordinary size, supported by lamellar carbonate of lime . . ." Then deeply involved in writing a biography of Heuland (Cooper 2001), I was so excited by this discovery that I had to sit down to recover. This magnificent suite was dated by Heuland the 6th April 1820, and must have been a most costly purchase (though no prices are noted), but by whom? Presumably the 6th Duke, though we are yet to find confirmation of this. One day perhaps we will discover further evidence to explain both its existence at Chatsworth and the reason the labels were written in French!

An annotated copy of the catalog of one of Henry Heuland's famous mineral auctions on Wednesday 7 May 1834, preserved in the library of the Natural History Museum in London, reveals that the Duke of Devonshire bought several lots. One lot, no. 512, Heuland describes as: "The most beautiful group known in this Country of the Amethyst from Rodna, in Transylvania; to be put up at £10." Bidding well over the odds, the Duke paid £15.0.0 for this piece. The Devonshire collection contains a striking nest of milky purple bulbous **amethyst** crystals sprouting from pyrite-coated rock. Could this be the piece? At the time of its discovery in the collections our knowledge of Rodna material was non-existent, yet the specimen certainly deserved a eulogy like Heuland's, for it drew the eyes of collectors like a magnet. The likelihood was increased to a near certainty by comparison of the specimen with known examples from Rodna in the Oxford University Museum of Natural History, one being so close in habit, colour and association that it could have come from the same vug. We are still hoping to identify some of the Duke's other purchases from this sale, another highlight of which was "The most valuable Crystal known of the **Idocrase**, from Ala, Piemont; cost 600 francs; to be put up at £24," for which the Duke parted with £30. It is probable that this is the remarkable deep olive-green striated single crystal that we found mounted in an oak block labeled "diopside." When removed from this support it was discovered that the perfect lustrous flat termination of this fine crystal (useful in distinguishing diopside from vesuvianite) had been used as its base! The few small orange grossular crystals on one side seem characteristic of material from

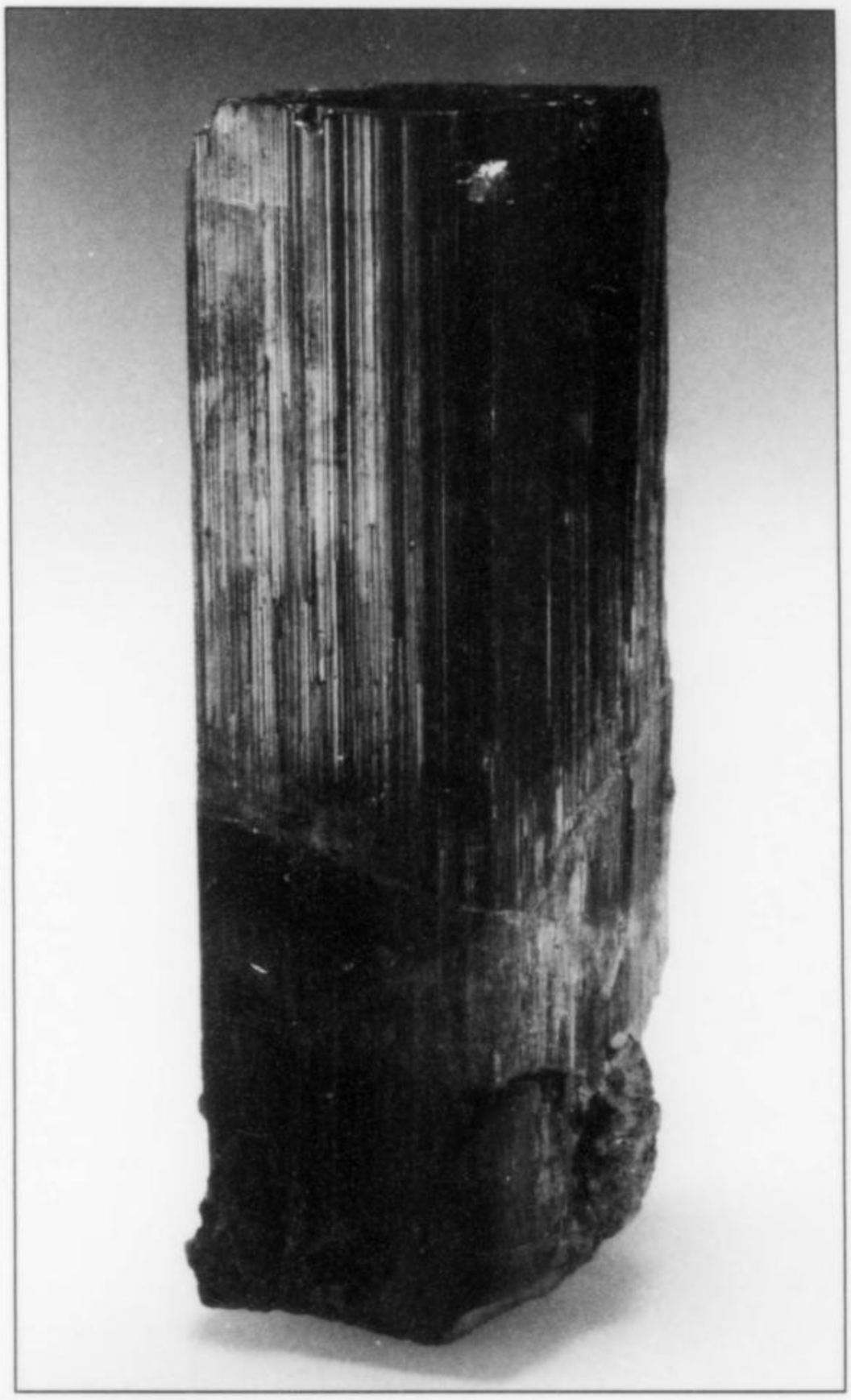


Figure 37. **Idocrase from Val d'Ala, Piemont, Italy. Almost certainly that bought by the 6th Duke from the Henry Heuland auction of 7 May 1834. "The most valuable Crystal known" according to the sale catalog; 4 × 5 × 13.5 cm. Photo by Mick Cooper.**

Figure 38. **Heulandite from Dumbartonshire, Scotland; 5 × 9 × 15 cm. Lot 1601 from the Crichton Collection sale: "A most select specimen." Sold for 3 guineas on the 11th day of the sale, Wednesday, May 2nd, 1827. Photo by Mick Cooper.**

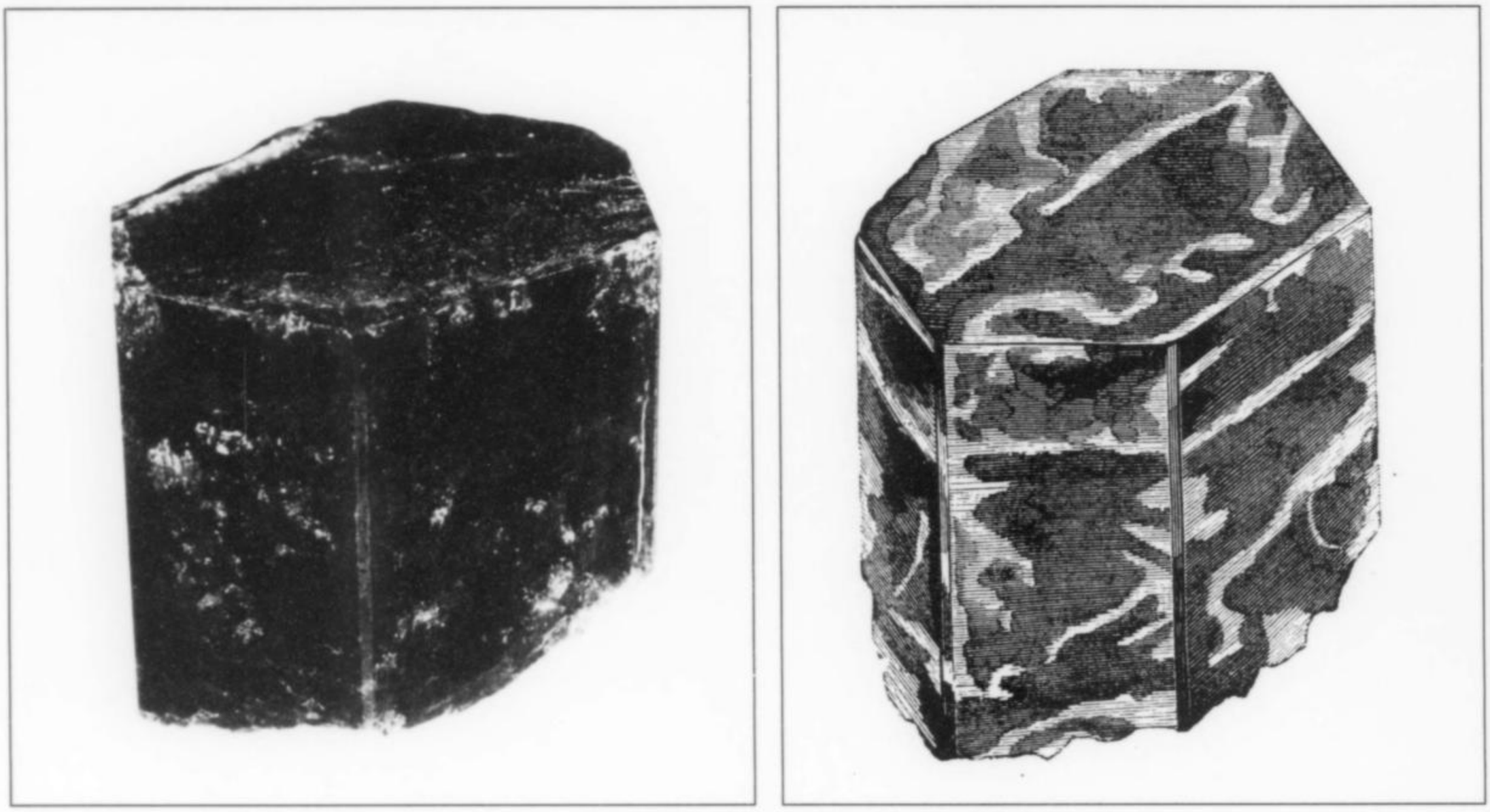


Figure 39. **The "Duke's Emerald," from Muzo, Santa Fé de Bogota, Colombia; 5 cm diameter. Photo by Ian Fraser-Martin, by permission of the Duke of Devonshire and the Trustees of the Chatsworth Settlement. Right: as illustrated in King (1865).**

Ala in Piedmont, though the crystal itself—at 13.5 × 5 × 4 cm—is anything but typical. Even it is not the Heuland specimen it is still one of the largest vesuvianites known from Ala (Renato Pagano, *pers. comm.*).

The Crichton purchase includes two very fine specimens of well crystallized orange-red **heulandite** from Scotland, and it is tempting to think the Duke bought them partly as a result of his acquaintance with the eponymous dealer.

Catalog Y

Specimens in Catalog Y are characterized by small handwritten paper labels in a distinctive hand. The descriptive text is preceded by the specimen number, e.g. "*No. 4 Marble Tyrol.*" Numbers begin at 2 and end at 11, the specimens being mostly in Watson catalog F.

Catalog Z

Specimens in Catalog Z have characteristic hand-written paper labels fixed, in most cases, to the display surface of the specimen. The label gives the species only. This frustrating habit is all too common in old (and some new) collections when what one really longs for is a locality, which can so often only be retrospectively supplied by educated or inspired guesswork. Catalog Z's 22 specimens are an odd mixture of Cornish **copper minerals**, Russian **pegmatite** and European **metamorphic species**.

"The Duke's Emerald"

The "Duke's Emerald" is an incredible terminated crystal from the mines of Muzo, Santa Fé de Bogota, in Colombia, home of the world's finest emeralds. It is a superb deep green, perfectly transparent in places, though heavily flawed in others, 5 cm across the pinacoid, and weighs 1383.95 carats. It was for long renowned as the largest and finest uncut emerald in existence. It is said to have been given to the 6th Duke by Emperor Dom Pedro I of Brazil in 1831, though there is no original documentary evidence for this at Chatsworth. The stone seems at one time to have been in the hands of the then Crown Jewellers Rundell and Bridge, as the banker and mineral collector Thomas Allan notes in the manuscript catalogue of his collection in 1831:

> In the hands of Mess Rundell & Co. I saw another fine crystal [of emerald], weighing 8 oz 18 pwts or 1043 carats,[8] of a perfect form measuring across its diameter 2¼, 2⅛ & 1⅞ inches, & two inches in length. (Allan-Greg Catalog, Natural History Museum, London)

Edmond Waller Rundell FGS (d. 1857) was a mineral collector and jeweler, a correspondent of mineralogists James Sowerby and E. D. Clarke of Cambridge. Why he was holding the emerald is unknown. Why Dom Pedro disposed of it remains an equal mystery. He had become Emperor of Brazil in 1822 after declaring Brazil's independence from Portugal and instating as president Brazil's most celebrated politician José Bonifácio de Andrada e Silva (1763–1838, after whom, incidentally, andradite is named). In 1831, after the loss of his popular support (which had been on the wane for many years) and a disastrous civil war in 1828 which resulted in the separation of Uruguay, he abdicated, made his 5-year-old son Dom Pedro II Emperor in his place, and returned to Europe, leaving the country to be ruled by a regency until his son's majority. Perhaps the emerald was a quickly pocketable valuable as insurance for possible financial problems ahead? It may equally have been potentially useful as a gift out of friendship, or as an expression of gratitude for political support.

This superb and historic stone has been illustrated several times (e.g. King, 1865; Bauer, 1904; Smith, 1958) and was exhibited at the Great Exhibition at Crystal Palace in 1851 by James Tennant. When G.F. Herbert Smith of the British Museum (Natural History) borrowed it from Chatsworth House for the Coronation Exhibition

[8] The weight Allan gives translates into 1384 carats; Allan's own conversion being an error, perhaps a slip of the pen.

of 1911 it was with regret that it was finally returned in 1915: "Its interest is mainly mineralogical and it would be far more accessible to those who can appreciate such a specimen in this Museum than in a private collection" (G. F. H. Smith to J. P. Maine, Librarian at Chatsworth 25 Mar. 1915, NHM Mineralogy Correspondence Archive DF1/31). Unsurprisingly, his remonstrations fell upon deaf ears. However, from July 1936 to January 1950 (except for the duration of World War II) it was loaned for exhibition in the mineral gallery of the British Museum (Natural History). It was subsequently exhibited in the Gemmological Association's exhibition in London in 1949 and again in the City of Birmingham Museum in 1955. Today it resides in a Chatsworth vault in a nondescript cardboard box which belies its remarkable contents.

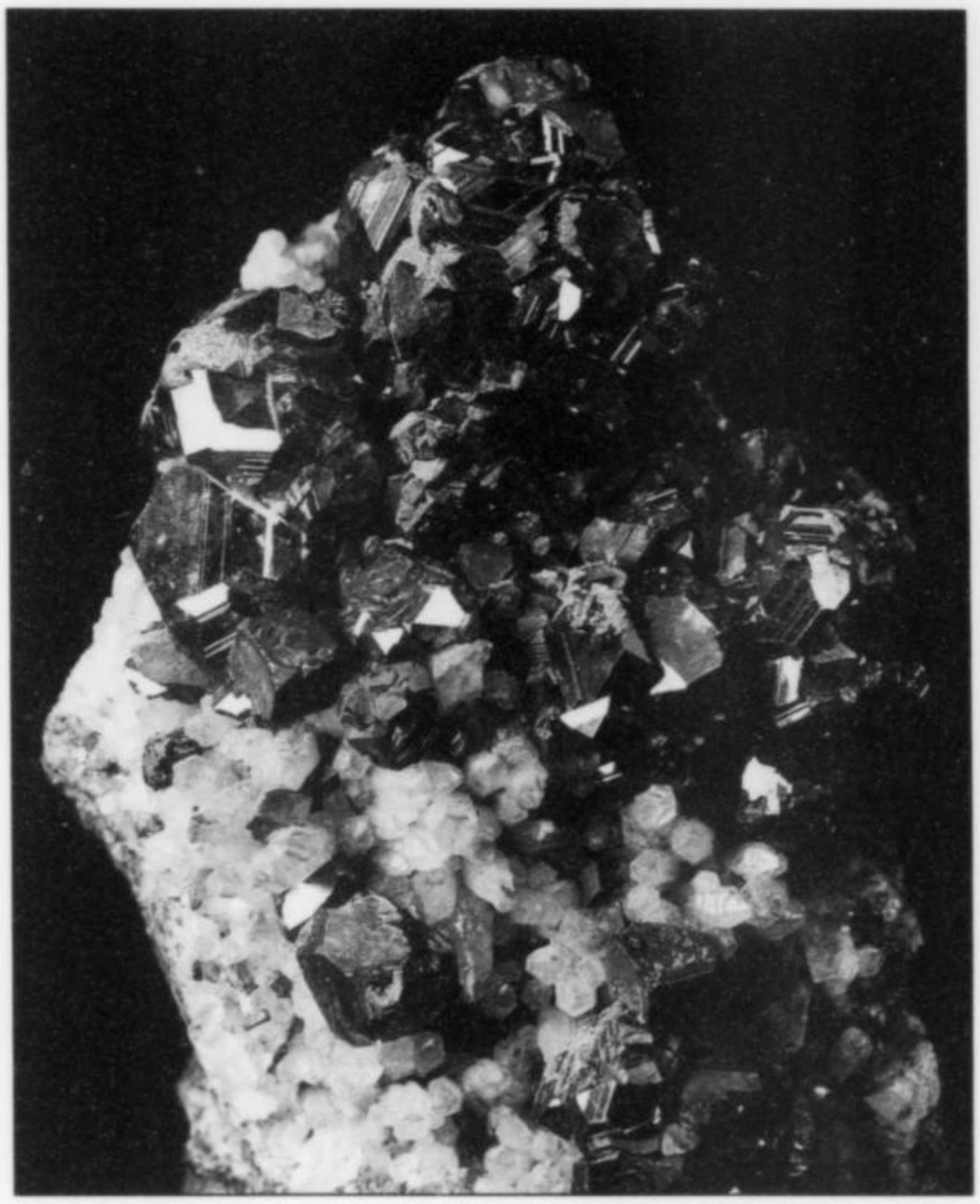


Figure 40. **Sphalerite, Przibram (?) or Schemnitz, Bohemia; 3 × 8 × 14 cm. An exceptionally fine example of the unusual pale green transparent variety of sphalerite known as "cleiophane," in crystals to 1.5 cm with small dull gray cubes of galena on quartz. Probably from the 6th Duke's collection.**

Figure 41. **Grossular to 6 mm and diopside to 1.5 cm from Val d'Ala, Piemont, Italy. The specimen (in its entirety 11 × 12 cm) is of unknown provenance, though there are remnants of what appears to be an auction catalog entry on the sawn base. Probably from the 6th Duke's collection.**

Catalog X: Unknown

There are many other fine pieces in the collection for which we have no matching documentation of any kind: a quite superb "cleiophane" **sphalerite** (possibly from Przibram in Bohemia) consisting of limpid olive-green crystals with **galena** on quartz (John White, the Smithsonian's ex-curator, on a visit in 2001, rated it the finest he had ever seen); several good North of England **fluorites** (all somewhat damaged unfortunately—and, judging by the cleanliness of the fracture surfaces, perhaps long after they were originally added to the collection); a fine and large Alston Moor **sphalerite**; two excellent botryoidal **chalcedony** specimens (one of which may be another purchase from the 1834 Heuland sale); and a highly unusual, thick **wire gold** on quartz with a cut-out label (probably from a 19th century mineral sale): "Green Ramose Native Gold, on Quartz with bunt Copper Ore, Olonetz." This must be from Olonets, some 200 km NE of St. Petersburg. An examination of 19th century sale catalogs might reveal its identity—though there are rather a lot of them . . .

Other than these notable items the collection also contains many "curiosities" such as medallions embedded in lava, probably obtained from one of the more active Mediterranean volcanoes such as Vesuvius, where there must have been a cottage industry making such things after each fresh outpouring of molten rock, as trinkets for the tourist trade; and a "petrified" egg (probably from one of the "Petrifying Wells" in Matlock Bath, Derbyshire). Our next task is the cataloging of these hundreds of additional items. There is still a way to go, and we are yet to make any inroads into the dozens of fossils in the collection. Who knows what other stories await discovery?

SUMMARY

The restoration of the Devonshire Collection has required a considerable effort on the part of Russell Society and other volunteers, and considerable patience and trust on the part of Chatsworth staff. It has proved well worth it. It is difficult to say

which has given us the more satisfaction: seeing Georgiana's collection rebuilt in its original arrangement; rediscovering Crichton's long-lost treasures; identifying a fine suite of specimens from the legendary Henry Heuland; finding enargite from Derbyshire or such a surprising array of fine material from the Gregory, Earl Ferrer's, and Ecton mines; or extending the range of White Watson's mineralogical and lapidary achievements. We trust that the collection will live on, and hope that it will continue to be used and appreciated by generations to come. As I write this, some of the collections rescued from obscurity are revealed in two displays at Chatsworth: one in the recently-established conference center and another in the room dedicated to Georgiana. The collection and the restoration project was featured in a Bazal Productions TV program in their acclaimed series on *Great Estates*—the first 10 minutes of fame for such a project on British television.[9] There are plans to include some of the finer pieces in a travelling exhibition of the *Treasures of Chatsworth* in the USA in the near future. After being overlooked for nearly a century the Devonshire Mineral Collections are back to stay, rare survivors from a fascinating era.

POSTSCRIPT: THE MINERAL COLLECTOR AND THE DUCHESS

In 1900, financier John Pierpont Morgan (1837–1913) purchased the finest collection of minerals ever made in America, that of Clarence Sweet Bement (1843–1923), and donated it to the American Museum of Natural History, New York, where the Morgan Hall of Gems and Minerals displays some of the finest specimens from this remarkable act of generosity. Morgan is more widely known as an art collector, a passion that links his name once more to mineralogy—albeit unwittingly. In about 1785 Georgiana's portrait was painted by Britain's foremost society painter, Thomas Gainsborough. The beautiful and coquettish face is said not to be a good physical likeness, but the amused eyes and enigmatic smile are as captivating as the living Georgiana must have been. For some years the portrait hung at Chatsworth and then disappeared. In 1841 it was rediscovered by an art dealer, who purchased it for £56 and sold it to the art collector Wynn Ellis. After Ellis's death in 1875 the painting was put up for auction in London where it created a sensation. When the auction came, the bidding was frantic and the Duchess was quickly knocked down to the art dealer Thomas Agnew for 10,000 guineas, then the highest price ever paid at auction for a portrait. Agnew gave her pride of place in his gallery where she was a huge hit with the public and press. Among the myriad visitors was the American banker Junius Morgan, who offered $50,000 for her as a present to his son John Pierpont Morgan. But before he could collect his prize the painting was acquired by another American admirer, Adam Worth, an eminent international thief and conman (the inspiration for Conan Doyle's arch-criminal Moriarty), who stole the portrait from the gallery on 25 May 1876. He originally intended ransoming the picture to bail out his brother, a less efficient criminal then in a London jail, but this became unnecessary when the brother was released on a technicality. But far from carrying through the ransom, Worth fell in love with the Duchess, and for several subsequent decades she accompanied Worth on his highly successful criminal travels around the globe. In 1893 he slipped up and was jailed in Belgium for 5 years. After this salutary experience he was a broken man and even his beloved Duchess could not console him. Anticipating his end, he decided to give her back. With US detective William Pinkerton as go-between, a deal was struck, and the painting was handed over to Thomas Agnew's son in a Chicago hotel room in 1901. On his triumphant return to London Agnew was contacted by Pierpont Morgan, willing to pay anything to have "his" painting. The price he paid was kept secret—Morgan considered he would be thought "lunatic" if it got out. We now know it was £30,000. He too jealously kept the Duchess to himself for the rest of his life. She was handed down through the family for generations until in 1994 she came back to England to be auctioned at Sotheby's. She was bought by the Chatsworth Trustees and returned at last to Chatsworth House. (See MacIntyre, 1994 for a fuller account of this fascinating tale.)

[9] Some viewers of this program may have been surprised to see the author explaining how the minerals in the collection range in quality from "masses and masses of very samey, rather nondescript pieces" to a "fantastic" piece of Blue John which he is seen turning reverently in his hands. The fact that Blue John is rarely "fantastic" and that the piece in question is mind-cripplingly nondescript will not have escaped their notice. In fact what I had pointed out at the other end of the mineralogical spectrum were the "fantastic" specimens of galena and fluorite from the Gregory mine described here. Truly mouth-watering pieces. Bazal had noted the connection between fluorite and Blue John, snipped out the middle part of my original statement, stitched it together seamlessly along with video of me holding a lump of this Derbyshire speciality from another take, and assumed it all made the same sense as my original intent. A series of outraged e-mails later, a promise to re-edit the program for future broadcasts was elicited along with an apology for ruining my credibility . . .

ACKNOWLEDGMENTS

Special thanks must go to the memory His Grace the late (11th) Duke of Devonshire (1920–2004) and Her Grace the Dowager Duchess of Devonshire for allowing us the freedom to work on the collection, and to the staff of Chatsworth, particularly Peter Day and Charles Noble, for their trust and support. The efforts of regular volunteers Franz Werner, Frank and Margaret Ince, Neil Hubbard, John Cooper, Catherine Foley and Keith Hughes are key to the project. Mike Bayley, Tony Brittain, Franz Werner, Phil Jackman and the author entered data from the Watson and other catalogs into various database applications which were then converted to Microsoft Access. Thanks to Wendell Wilson, Bob Symes, John Appleby (Alexander Crichton's most recent biographer), Trevor Ford, Renato Pagano, John Jones, Wendy Cawthorne of the Geological Society of London, and Amanda Foreman for supplying useful information; to Chris Stanley for help and advice, to Monica Price for access to the collections of the Oxford University Museum of Natural History, and to the late Mike Rothwell and to Franz Werner for translations from German. Sara Russell and Monica Grady of the Department of Mineralogy, Natural History Museum, London provided useful information on the Siena meteorite shower for the story of the "Stone which fell from the Clouds." The patience of Ian Fraser-Martin, the Chatsworth staff photographer, deserves the highest praise as we chased ideal images of several of the collection's finest treasures. Peter Day, Franz Werner, and Hugh Torrens made penetrating observations on the draft and I thank them for their compensations for my editorial and historical shortcomings. The work was substantially improved by myriad suggestions from Hugh Torrens' encyclopedic store of knowledge, and by the thoughtful editing of Wendell Wilson and Thomas Moore. Any remaining inaccuracies and ambiguities are mine alone.

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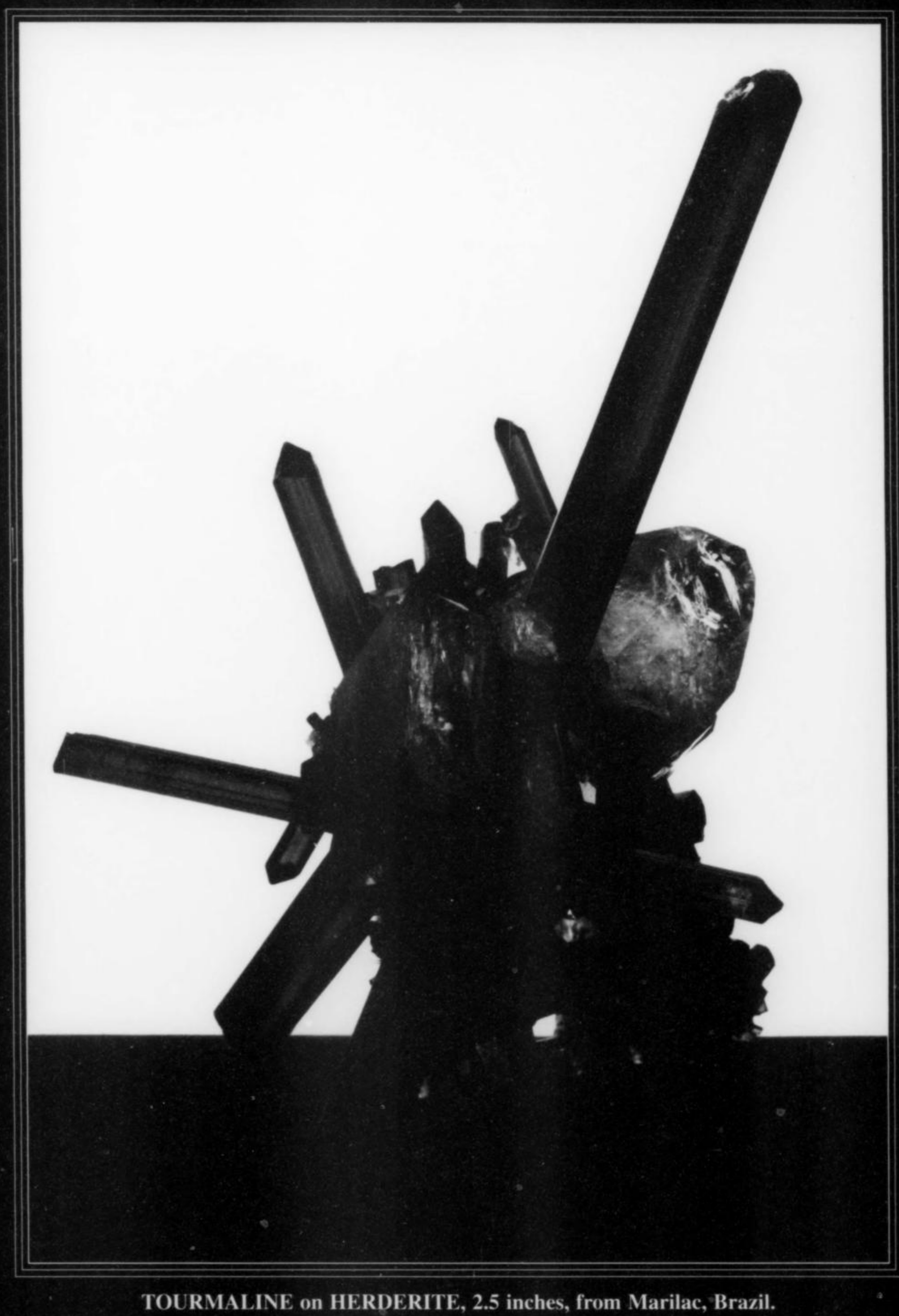

TOURMALINE on HERDERITE, 2.5 inches, from Marilac, Brazil.
From Kieth Proctor in April 1991; Alvaro Lucio to Richard Kosnar.
Collection to Proctor Collection. Received the Pearl Prize 1994.

Clara and Steve Smale

COLLECTORS

PHOTO BY STEVE SMALE

TUPERSSUATSIAITE

from

THE BORTOLAN QUARRY
POÇOS DE CALDAS, MINAS GERAIS, BRAZIL

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INTRODUCTION

Tuperssuatsiaite was originally described from three localities within the Ilímaussaq alkaline intrusion, South Greenland: at the Tuperssuatsiait Bay, at Kangerdluarssuk, and in the north shore of the fjord Tunugdliarflik (Karup-Møller and Petersen 1984). A second occurrence was reported from the Aris phonolite, Windhoek, Namibia (von Knorring *et al.,* 1992). Tuperssuatsiaite was reported from Mont Saint-Hilaire (Wight and Chao 1995) but no mineralogical data were published. It was also described from the Saint-Amable sill, Verchéres, Québec, Canada (Horváth *et al.*, 1998). Tuperssuatsiaite (sometimes referred to as "a mineral similar to tuperssuatsiaite," due to uncertainties about its identification) was reported from Poços de Caldas, Minas Gerais, Brazil by several authors (Atencio *et al.*, 1996; Tsugawa and Atencio, 1997; Horváth *et al.*, 1998; Matioli *et al.*, 1998; and Atencio *et al.,* 1999); the first preliminary data were published by Coutinho and Vlach (2002). A full description is presented here.

OCCURRENCE

Tuperssuatsiaite occurs in the abandoned Bortolan tinguaite quarry, about 8 km west of the center of Poços de Caldas city, within the geological domain of the Poços de Caldas alkaline complex (Fig. 1). The name *tinguaite* is applied to a dark green intrusive phonolite composed essentially of alkali feldspar, nepheline and aegirine, and characterized by the so-called "tinguaitic" texture. It is the dominant lithology present in a topographically prominent ring structure that bounds the Poços de Caldas complex. The relationships among the different rocks that comprise the intrusion have been repeatedly discussed since the pioneer geological (Ellert 1959) and mapping (Ellert *et al.*, 1959) studies. For background information on the geology and mineralogy of the Poços de Caldas area, see Schorscher and Shea (1992) and Ulbrich and Ulbrich (1992). Descriptions of rare minerals found in cavities or in the matrix of agpaitic rocks of the complex have also been published (Matioli and Atencio, 1994; Matioli *et al.,* 1994, 1998; Atencio *et al.,* 1996, 1997, 1999, 2000; Tsugawa and Atencio, 1997; Gualda and Vlach, 1998a, 1998b).

Tuperssuatsiaite from Poços de Caldas occurs inside and in the immediate vicinity of miaroles in the tinguaite. These cavities are of elongated irregular shape and vary from a few centimeters to 10 or 20 centimeters and may be bounded by 1-cm-thick aureoles of darker tinguaite.

Tuperssuatsiaite occurs as fibers and needles 1 to 4 μm thick, and up to 3 mm wide, isolated or more commonly amassed in rosettes, tufts and shapeless aggregates. The color of the crystals is copper-red-brown or orange-brown and the luster is vitreous. Tuperssuatsiaite aggregates exhibit a dull pinkish brown hue. Inside miaroles, the mineral lies over or fills spaces between well developed, turbid white {010} plates of Na-K-feldspar, translucent gray natrolite prisms, black aegirine prisms, and pale brownish yellow elongated hainite prisms (Figs. 2 to 7).

Divergent needles of pectolite are also commonly seen growing on the surface of the same minerals. Other sporadic miarolitic constituents include eudialyte, villiaumite, fluorapophyllite, calcite, biotite, fluorite and analcime. Four unidentified minerals have been found in a thin section close to a cavity wall and are now under investigation.

The platy feldspar seen in the miaroles is actually microcline (as shown by its indices of refraction) with multiple "chess-board" twinning. The common feldspar of the host tinguaite is, on the other hand, a clean untwinned orthoclase. This fact suggests that a

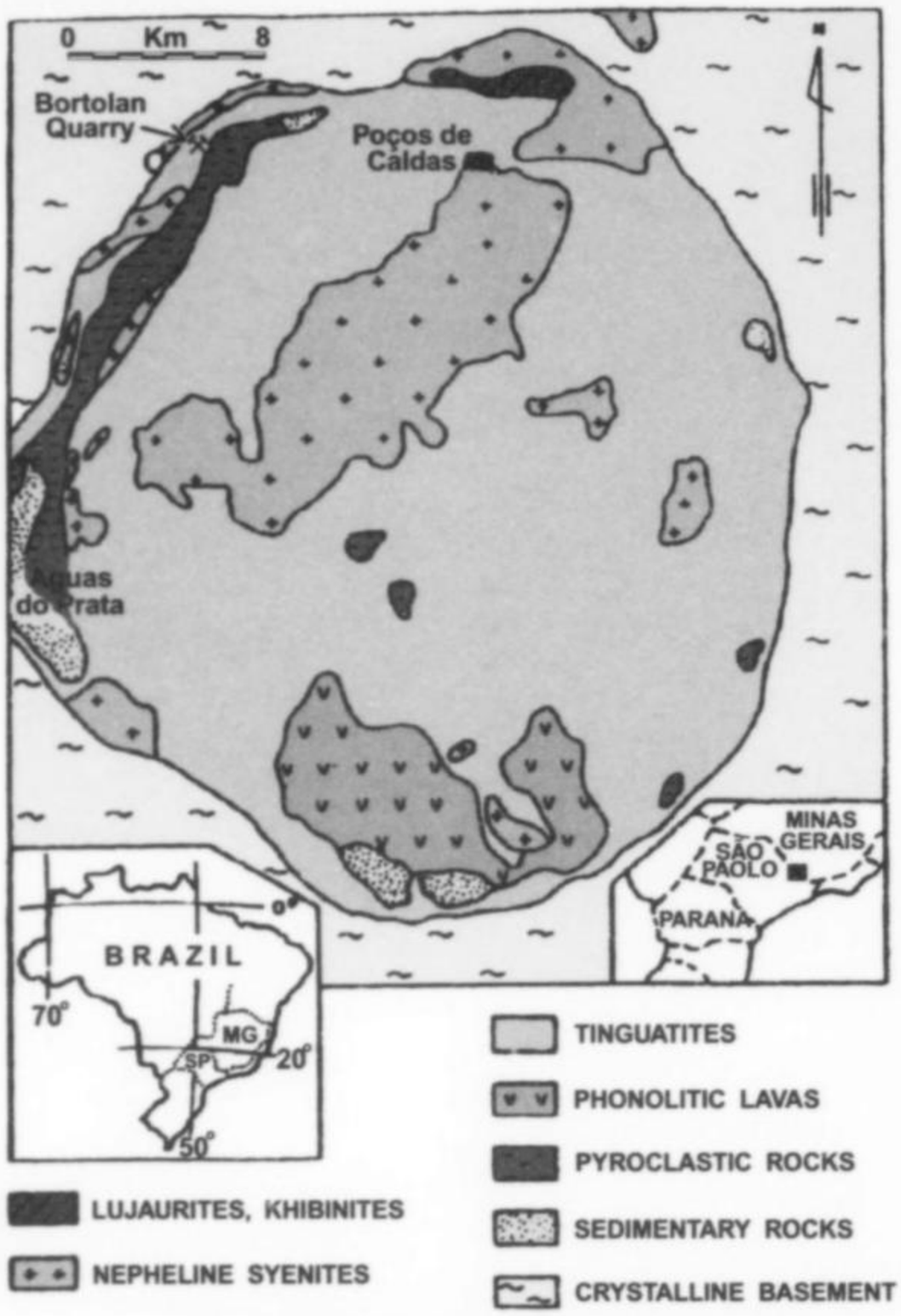

Figure 1. **Simplified geological map of Poços de Caldas, Minas Gerais. Modified from Ellert *et al.* (1959) by Ulbrich (1983).**

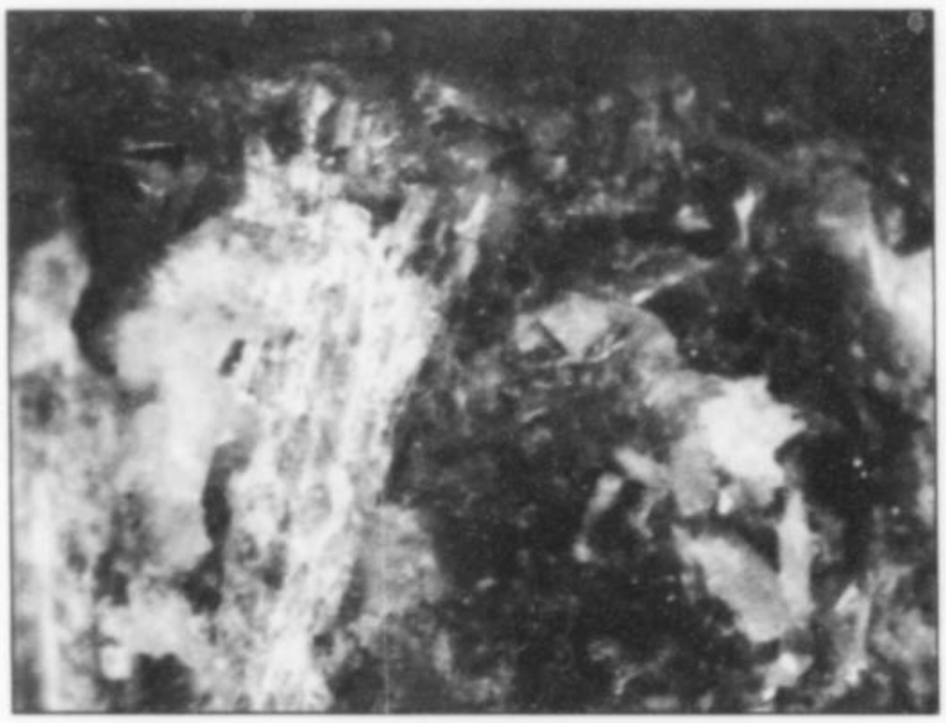

Figure 2. **Tupperssuatsiaite (brown) and hainite (pale brownish-yellow) from Poços de Caldas.**

comparatively low temperature was necessary for the formation of the "chess-board" twinning in the miarolitic microcline.

OPTICAL PROPERTIES

Optical data for tuperssuatsiaite were determined in white light. The mineral is biaxial positive. The width of tuperssuatsiaite needles is exceedingly small for accurate optical determination. It was, however, possible to measure indices of refraction to the third decimal. Table 1 shows the results in comparison to other optical data from the literature.

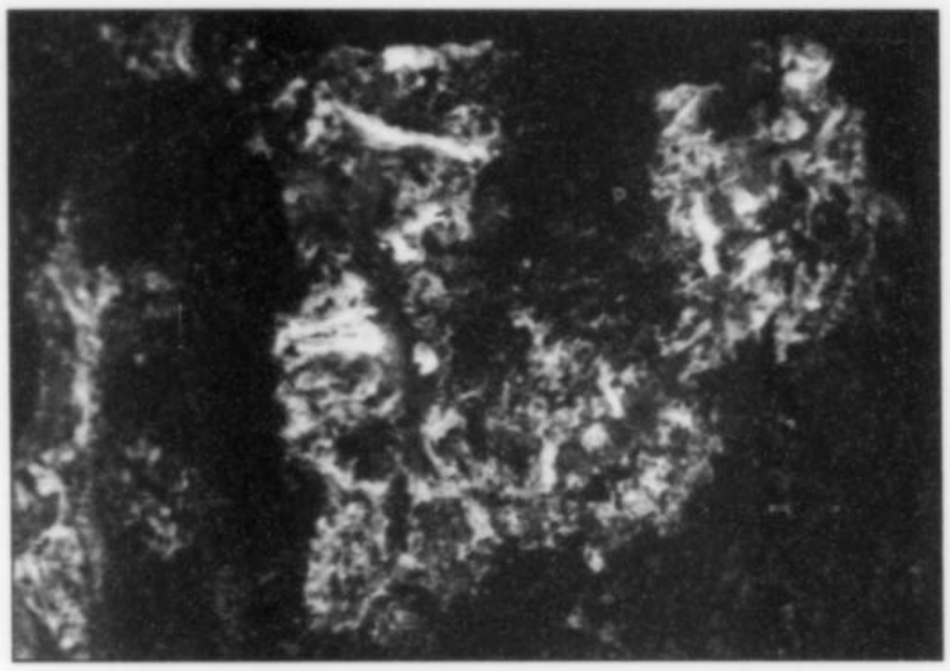

Figure 3. **Tupperssuatsiaite (brown) and hainite (pale brownish-yellow) containing miarolitic cavities in tinguaite from Poços de Caldas.**

Figure 4. **Tuperssuatsiaite from Poços de Caldas.**

Figure 5. **Tuperssuatsiaite from Poços de Caldas.**

Tuperssuatsiaite from Poços de Caldas has higher indices of refraction and much higher birefringence than the samples from Greenland and Namibia, probably due to its higher Fe content.

CHEMISTRY

Electron probe microanalysis data for tuperssuatsiaite (wavelength-dispersion mode) are presented in Table 2. The chemical analyses were carried out at the Instituto de Geociências of the Universidade de São Paulo using a JEOL JXA-8600 electron probe microanalyzer and a Noran system for automation and data reduction. Tuperssuatsiaite crystals were embedded in epoxy resin and polished. The crystals were analyzed under an excitation voltage of

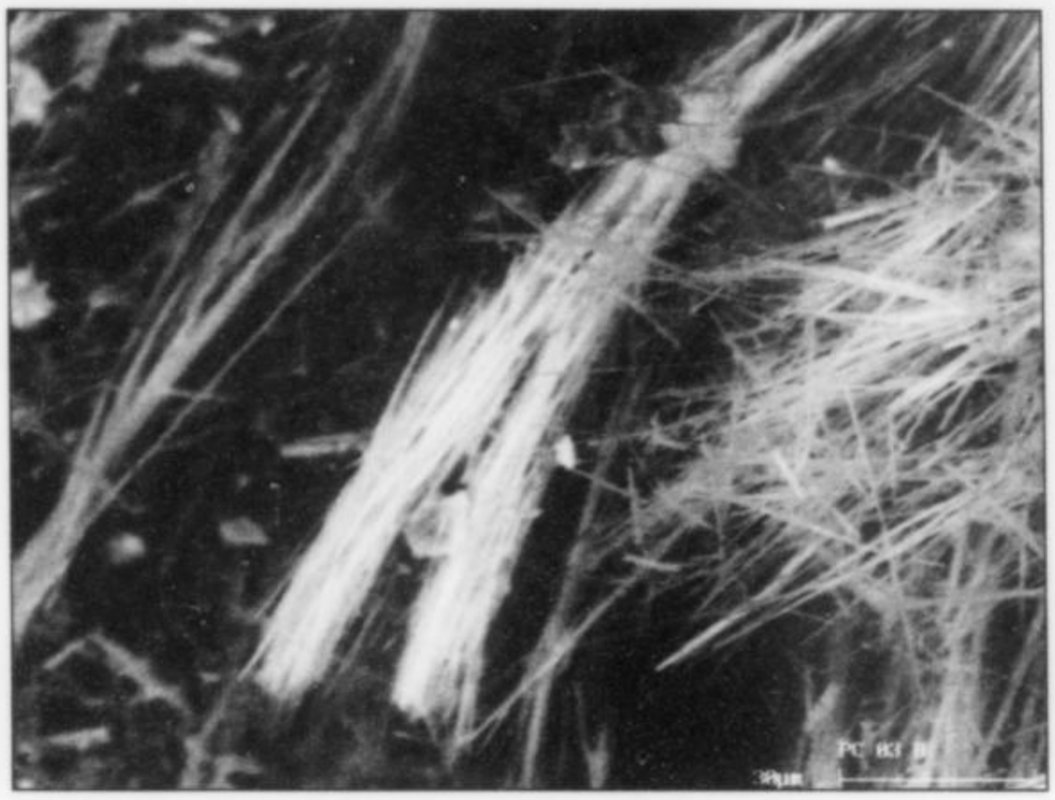

Figure 6. **Tuperssuatsiaite backscattered electron images.**

Figure 7. **Tuperssuatsiaite backscattered electron images.**

Table 1. **Optical properties for tuperssuatsiaite.**

	1	*2*	*3*	*4*
α	1.54	1.5388(5)	1.556(5)	1.548(5)
β	1.56	1.5596(5)	1.565(5)	1.560(5)
γ	1.58	1.595(1)	1.662(3)	1.648(3)
birefringence	0.04	0.056	0.106	0.100
$2V_{x\ obs.}$(°)	large	76.5(1.5)	medium	medium
$2V_{x\ calc.}$(°)	90	+76.4	+35.5	+42.3
X	Parallel to a, colorless	X a = 20 to 22° in the obtuse angle β, colorless	Normal to c axis, colorless	Normal to c axis, colorless
Y	Parallel to b, colorless	Y = b, very light reddish brown	Normal to c axis, light green	Normal to c axis, light green
Z	Parallel to c, pale yellow brown	Z c = 5 to 7° in the acute angle β, dark reddish brown	Parallel to c axis, red-brown	Parallel to c axis, red-brown

1. Ilímaussaq intrusion, South Greenland (Karup-Møller and Petersen, 1984, von Knorring *et al.,* 1992).
2. Aris phonolite, Windhoek, Namibia (von Knorring *et al.,* 1992).
3. and 4. Bortolan quarry, Poços de Caldas, Minas Gerais, Brazil. Crystals from two cavities (this paper).

15kV and a beam current of 20nA. Quantitative point analyses were made with a 1μm diameter beam. Matrix corrections were made with the PROZA program, as provided by Noran. Standards and elements lines were as follows: magnesian manganoan fayalite (Si*K*α, Mg*K*α, Mn*K*α, and Fe*K*α), synthetic anorthite (Al*K*α and Ca*K*α), rutile (Ti*K*α), synthetic ZnO (Zn*K*α), Amelia albite (Na*K*α), and microcline (K*K*α). Fe^{2+} and Fe^{3+} were discriminated by determination of FeO in 2.5 g of an almost pure tuperssuatsiaite sample hand-picked under 36X magnification of a binocular microscope. A modified Wilson method (Andrade *et al.*, 2002) was applied at the Laboratório de Química e ICP do Instituto de Geociências, Universidade de São Paulo. Back-titration with potassium dichromate and an Fe^{2+} and ammonium sulfate solution was used, after dissolution of the sample powder in a heated HF/H_3PO_4 mixture and ammonium vanadate. The H_2O content could not be determined owing to insufficient amount of pure material. It was therefore calculated by difference.

Empirical formulae for tuperssuatsiaite are shown in Table 3. The ideal formula of tuperssuatsiaite varies from $NaFe^{3+}_3[Si_8O_{20}](OH)_2 \cdot 8H_2O$ to $Na_2Fe^{3+}_{2.67}[Si_8O_{20}](OH)_2 \cdot 8H_2O$, that is, it can be expressed as $Na_{1+x}Fe^{3+}_{3-(x/3)}[Si_8O_{20}](OH)_2 \cdot 8H_2O$, where $0 < x < 1$. The formula is modified by the presence of K, Ca, Mn, Zn, Fe^{2+}, Mg, Al, Ti, Cl and F. H_2O is also highly variable; four of the eight H_2O molecules in the formula are of zeolitic nature. Palygorskite—$Mg_2Al_2[Si_8O_{20}](OH)_2 \cdot 8H_2O$—and yofortierite—$Mn_5[Si_8O_{20}](OH)_2 \cdot 8H_2O$ (Perrault *et al.,* 1975)—are isostructural with tuperssuatsiaite. Sample 3 (Tables 2 and 3) is clearly a different unnamed zinc species and deserves further studies. The "yofortierite" from the Saint-Amable sill described by Horváth *et al.* (1998), with Fe > Mn, seems also to be a new species. Na was sought but not detected in their analysis; therefore it is not tuperssuatsiaite.

CRYSTALLOGRAPHY

Tuperssuatsiaite is monoclinic, space group *C*2/*m*. X-ray powder diffraction data for tuperssuatsiaite from Poços de Caldas (Table 5) were obtained using a Siemens D5000 diffractometer equipped with Göbel mirror and position-sensitive detector using CuKα radiation and 40kV and 40mA at Instituto de Geociências of the Universidade de São Paulo. The pattern was indexed using the crystal structure data obtained by Cámara *et al.* (2002). Unit-cell

Table 2. **Chemical composition of tuperssuatsiaite (wt. %). Electron-microprobe data (wavelength-dispersion mode).**

	1#	*2#*	*3#*	*4#*	*5*	*6*	*7*
Na_2O	3.23	3.80	3.40	6.70	6.70	2.43	4.26
K_2O	0.78	0.31	0.14	0.07	0.15	0.56	0.77
CaO				0.11	0.04	0.94	0.12
Fe_2O_3	20.63*	19.77*	13.14*	26.26*	19.84*	19.67*	25.45
FeO							0.50
MnO	5.31	6.01	2.86	0.66	3.94	4.83	0.43
ZnO	0.81	0.71	20.58	0.11			0.23
MgO	1.04			0.18	0.09	0.16	0.15
SiO_2	56.38	56.62	41.35	55.72	56.00	55.97	55.13
Al_2O_3	0.47	0.60	4.08	0.15	0.17	1.22	0.33
TiO_2				0.18	1.33	0.38	
H_2O**	[11.35]	[12.18]	[14.45]	[9.71]	[11.61]	[13.84]	[12.63]
Cl				0.13	0.02		
F				0.09	0.19		
O=Cl, F				−0.07	−0.08		
Sum	[100.00]	[100.00]	[100.00]	[100.00]	[100.00]	[100.00]	[100.00]

original analysis given as elements, here recalculated to oxides.
* all Fe calculated as Fe^{3+}.
** calculated by difference.

1. Tuperssuatsiait Bay, Ilímaussaq intrusion, South Greenland (Karup-Møller and Petersen, 1984), average of seven analysis.
2. North shore of the fjord Tunugdliarflik, Ilímaussaq intrusion, South Greenland, average of the first nine analysis by Karup-Møller and Petersen (1984).
3. North shore of the fjord Tunugdliarflik, Ilímaussaq intrusion, South Greenland, average of the last four analysis by Karup-Møller and Petersen (1984).
4. Aris phonolite, Windhoek, Namibia (von Knorring *et al.,* 1992), average of ten analysis.
5. Aris phonolite, Windhoek, Namibia (Cámara *et al.,* 2002), average of eleven analysis. Original data expressed to three places; Fe originally calculated as Fe^{2+}.
6. Saint-Amable sill, Verchéres, Québec, Canada (Horváth *et al.,* 1998).
7. Bortolan quarry, Poços de Caldas, Minas Gerais, Brazil (this paper), average of five analysis.

Table 3. **Empirical formulae for tuperssuatsiaite.**

1	$(Na_{0.88}K_{0.14})_{\Sigma 1.02}$	$(Fe^{3+}_{2.18}Mn_{0.63}Mg_{0.22}Zn_{0.08})_{\Sigma 3.11}$	$(Si_{7.92}Al_{0.08})_{\Sigma 8.00}$	$O_{20}(OH)_{1.34}\cdot 4.65H_2O$
2	$(Na_{1.03}K_{0.06})_{\Sigma 1.09}$	$(Fe^{3+}_{2.08}Mn_{0.71}Zn_{0.07})_{\Sigma 2.86}$	$(Si_{7.90}Al_{0.10})_{\Sigma 8.00}$	$O_{20}(OH)_{0.79}\cdot 5.27H_2O$
3	$(Na_{1.07}K_{0.03})_{\Sigma 1.10}$	$(Zn_{1.94}Fe^{3+}_{1.60}Mn_{0.39})_{\Sigma 3.93}$	$(Si_{6.70}Al_{0.78}Zn_{0.52})_{\Sigma 8.00}$	$O_{20}(OH)_{0.74}\cdot 7.44H_2O$
4	$(Na_{1.85}Ca_{0.02}K_{0.01})_{\Sigma 1.88}$	$(Fe^{3+}_{2.82}Mn_{0.08}Mg_{0.04}Zn_{0.01})_{\Sigma 2.95}$	$(Si_{7.95}Al_{0.03}Ti_{0.02})_{\Sigma 8.00}$	$O_{20}[(OH)_{1.34}O_{0.59}F_{0.04}Cl_{0.03}]_{\Sigma 2.00}\cdot 3.95H_2O$
5	$(Na_{1.82}K_{0.03}Ca_{0.01})_{\Sigma 1.86}$	$(Fe^{3+}_{2.09}Mn_{0.47}Mg_{0.02})_{\Sigma 2.58}$	$(Si_{7.83}Ti_{0.14}Al_{0.03})_{\Sigma 8.00}$	$O_{20}[(OH)_{1.01}F_{0.08}]_{\Sigma 1.09}\cdot 4.91H_2O$
6	$(Na_{0.65}Ca_{0.14}K_{0.10})_{\Sigma 0.89}$	$(Fe^{3+}_{2.05}Mn_{0.57}Mg_{0.03})_{\Sigma 2.65}$	$(Si_{7.76}Al_{0.20}Ti_{0.04})_{\Sigma 8.00}$	$O_{20}(OH)_{0.18}\cdot 6.32H_2O$
7	$(Na_{1.19}K_{0.14}Ca_{0.02})_{\Sigma 1.35}$	$(Fe^{3+}_{2.76}Fe^{2+}_{0.06}Mn_{0.05}Mg_{0.03}Zn_{0.02})_{\Sigma 2.92}$	$(Si_{7.94}Al_{0.06})_{\Sigma 8.00}$	$O_{20}(OH)_{1.91}\cdot 5.11H_2O$

1 to 7. See legend for Table 2.

Table 4. **Cell parameters for tuperssuatsiaite.**

	1	*2*	*3*	*4*	*5*
a(Å)	13.73(3)	13.99(3)	13.92(7)	14.034(7)	13.945(6)
b(Å)	18.00(1)	17.70(2)	17.73(5)	17.841(7)	17.93(1)
c(Å)	4.83(3)	5.31(1)	5.30(3)	5.265(2)	5.277(3)
β(°)	104.3(1)	104.54(1)	104.78(1)	103.67(4)	103.35(5)
V(Å^3)	1156.2	1272.7	1264.9	1280.9(9)	1283.8(7)

1. Tuperssuatsiait Bay, Ilímaussaq intrusion, South Greenland (Karup-Møller and Petersen, 1984; ICDD card 38-372).
2. Tuperssuatsiait Bay, Ilímaussaq intrusion, South Greenland (von Knorring *et al.,* 1992).
3. Aris phonolite, Windhoek, Namibia (von Knorring *et al.,* 1992).
4. Aris phonolite, Windhoek, Namibia (Cámara *et al.,* 2002).
5. Bortolan quarry, Poços de Caldas, Minas Gerais, Brazil (this paper).

Table 5. **X-ray powder diffraction data for tuperssuatsiaite from Poços de Caldas.**

$I_{obs.}$	$d_{obs.}$	$d_{calc.}$	h	k	l
100	10.804	10.819	1	1	0
9	8.957	8.965	0	2	0
1	6.750	6.784	2	0	0
1	5.454	5.470	1	3	0
6	5.386	5.410	2	2	0
13	4.473	4.482	0	4	0
1	4.126	4.122	−2	2	1
13	3.728	3.740	2	4	0
4	3.587	3.581	1	3	1
1	3.461	3.467	1	5	0
1	3.449	3.423	2	2	1
17	3.368	3.392	4	0	0
1	3.152	3.173	4	2	0
2	2.691	2.705	4	4	0
3	2.665	2.683	5	1	0
1	2.626	2.629	−3	5	1
1	2.506	2.513	−2	6	1
1	2.453	2.468	0	2	2
2	2.123	2.128	2	8	0
1	1.863	1.870	4	8	0
2	1.817	1.823	3	9	0
1	1.788	1.793	0	10	0
2	1.729	1.727	−7	5	1
2	1.614	1.617	−8	4	1
1	1.580	1.583	2	8	2
2	1.491	1.494	0	12	0
2	1.489	1.486	2	4	3
1	1.487	1.485	0	6	3

parameters are compared with those available for the other occurrences in Table 4. The *a:b:c* ratio for the unit-cell parameters is 0.7777:1:0.2943. The calculated density is 2.239 g/cm^3.

Calculations using the Gladstone-Dale relationship were performed for the chemical data, the calculated density and the recorded indices of refraction of the Poços de Caldas tuperssuatsiaite. A total of 26 O corresponds to the ideal formula with 4 H_2O, but the mineral can have 4 to 8 H_2O; 4 H_2O are of zeolitic nature. We have calculated the formula for 8 (Si + Al), wherein the O content is 27.02 apfu, and H_2O is 5.11. These calculations yelded K_C = 0.2508 and K_P = 0.2654 (for the optical data of the first cavity crystal) or 0.2614 (second cavity crystal). Hence 1-(K_P/K_C) is –0.059 in the first case and –0.042 in the second case. In both cases, the compatibility is rated good, according to Mandarino (1979).

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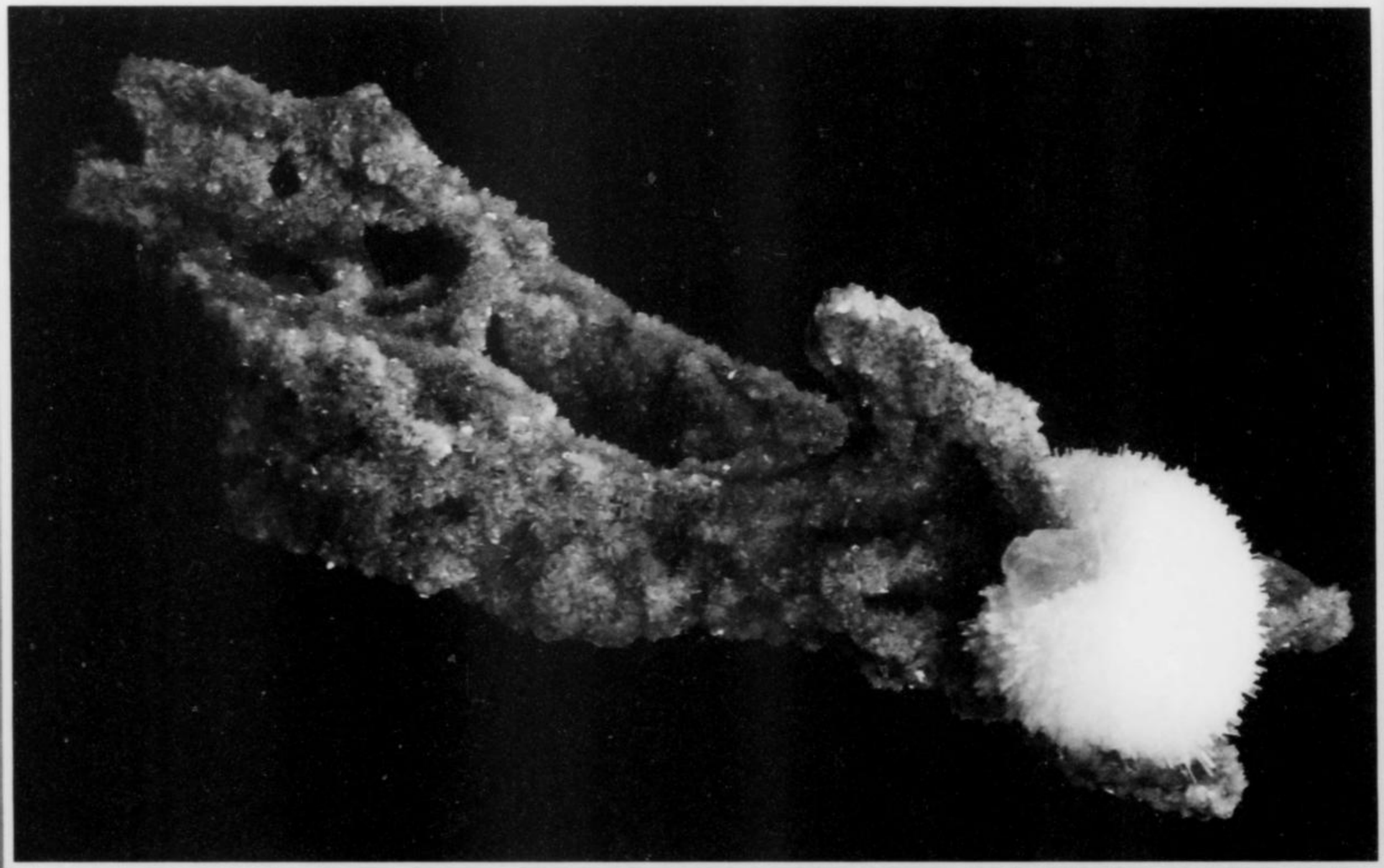

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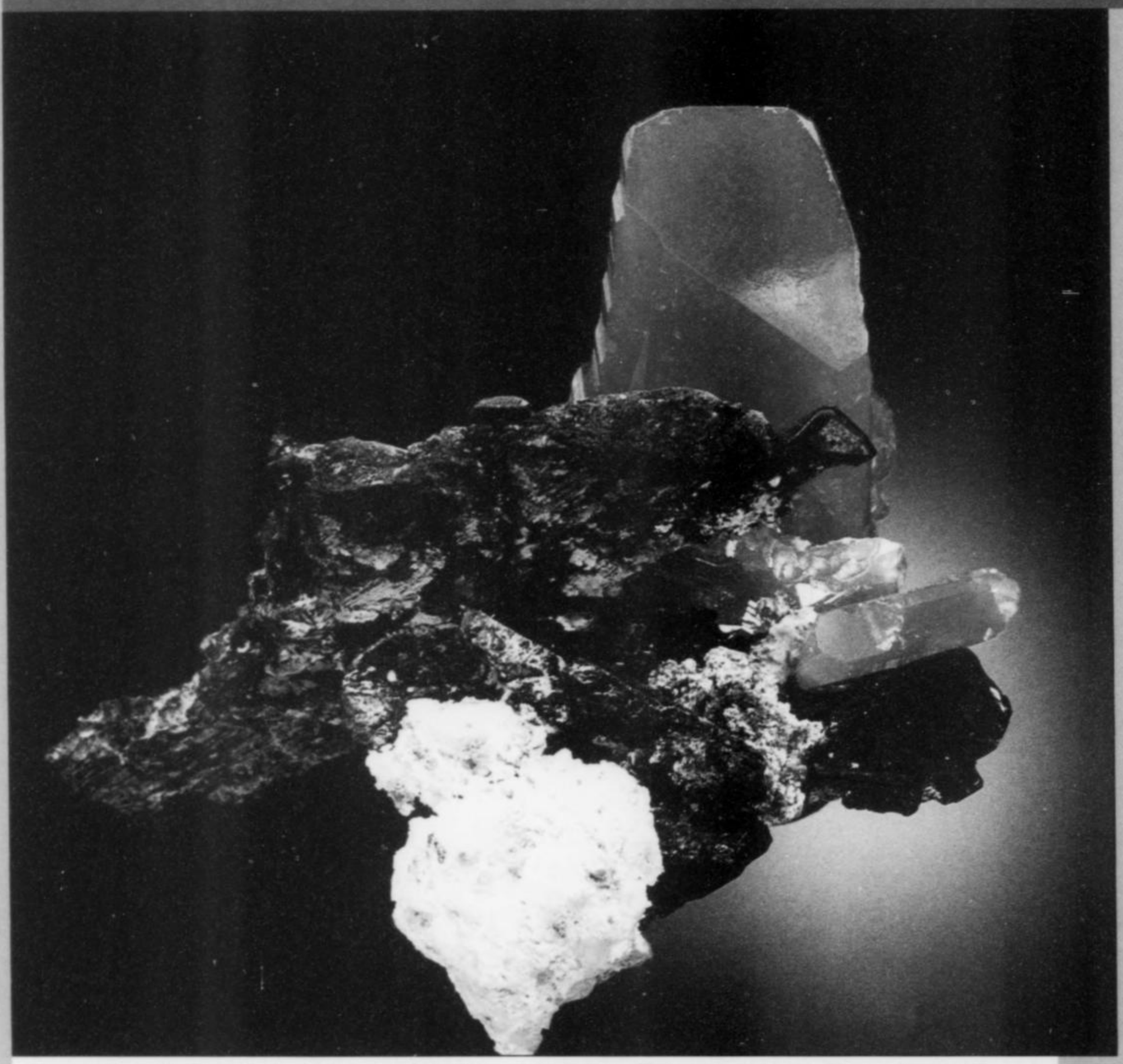

Cerussite with Cuprite inclusions, Malachite and Azurite,Tsumeb, 4.6 cm. Photo by Jeff Scovil.

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What's New in Minerals

Tucson Show 2005

by Tom Moore

[January 29–February 13, 2005]

Marty Zinn's *Arizona Mineral & Fossil Show* had "changed its spots," as the ads said, and relocated to two new venues (The Clarion and the Smuggler's Inn, besides the usual InnSuites). Nevertheless, the Tucson Show this year was the same lavish collectors' experience—the same rich banquet, with mineralogically gorged appetites and annihilated budgets for all—that it has always been. Although traveling between the three hotel shows involved at least half an hour's immersion in wild-western Tucson traffic (with many potholes on Broadway and Speedway, thanks to this year's atypical rainy spells), no one's enthusiasm seemed dampened. Yes, there was some offhand grousing about the logistics, but business volume remained quite high.

Indeed, most of the dealers in the Smuggler's Inn, while on the one hand referring to it as "Siberia," also expressed delight with its idyllic courtyard, orange trees and zen-like winding walkways. By the end of the show they were quite satisfied with the business they had done there. The Clarion (where the *Mineralogical Record* table was) sufficed nicely as the successor to Marty's Executive Inn show once one learned to navigate the new, somewhat more complex downstairs layout. As for the Executive Inn itself, it is now the site of a small but busy non-Zinn mineral show, which managed to yield an item or two for this report. The word on the street is that enough dealers have signed up there for next year to fill the bottom floor as Marty had.

The InnSuites remains the same beautiful and busy site it has been for several years now, and the place where the majority of Marty's high-end dealers hung out. In short, this spot-changing business seems not to have harmed the Arizona Mineral & Fossil Show in any significant way. It is possible that Marty may tweak it a bit, or even make some further strategic changes next year, but the show remains robust, lively and fun for everyone, potholes notwithstanding.

Then there was Dave Waisman's Westward Look Show, located in the Westward Look Resort on Tucson's north fringe, where about 20 more high-end dealers held court in small but elegant hotel rooms. This show is also doing very well, and will continue to expand. The only unavoidable problem here was that the fine exhibit of copper minerals from Les Presmyk's collection had to be set up in the hotel lobby, far from the dealer rooms and well out of the traffic flow.

There was also the "funky row" (as I call it) of gem/lapidary/fossil/mystical crystal shows in the hotels and tents along I-10 on the western edge of town. And of course, in the final weekend, there was the great buzzing circus/museum/bazaar of the "Main Show" at the Convention Center, where China was the theme, and where at our stand we sold copies of our first China Special Issue (Jan.-Feb. 2005) faster than steaming bowls of lo mein in a hungry village. And in all of these venues there were plenty of new worldwide minerals to be seen . . .

The last active copper mining at Bisbee, Cochise County, Arizona ceased during the 1970's, but even though this great locality is long past its specimen-producing heyday, about 20 flats of fine **calcite/aragonite** specimens were taken from the old workings of the Southwest mine last fall, and many of these flats were brought to Tucson by Rocko Rosenblatt of *Rocko Minerals & Jewelry* (rocko@catskill.net). Snow-white spheres of calcite to 2.5 cm in diameter blanket limestone matrix, and encircling the tops of the spheres are sprays of colorless acicular aragonite crystals, with individuals to 3 cm long. These are miniature to 35-cm-wide specimens, some stained green by malachite, others lightly spotted by vivid green "primary" malachite microcrystals.

One of the capital cities of western American mining history and lore is the Comstock Lode, Virginia City, Nevada, where in the mid-1800's Mark Twain sat out the Civil War, and where, in following decades, the richest of all known American silver deposits was exploited. Wondrous must have been the specimens of wire silver, stephanite, acanthite, etc., which disappeared into the smelter—good specimens of anything from the Comstock Lode are exceedingly rare today. However, in the fall of 2003 and spring of 2004 a collecting group visited the old Gold Hill tunnel workings (a claim at the edge of the Comstock, never actively mined) and took out about 200 **amethyst** specimens ranging from small-miniature to small-cabinet size. Color-zoned, transparent quartz crystals, from very pale purple near their surfaces to nearly colorless at their cores, reach 1.5 cm individually, and form pleasant-looking clusters on massive milky quartz. Although not top-quality amethyst (like the new material from Georgia, coming up shortly), these specimens make fine "locality" pieces anyway. They were to be seen with George Witters at the Main Show stand of *Silver Scepter Minerals* (P.O. Box 3025, Kirkland, WA 98083).

Also in Nevada, Scott Kleine last November dug about 250 crystals of **quartz with stibnite inclusions** at the Bottomley prospect, Pershing County, and he had many of these at the dealership of *Miner's Lunchbox* in the InnSuites. Very thin, very black stibnite crystals to 1 cm are visible inside the colorless, transparent, lustrous crystals of quartz, which reach 3 cm and occur as loners or floater clusters. And from one narrow zone in the presently active Round Mountain gold mine, Nye County, Nevada, some very good **gold** specimens have recently come: lustrous, dark yellow, cubic gold microcrystals in interlocked leaves and herringbone formations which stand and branch up from chalky white massive quartz, in specimens measuring from 3 to 10 cm. These were to be found at the Clarion with *Lehigh Minerals* (jim@lehighminerals.com) and at the *Miner's Lunchbox* outpost at the Westward Look show.

Doug Wallace of *Mineral Search* (P.O. Box 1585, Little Elm, TX 75068) has also lately struck **gold**: last summer and fall, in the

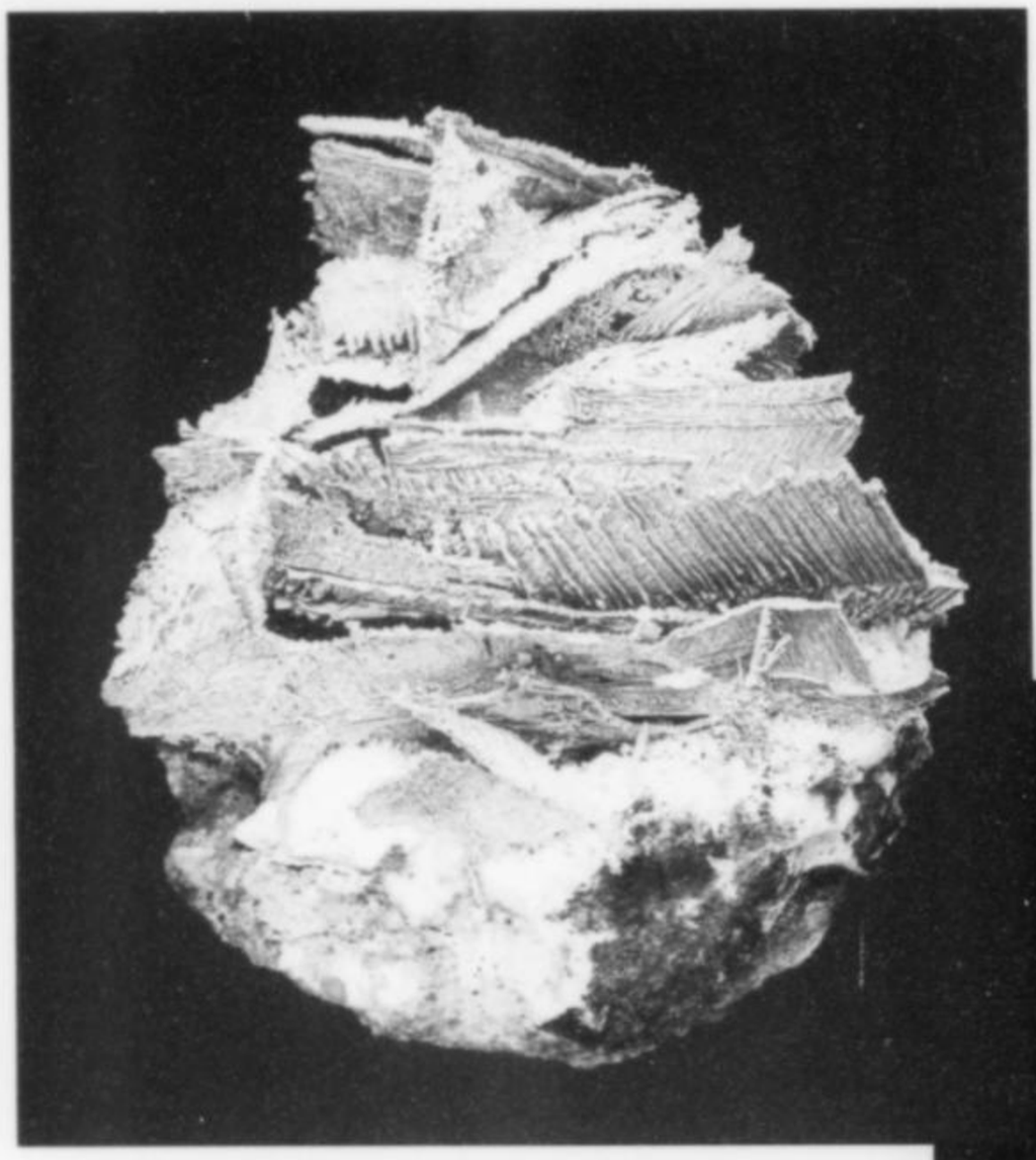


Figure 1. **Gold, 6.8 cm, from Round Mountain, Nye County, Nevada. *Miner's Lunchbox* specimen; Jeff Scovil photo.**

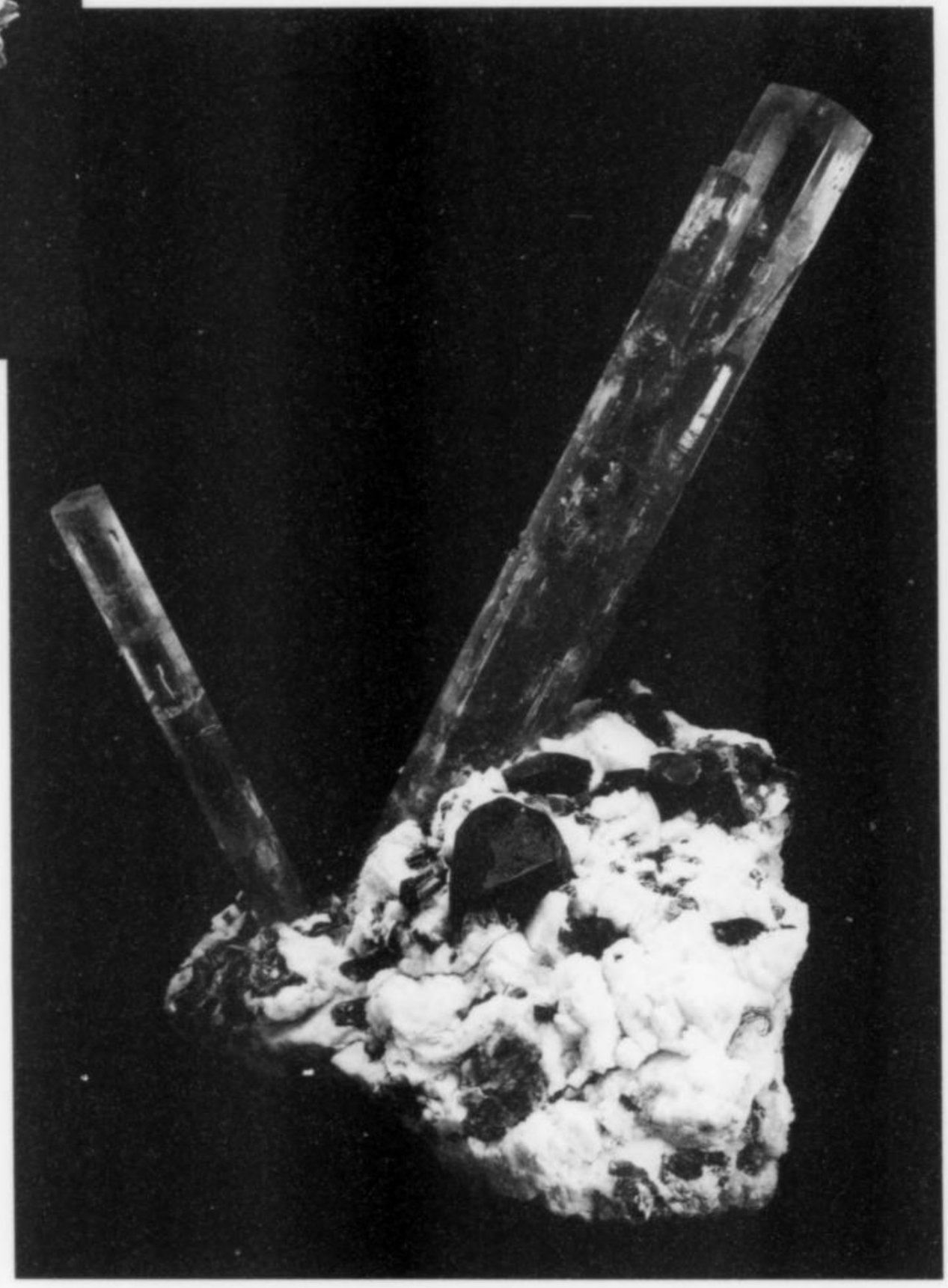


***Figure 2.* Aquamarine beryl crystals to 16.8 cm, on matrix, from Mount Anero, Chaffee County, Colorada. *Collector's Edge* specimen; Jeff Scovil photo.**

Prescott vein of the old Badger mine, Mariposa County, California, Doug and his partner Bill Forrest dug about 150 pounds of gold-laced, massive milky quartz, then carved out some promising little specimens. The leafy microcrystal gold aggregates, reaching 1 cm, stand up smartly from matrix in about 100 thumbnails which were on view in the Clarion ballroom.

As I reported from Denver last fall, the workings of the now-inactive Sioux Ajax mine, Mammoth, Tintic district, Eureka County, Utah yielded a large number of pretty **aragonite** specimens to collectors in mid-2004. In Tucson, at the Clarion, *Lehigh Minerals* offered about 100 sparkling thumbnail, miniature and small-cabinet specimens, with very white, isolated to clustered spheres, and some stalk-like growths, from which protrude delicate whiskers and radial sprays (to 1.5 cm) of colorless acicular aragonite crystals.

As we leave the American West in the sunset behind us, we pause for a notice of one major, indeed spectacular, recent discovery. Mt. Antero, Chaffee County, Colorado has long been famous for the gemmy crystals of **aquamarine beryl** that collectors have found for decades in pegmatite pockets along the mountainside, but in 2004 a single pocket gave up just five pieces which arguably are the finest aquamarine specimens ever found in North America. These matrix pieces are presently owned by the *Collector's Edge* dealership, who put three of them on display at the Main Show, so that Colorado collectors (especially) could have a shock-and-awe viewing experience. On the largest specimen, a sharp, lustrous, largely gemmy, deeply aqua-blue hexagonal prism of aquamarine measuring 2.5 × 2.5 × *16.8* cm rises from a matrix of white subhedral microline crystals, sharp muscovite books and very dark smoky quartz crystals, the latter to 8 cm. The other four specimens, while smaller, are just as dramatic, having aquamarine prisms averaging around 10 cm standing at various angles on the same pegmatitic matrix; all of the prisms are gemmy or part-gemmy, and all are of a much deeper blue than the general run of aquamarine crystals from Pakistan. Yes, these specimens are "reconstructed" from crystals and matrix pieces originally found lying loose in the pockets. But as in the case of, say, the Alma King rhodochrosite, or the San Diego County tourmalines, savvy collectors don't care. And in any case the work has been expertly done by the "rock

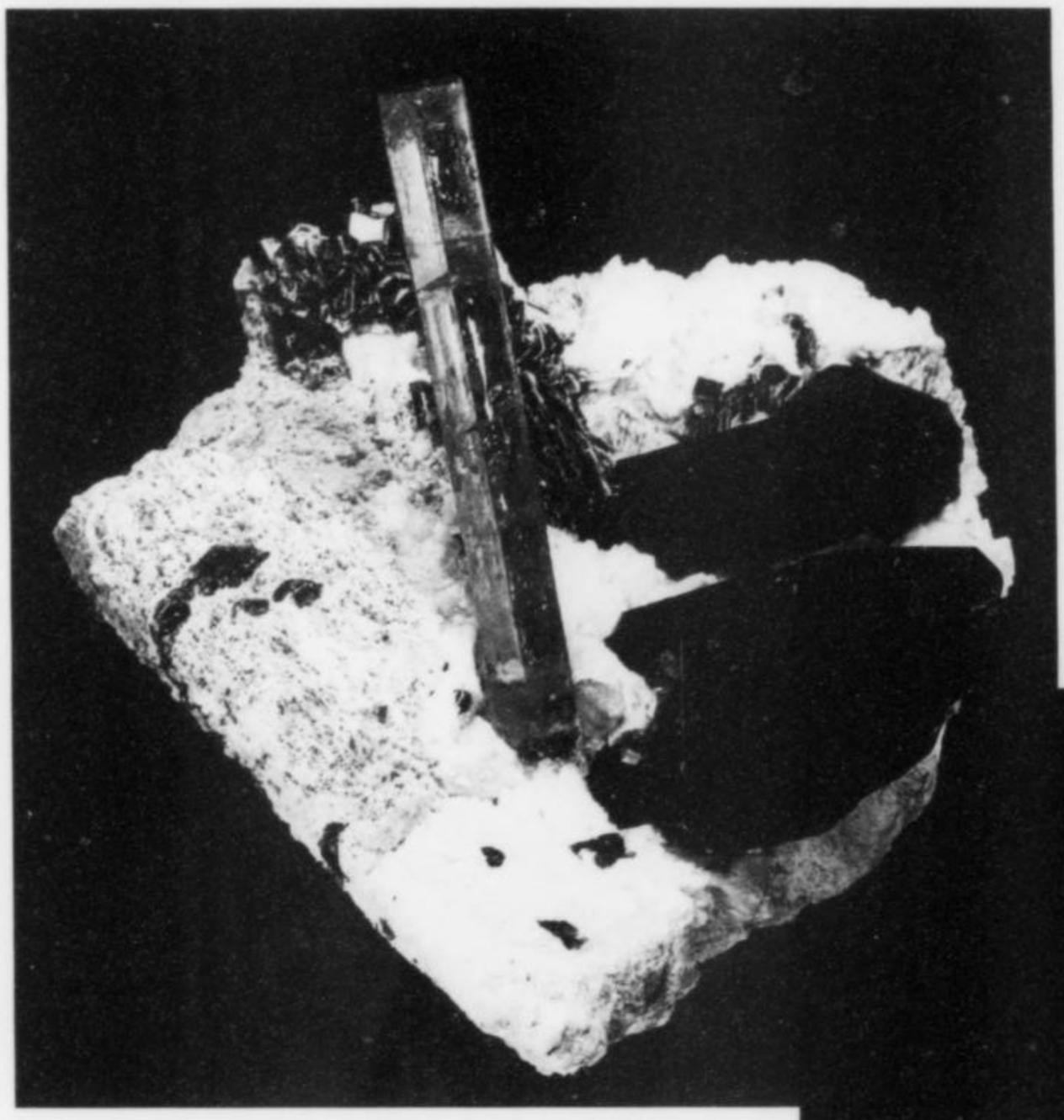


Figure 3. **Aquamarine beryl crystals to 10 cm, on microcline with smoky quartz crystals, from Mount Anero, Chaffee County, Colorada. *Collector's Edge* specimen; Jeff Scovil photo.**

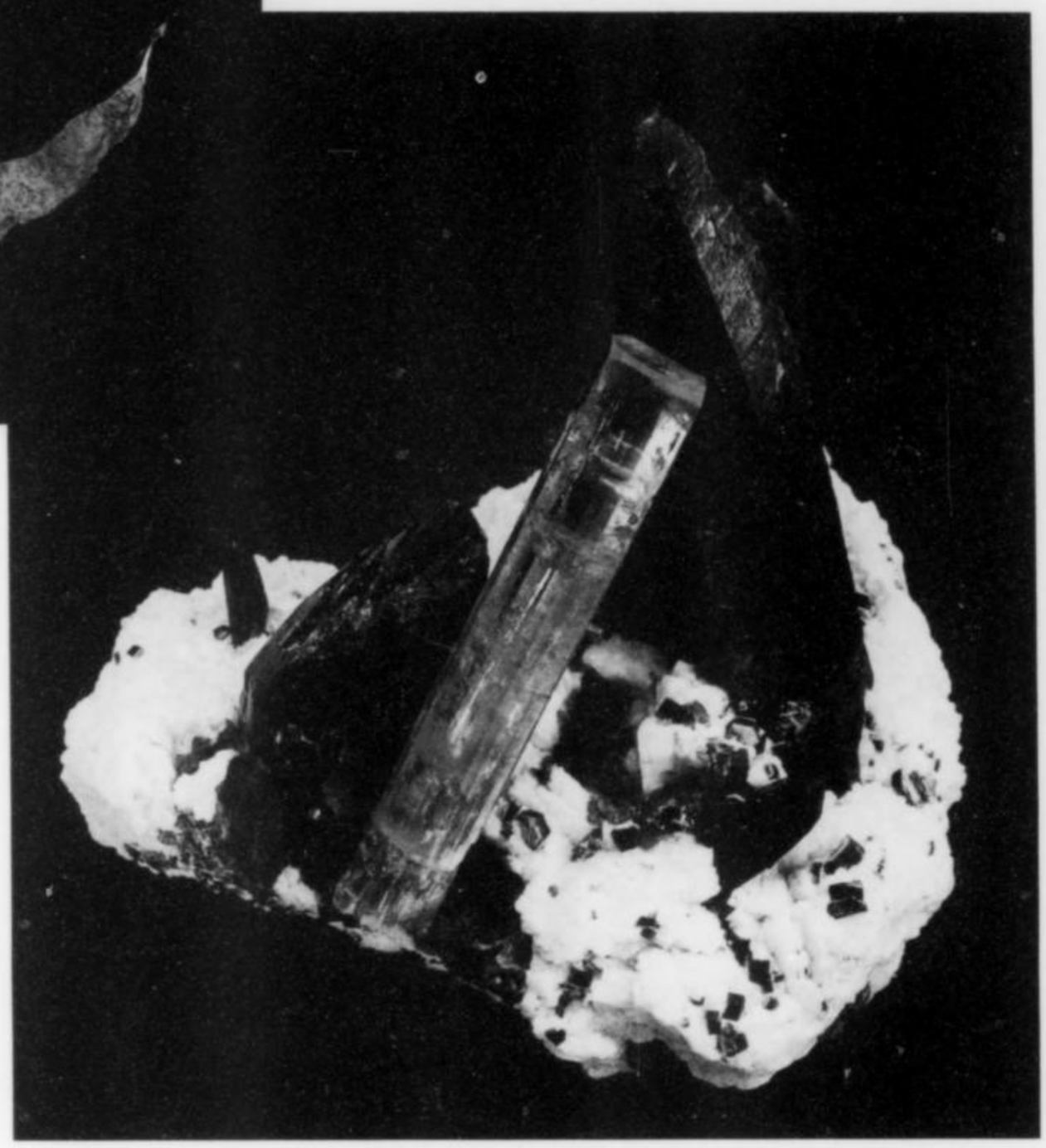


Figure 4. **Aquamarine beryl crystals, 10 cm, on microcline with smoky quartz crystals, from Mount Anero, Chaffee County, Colorada. *Collector's Edge* specimen; Jeff Scovil photo.**

doctors" at *Collector's Edge*, and no sutures show except upon very close scrutiny. For color, sharpness, aesthetic composition and, most of all, for sheer size these specimens are record-setters, and are destined for a museum exhibit somewhere.

Another gem-pegmatite show-shopper follows immediately, and it also hails from an old classic American locality: Mt. Mica, Oxford County, Maine, the country's first-found source of gem-quality tourmaline. Two boys picked loose, gemmy green **elbaite** crystals from the soil there in 1820, and good specimens have emerged at intervals during the following 150 years. The Mt. Mica pegmatite produced relatively little from the late 1970's until July 2003, when a team led by Gary Freeman began a collecting campaign—which continues today—in the old quarry pit. At the Main Show this year, the most amazing of the new Mt. Mica elbaite specimens were shown in an exhibit case. These included a lovely, thick, color-zoned gemmy crystal 12 cm long in albite matrix; lustrous, gemmy pink crystals and a few gemmy blue ("indicolite") crystals as loose loners; a huge green compound crystal termination, 22 cm across, called "the wedding cake"; a flaring, opaque pink compound prism 20 cm high with a jet-black "moor's head" cap; and, as a bonus, a pale pink, part-gemmy **morganite beryl** crystal measuring about 15 × 20 cm. These are the most princely of hundreds of specimens which have been found at Mt. Mica during the past year and a half, and many of the others were on sale at the Main Show stand of *Graeber & Himes* (cgraeber@tfb.com, MinAmer@aol.com), where a fine, gemmy, deep green to pink elbaite crystal of thumbnail size could be had for around $50; a doubly terminated crystal would set you back only slightly more. Some of these small crystals, like some of the large ones in the display case, show color/compositional zoning, from brownish black schorl through pink and green elbaite, to that very black "moor's head" cap that is thought to be the mineral foitite. *Graeber & Himes* also were offering a few Mt. Mica matrix specimens showing 4-cm smoky **quartz** crystals, and a very few showing lustrous, twinned **cassiterite** crystals to 4 cm.

Among the favorite collecting localities of upstate New Yorkers for many decades has been Power's Farm, Pierrepont, St. Lawrence

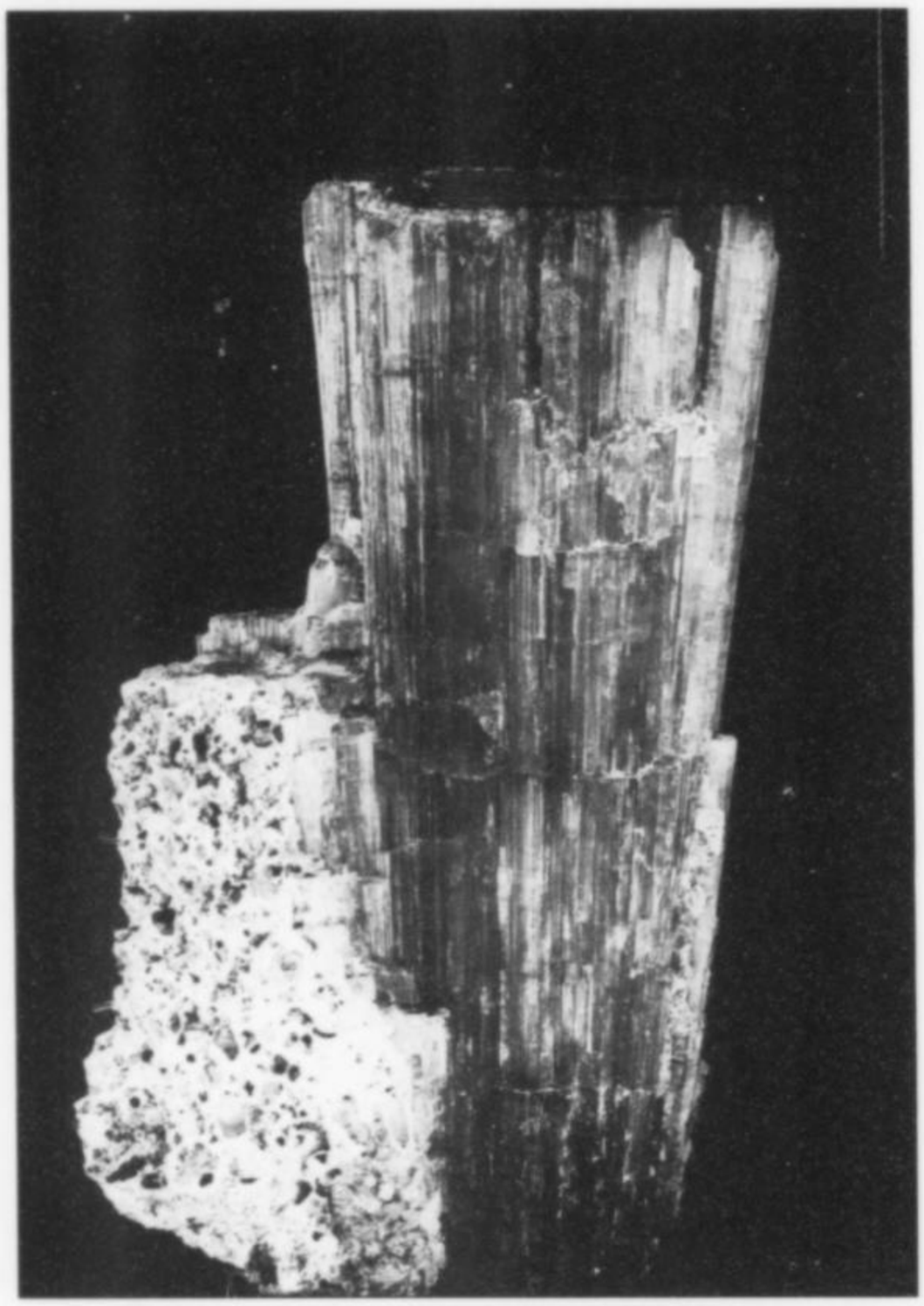


Figure 5. **Elbaite, 19.1 cm, from Mount Mica, Oxford County, Maine.** ***Graeber & Himese*** **specimen; Jeff Scovil photo.**

County, where dignified-looking, flashing black clusters of very sharp **uvite** crystals may be found. Last summer, after much difficult trenching work, Scott Wallace of *Majestic Minerals* (scott@majesticminerals.com) took out about 300 specimens of the best uvite to have been dug for a long time at Power's Farm, and he brought the best of these to a room in the InnSuites. Mirror-faced, lustrous black uvite crystals to 6 cm, as loose individuals and clusters to almost 20 cm, some on corroded quartz-mica matrix, were available from hard-working Scott.

Lurching south now to still a *third* jolt of gem crystals from a reviving classic locality, we arrive at the famous Rist/Ellis emerald-mining tract at Hiddenite, Alexander County, North Carolina (see the article in March-April 2001). Famous for many decades as the source of North America's finest emerald crystals, pegmatitic veins in the area's weathered schists and gneisses are now being exploited by an open-pit mine run by the North American Emerald Mines company of Hiddenite. At the Westward Look show, Richard Freeman of *EF Watermelon* (e.f.watermelon@aol.com) had a large wall case full of impressive results from this past year's work at the site. The "lesser," i.e. non-emerald, specimens are groups of sharp, lustrous, translucent grayish or brownish white rhombohedral crystals of **dolomite** (perhaps grading to **ankerite** as Fe increases), with individuals to 4 cm on edge, the groups reaching large-cabinet size; associated with the carbonate crystals are thin, sharp **muscovite** plates to 3 cm (some standing up edgewise), **rutile** as lustrous 2-cm prisms and nests of "sagenite" needles, colorless **quartz** crystals, and, oddly, lustrous **arsenopyrite** crystals to 2 cm. Best of all, on a few of the crystal groups, very deep green **emerald** could be seen, as gemmy prisms to 2 cm. And Richard had hung on the wall of the Westward Look room a photograph of a single astonishing specimen, mined last year, on whose matrix perches what is without doubt the finest gem emerald crystal ever found on this continent. A wholly gemmy, terminated hexagonal prism measuring 13 cm long and weighing 1869 carats rests diagonally on a cluster of dolomite crystals; the emerald faces are somewhat etched but the form is sharp, and the great beast glows a sumptuous green when backlit. I know this last fact because the specimen, now belonging to the Houston Museum, was displayed alone in a big, crowd-gathering case at the Main Show, just around the corner from the Smithsonian case where the *former* champion North Carolina emerald specimen (an ex-Dave Wilber piece shown on the cover of May-June 1975) reposed in upstaged majesty. The new specimen is also pictured in the recently published book, *Mineral Masterpieces*, available from the *Mineralogical Record*'s online bookstore (www.MineralogicalRecord.com).

Nor was that all from North Carolina this year: Terry Ledford of *Mountain Gems & Minerals* (wiscottawatta@wmconnect.com) had still another fresh swarm of gem-quality **spodumene variety hiddenite**, starring one single crystal of classic form and (in its top half) deepest green color, measuring about 12 cm long. Terry and his wife indeed had an extraordinary show, since before escorting the hiddenites to the Main Show they had held court in a room in the Clarion with some very fine, newly unearthed **amethyst** specimens from a surface exposure of pegmatite at Jackson's Crossroads, Wilkes County, Georgia. The property belongs to Rodney Moore of Jackson, Georgia, who had his first Tucson Show Experience this year, retreating to Georgia after a few overstimulated days, while the Ledfords continued happily to move his

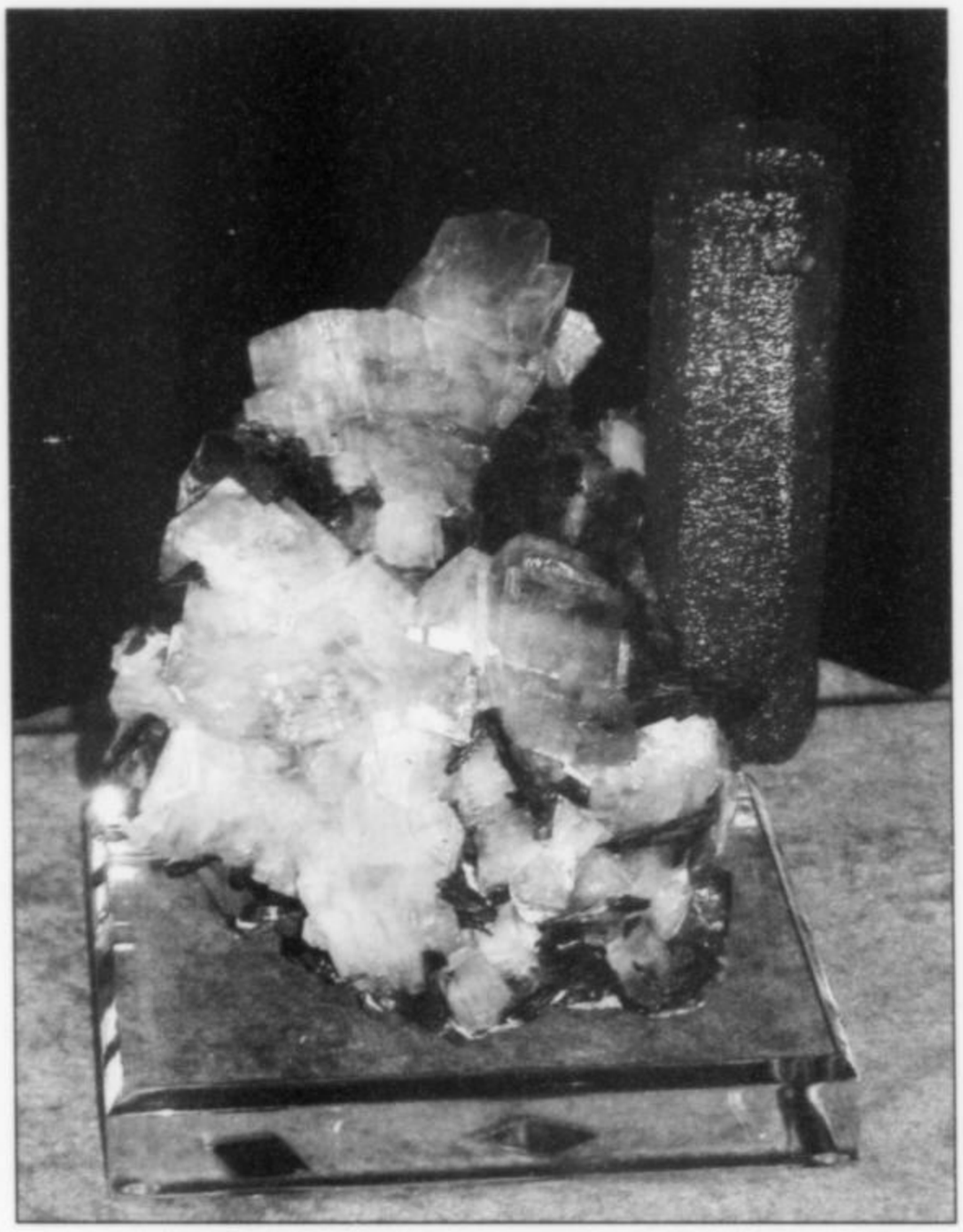


Figure 6. **Emerald crystal, 13 cm, with dolomite/ankerite crystals, from Hiddenite, Alexander county, North Carolina.** ***North American Emerald Mines Company*** **specimen, now in the Houston Museum of Natural Science collection; Jeff Scovil photo.**

amethysts for the duration. The amethyst crystals are very sharp, color-zoned from deep purple to almost colorless, and reach 20 cm; loose clusters reach 30 cm, while matrix specimens get even larger. Most remarkable is their brilliantly high, glassy luster and mirror-smooth faces: these are extremely beautiful, maximally showy pieces, and probably rank with the best amethysts found anywhere in the string of localities along the Piedmont of the eastern U.S. (see the article by White and Cook in May-June 1990). A few beautiful faceted gems have already been cut, and some of these show a tanzanite-like pleochroic effect, looking purple from one angle and blue-purple from another. According to Rodney Moore, future prospects for the locality are bright, i.e. he'll continue digging (once he recovers from Tucson), so that the present 100 or so specimens may be just the beginning.

One more stop remains in this unusually protracted sojourn through the Deep South. At the Munich Show in November, as well as on a couple of websites still earlier last year, there appeared considerable numbers of mineral/fossil specimens showing lovely deep orange, elongated-rhombohedral crystals of **calcite** lining fossilized shells of large clams of the species *Mercenaria permagna*,

Figure 7. **Spodumene ("hiddenite") crystal, 6.7 cm, from Hiddenite, North Carolina. Terry Ledford specimen; Wendell Wilson photo.**

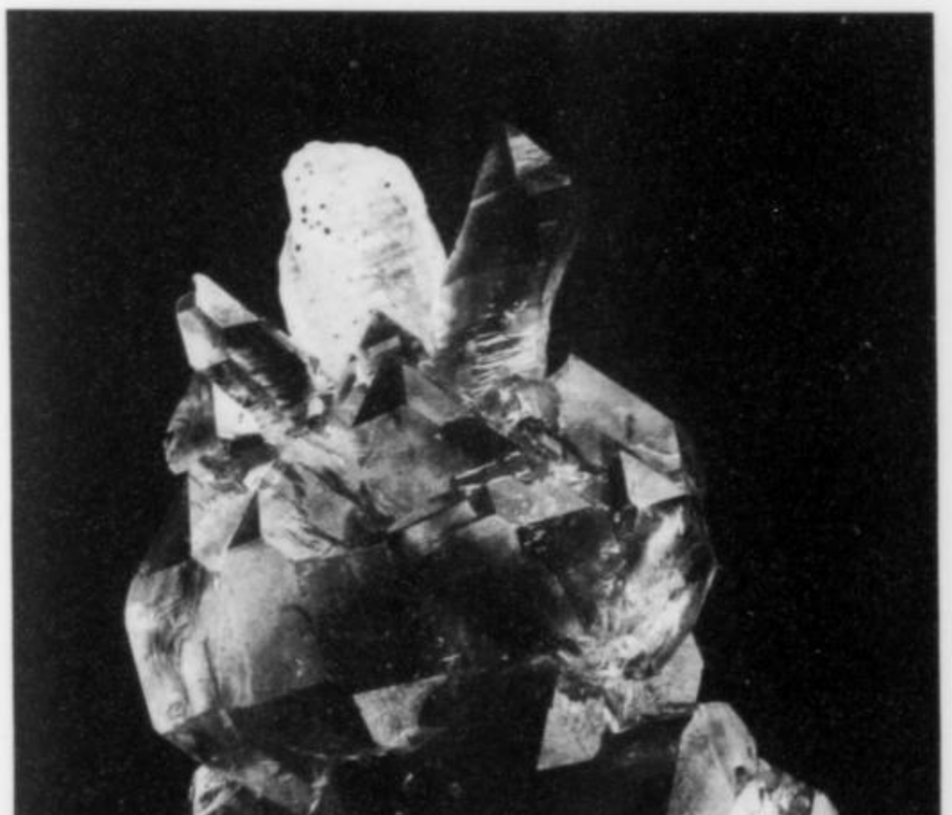


Figure 8. **Amethystine quartz cluster, 6 cm, from Jackson's Crossroads, Wilkes County, Georgia. *Mountain Minerals & Gems* specimen; Jeff Scovil photo.**

Figure 9. **Amethystine quartz cluster, 10.2 cm, from Jackson's Crossroads, Wilkes County, Georgia. *Mountain Minerals & Gems* specimen; Jeff Scovil photo.**

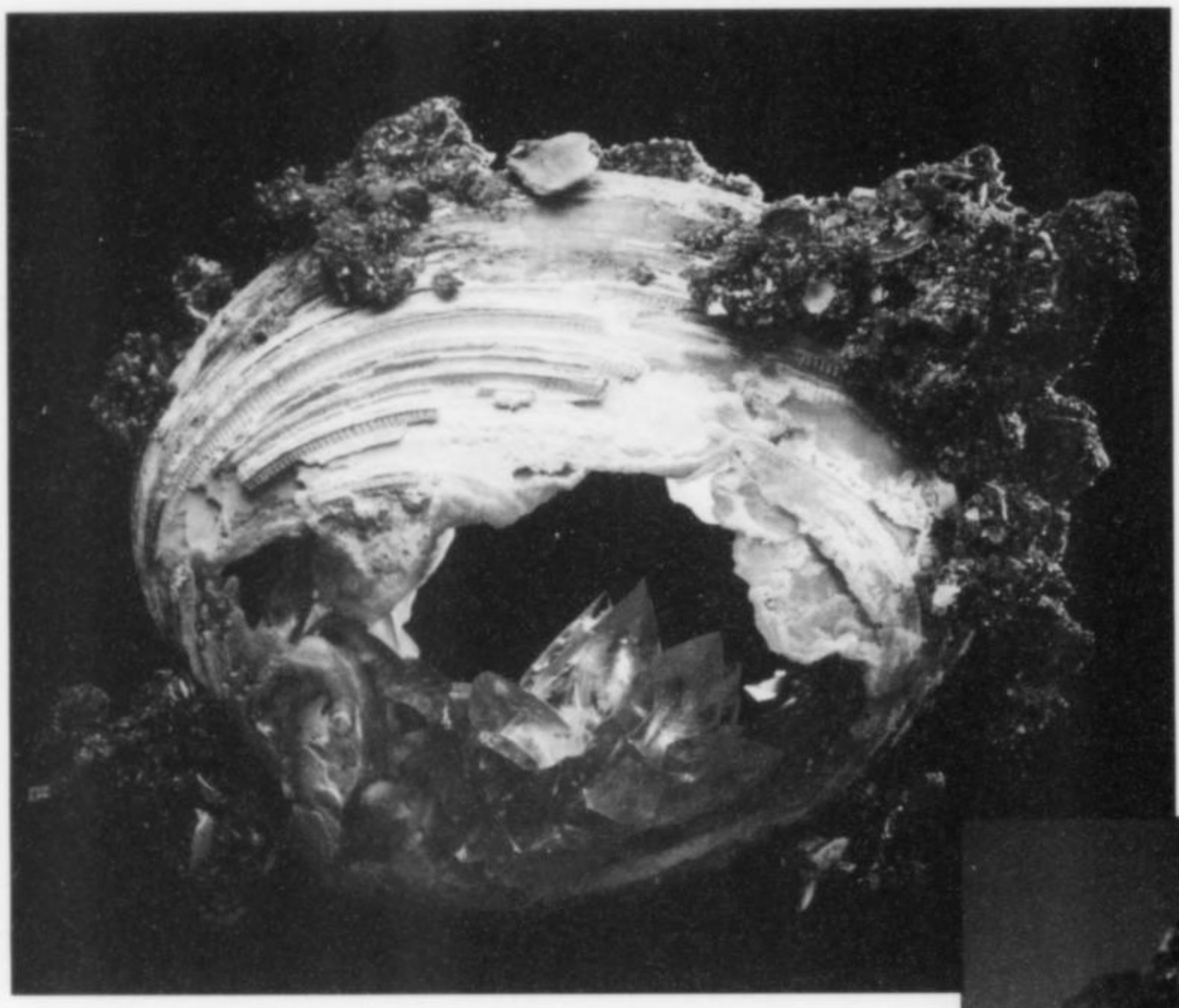


Figure 10. **Calcite crystals in pelecypod shell, 10 cm, from Ruck's pit near Fort Drum, Okeechobee County, Flordia.** ***Geonic Minerals*** **specimen; Jeff Scovil photo.**

Figure 11. **Wardite crystals on matrix, 2.8 cm, from Rapid Creek-Big Fish area, Yukon Territory Canada.** ***Tyson's Minerals*** **specimen, now in the Wendell Wilson collection; Wendell Wilson photo.**

dug from a Pliocene/Pleistocene "shell pit" turned limestone quarry near Fort Drum, Okeechobee County, Florida. Originally overlain by a mangrove swamp, the site, called Rucks' Pit, produced its first specimens two and a half years ago, and at this date a couple of thousand significant pieces have emerged. Many hundreds were brought to the Executive Inn show in Tucson by Gary Maddox of *Apalachee Minerals* (www.apalachee-minerals.com), and still more were to be seen at the Main Show with Georg Claes of *Geonic Mineral Collection* (geonicmineralen@pro-tiscali.be). Large "matrix" specimens consist of grooved, grayish white clam shells embedded in gray limestone, with openings into the crystal-lined interiors of the shells; smaller specimens are simply lone shells laid open, or else loose thumbnail and miniature clusters of calcite crystals, looking quite beautiful (one might dare say happy as clams) all on their own. Individual calcite crystals reach 3 cm, and the crystal clusters are a glowing, lustrous, gemmy, rich orange, and fluoresce briliiantly greenish yellow in both longwave and shortwave ultraviolet light. A typical thumbnail, making a snazzy addition to anyone's calcite-thumbnail suite, could be had for about $30.

What's new from Canada this time out is a nice lot of phosphates collected by Rod Tyson last August at the famous Big Fish-Rapid Creek locality in the northern Yukon (erudite hyperlink: the *Yukon Phosphates Special Issue*, July-Aug. 1992). It was good to see a substantial new batch of professionally collected specimens from this famous occurrence. At the Main Show, the Tyson's Minerals stand showed off sparkling, mostly thumbnail and miniature specimens of, among others, lustrous shaving-brush aggregates of acicular, deep blue **gormanite** crystals on beds of sharp, gemmy brown, rhombohedral **siderite** crystals; very lustrous, high-quality, sharp, blue-black **lazulite** crystals to 1.5 cm on siderite druses with quartz; white hexagonal-tabular crystals of **whitlockite** to 2 cm; lustrous pseudo-octahedral **wardite** crystals to 1.5 cm, in varying hues of colorless, green, yellow and brown; translucent white **apatite** prisms to 5 mm in little groups; and the rare **arrojadite** as lustrous brown, platy crystals to 3 mm densely covering matrix.

Peter Megaw of Tucson, guest editor of our ongoing series of special Mexico issues, is a main man to see in matters Mexican, and this year, at *Peter Megaw Minerals* (pmegaw@imdex.com) in the Clarion, he was offering large and attractive batches of new things from old localities in Chihuahua. Level 13 of the Potosí mine, West Camp, Santa Eulalia, produced last spring a splendid lot of about 50 miniature and small cabinet specimens of the mine's distinctive **mimetite**—sparkling brownish orange spherules of microcrystals, with little subspherules for a cauliflower effect, in thick coatings on earthy "limonite"; some areas of these specimens show the mimetite mimicking the forms of bladed crystals of gypsum, now gone from beneath the mimetite blankets. Also, from the Vieja mine, West Camp, Santa Eulalia, about 50 fine small-cabinet specimens of **hematite/goethite pseudomorphs after gypsum** were found just a few weeks before the show. Over more of the "limonite" matrix, the hematite/goethite mixture forms jet-black, lustrous coatings and mounds which in some areas are mammillary, resembling a bubbling tar pit, while in others the pitchy stuff is frozen faithfully in the form of monoclinic gypsum crystals to 3 cm. Finally there was the strike of sleek, lustrous **hemimorphite** in translucent white fan-shaped aggregates to 8 cm, rising from the calcite-limonite matrix. These are from somewhere

in Santa Eulalia (although they greatly resemble specimens from the Ojuela mine, Durango). Some of the hemimorphite crystal fans are lightly dusted by sharp microcrystals of **plattnerite** (prisms) and **murdochite** (cubes). These specimens, ranging through miniature and small-cabinet sizes, came out last July, and fine examples were available both from Peter Megaw and from Luis Burillo (Urb. Pinar Canal, 24, 50007 Zaragoza, Spain).

Legendary Mexican-American rancher and specimen miner Benny Fenn (bennyfenn@zianet.com) showed up in the Clarion ballroom with beautiful specimens from a new discovery of **green quartz on sphalerite**, from an active silver mine in the famous Naica, Chihuahua district. Found only a few weeks before the show, these striking "combination" pieces show lustrous, translucent quartz prisms to 3 cm, colored a pleasing medium-green by included chlorite, forming little sprays and jackstraw clusters on groups of sharp, brilliant black sphalerite crystals, with individual sphalerites reaching 1 cm. A tasteful dusting of white, rhombohedral dolomite crystals to a few millimeters each further improves the aesthetics. Benny had about 150 pieces in all, from toenail-size to 12 cm across.

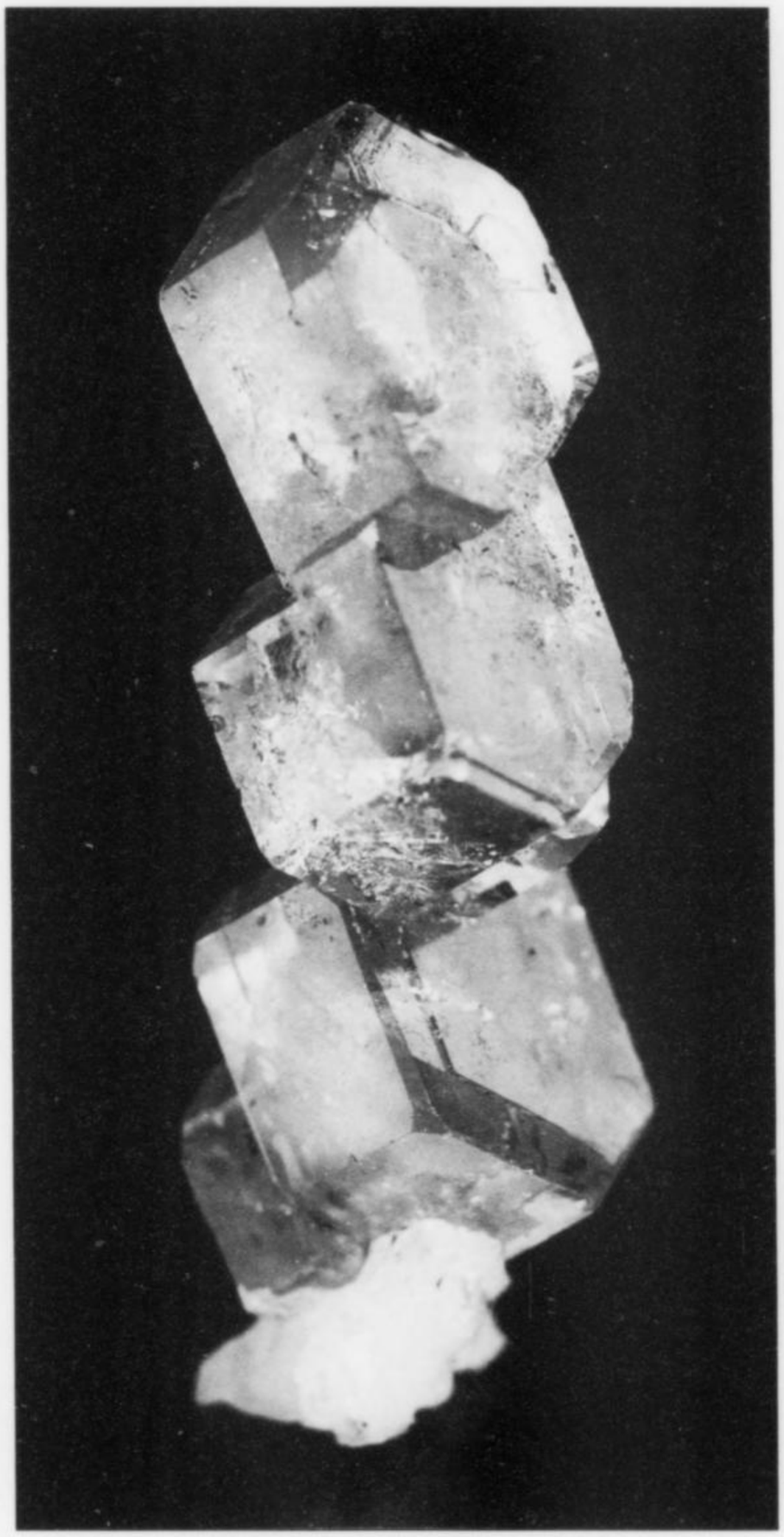


Figure 12. **Fluorapatite, 2.6 cm, from La Marina mine, Boyaca, Colombia.** ***Well Arranged Molecules*****; Jeff Scovil photo.**

In a room at the InnSuites, Pierre Vuillet of the Swiss/Colombian dealership *Samargand Resources Ltd.* (samress@yahoo.com) had some exciting items—as he has had before—from the emerald mines of Colombia. Stars of the show, of course, were sharp, lustrous, gemmy **emerald** prisms to 4 cm, both loose and on matrix, from various of the famous mines (La Paz, Coscuez, Gachala, etc.)—only the relative paleness of their green colors saved these gorgeous crystals from the horrible Blade. Also here were lovely, lustrous thumbnail-size clusters of pale to medium-pink **fluorapatite** crystals; a couple of superb brown **parisite** crystals approaching 2 cm; and wonderful pale blue, gemmy **euclase** crystals to a remarkable 7 cm, with sharp wedge-terminations and no side-cleavage wounds at all.

Have you ever heard of **dioptase** from *Peru*? You could have seen a good specimen in the *Mineralogical Record*'s "what's new in minerals" case in the Clarion lobby during two days of the hotel show, and you could have seen about a dozen more in the Clarion room of Luis Burillo (see above under hemimorphite). Last summer, two small pockets in the Cobre Pampa mine, Nazca, Ica Province, Peru, gave up about 250 fine dioptase specimens, plus many more lesser ones, as matrix pieces ranging from 4.5 to 10 cm across. The matrix is massive brown chalcedony with chrysocolla coatings on open seams, and sharp dioptase crystals to more than 1 cm are scattered on the seams; the dioptase has a good, rich green color but is not of the highest luster, so we must call this locality merely "promising" for the moment. However, anything with dioptase on chrysocolla is bound to be strikingly colorful, as Luis' specimens surely are.

Also posing in the what's-new case was a handsome, flashing 8-cm cluster of **stibnite** crystals from the Animon mine, Huaron, Pasco Department, Peru—one of only about a dozen such specimens brought in by Jaroslav Hyrsl (hyrsl@kuryr.cz). Heretofore, Peru's best stibnite came (infrequently) from mines in the Raura district, Lima Department, but these newly found specimens are superior to the best of the "Rauras," which always are luster-challenged. The crystals from Huaron are flattish and wedge-terminated, reach lengths to 4 cm, and occur in highly lustrous specimens, to 8 cm across, consisting of interlocked sprays without matrix. Some of the crystals' prism faces are lightly coated by second-generation stibnite microcrystals.

Active mining for silver ceased in 1991 at the San José mine, Oruro, Bolivia. But around that time about 2000 former ore miners took over and became specimen-miners, with the result that excellent specimens of several rare sulfosalts have appeared intermittently from the San José mine ever since. Last fall saw a major strike of about 150 specimens of **andorite**, including what are probably the world's best-ever representatives of the species; at Tucson, Brian Kosnar of *Mineral Classics* (minclassics@aol.com) and Rob Lavinsky of *Arkenstone* (rob@irocks.com) had the topmost pieces at the Westward Look and at the Main Show, while Alfredo Petrov (alfredopetrov@earthlink.net) proudly showed close runners-up at the Smuggler's Inn. Flat, striated, compound andorite blades to 9 cm, metallic gray and medium-lustrous, are decorated with nests of small, brilliant black, iridescent needle crystals of **zinkenite**; other associated species, in microcrystals, include **stannite** and **pyrite**. One intriguing toenail specimen of Alfredo's is a complete, euhedral, rounded stannite crystal measuring 2.5 × 2.5 × 2.5 cm, with about ten very sharp andorite blades standing straight

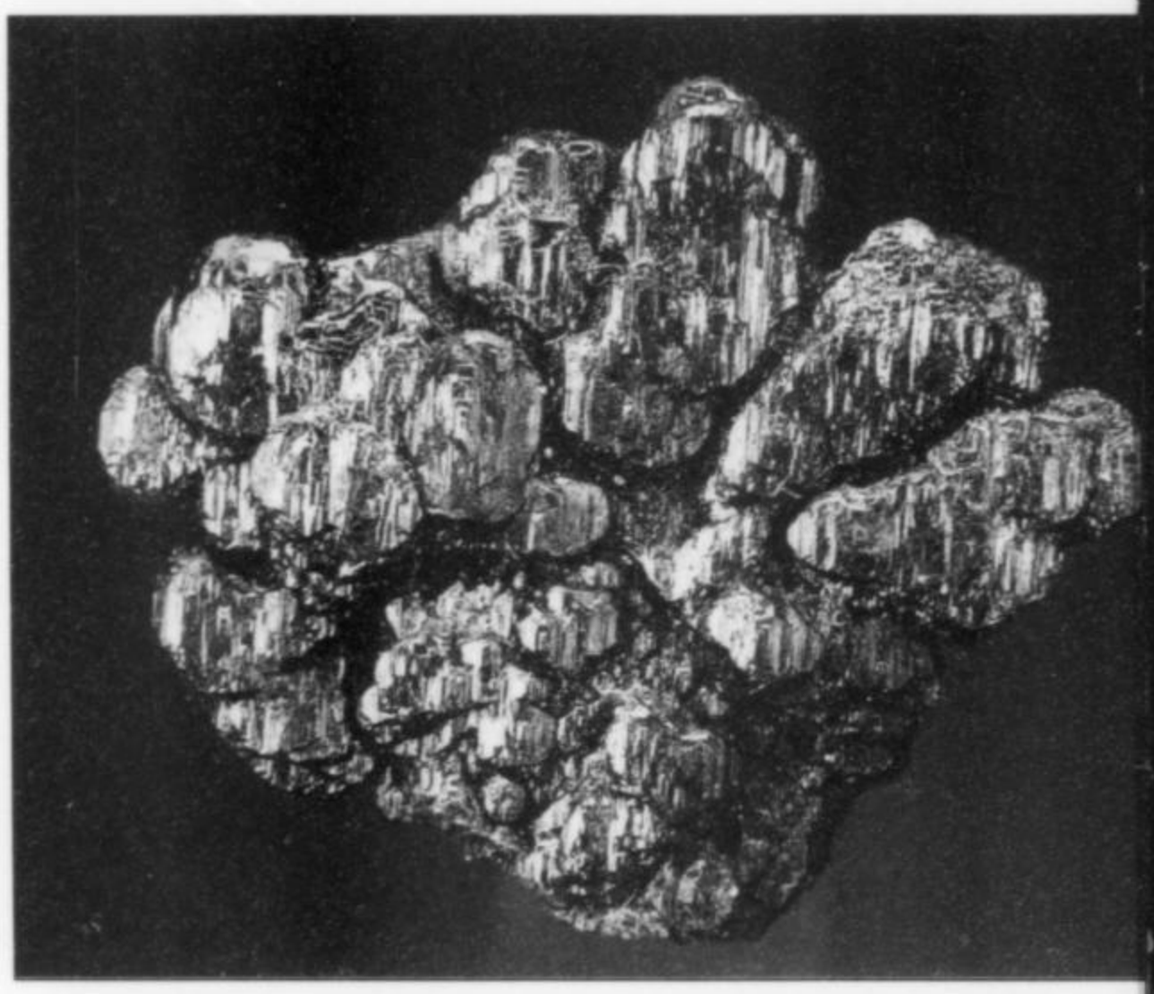
Figure 13. **Andorite crystals with zinkenite, 9.1 cm, from San José mine. Oruro, Oruro Department, Bolivia. *Mineral Classics* specimen; Wendell Wilson photo.**

Figure 14. **Andorite crystals, 4 cm, from San José mine. Oruro, Oruro Department, Bolivia. *Fabre Minerals* specimen; Jeff Scovil photo.**

up on it at points all around. The same discovery produced about 30 specimens showing the very rare **potosíite** (a Pb-Sb-Fe-Sn sulfide) as lathlike, metallic gray crystals to 1 cm, some twinned to make fanlike forms, on drusy **franckeite**, with zinkenite and arsenopyrite; Kosnar and Lavinsky had potosíite-bearing specimens of this description to 9 cm across. An even more arcane Bolivian rarity is **joséite** (Bi_4TeS_2), which showed up in Tucson in the form of the first euhedral crystals of this species ever discovered: the loose, dull, metallic gray, bladed crystals, reaching 1.75 cm, were found enclosed in massive native bismuth at the Tazna mine, but popped out freely when the bismuth was cleaved; Alfredo Petrov offered a few small-thumbnail crystals at the Smuggler's Inn.

Of the new Brazilian items on hand, one of the most intriguing to me—this because I never got to see it—was **euclase** from an unnamed mine about ten kilometers from the famous (for gemmy elbaite) Paraíba mine, in the state of Bahia. Yes, by the time I got to the specimens' handler, Mike Bergmann, he'd already sold all but one of the lot, but the single, loose, 2-cm crystal I did examine was a striking thing: transparent, sharp, highly lustrous, and totally colorless except for a deep blue "racing stripe" zone in the middle. In other words, these crystals look exactly like the familiar ones from Equador, in far-distant Rio Grande do Norte state, but Mike swears that the locality information he had was correct; the supplier, he said, had been in the mine and had taken out some of the euclase crystals himself. The original lot had held about 30 thumbnail and miniature specimens, some with the brilliant euclase crystals resting on quartz-albite matrix. A few of these can be seen on Scott Werschky's *Miner's Lunchbox* website (www.minerslunchbox.com).

At one of the outdoor stands in the kingdom of funky shows along I-10, I was pleased to find Chris Ehrlich (luvquartz@kachina.net) with about 100 loose, sparkling, beautiful crystals of **aquamarine** newly taken from the workings in primary pegmatite around the town of Medina, in Minas Gerais. The pale blue crystals, ranging from 2 to 4 cm, are wholly gemmy and wonderfully bright; some are doubly terminated, others are deeply but not unpleasantly etched,



with little ruffled pits and caverns around their backsides. Chris also had a few groups of such crystals to 10 cm across. Whatever the style of crystallization, he was selling this aquamarine as gem rough @ $5/gram—a very good deal for the thumbnail-seeker.

Luis Menezes (lmenezesminerals@uol.com.br) had a couple of new mineral finds from Brazil which can best be described as *intelligent* items, collected and marketed courtesy of the keen mineralogical eye for which Luis is known. From the Ipê mine near Governador Valadares, Minas Gerais (a pegmatite long mined for aquamarine) have come lustrous druses of orange-brown **microlite** crystals, as glittering coatings to 10 cm across on albite matrix, with some areas showing black, subhedral **manganotantalite** crystals, and other areas sporting tiny white sprays of prismatic microcrystals of **zircon**. A discovery in November 2004 produced a few hundred specimens, thumbnail to small-cabinet size, thickly coated by microlite crystals, with individual microlite octahedrons

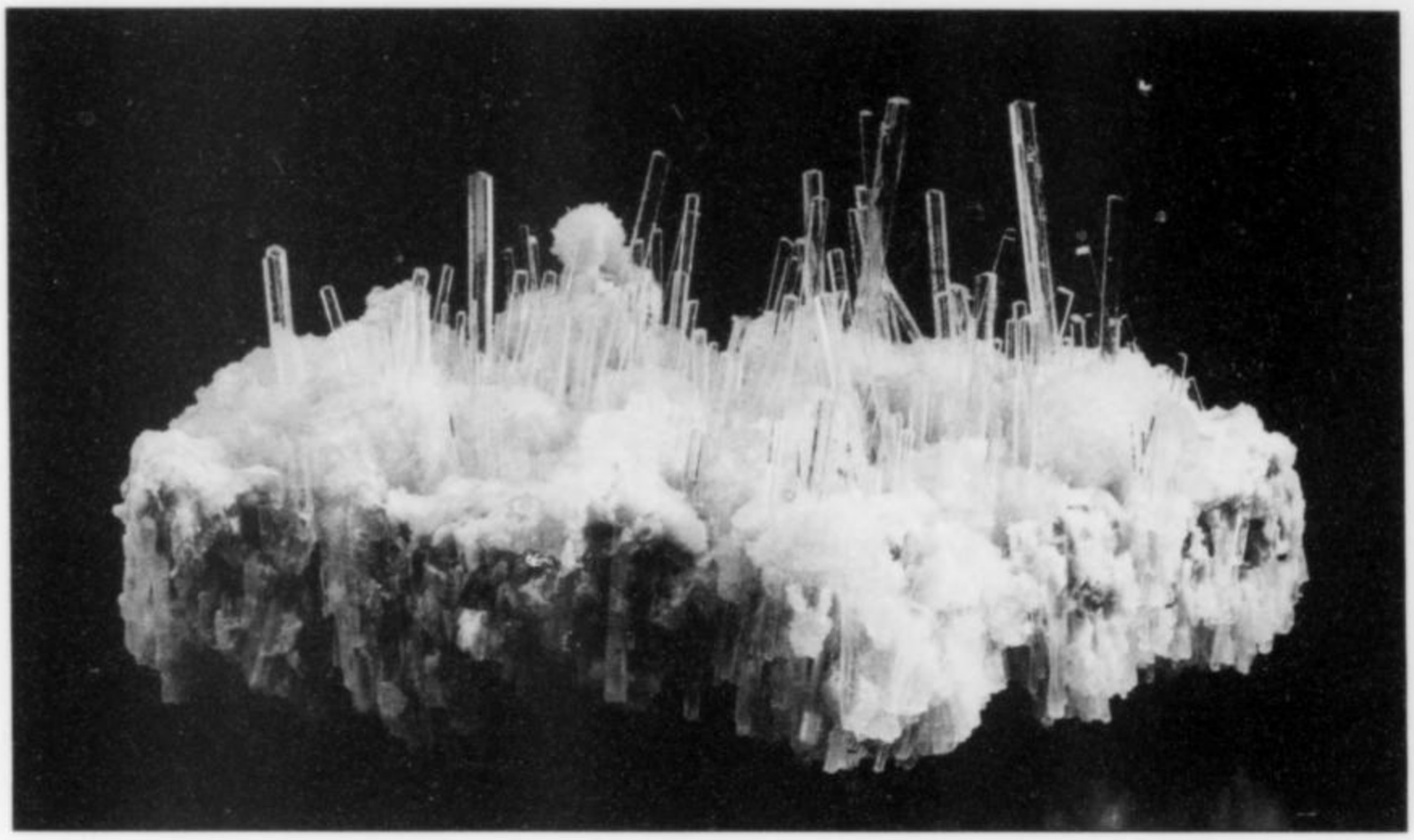


Figure 15. **Natrolite crystals on matrix, 9.5 cm, from San Augustin del Valle Fertil, San Juan, Argentina. *Southern Minerals & Fossils* specimen; Jeff Scovil photo.**

reaching 7 mm. Luis also had dozens of small specimens showing **chrysoberyl** as sharp, pale green, V-twinned crystals to 2 cm lying flat on the cleavage surfaces of sharp, diamond-shaped muscovite crystals, these from the Ipiaú, Bahia, where they were found last December. And he had **fairfieldite**, as grayish green bowtie and rosette-shaped aggregates of microcrystals on albite and quartz, lately found in the Cigana mine, Galileia, Minas Gerais.

For a final image from the western hemisphere, consider the large and peculiar-looking **natrolite** specimens found last summer in an outcrop of unspecified geological kind at San Agustin del Valle Fertil, San Juan Province, Argentina. Some of these specimens are solid masses approaching 20 cm across, of splintery, opaque white natrolite needles (some stained reddish by iron oxides), suggesting Flux mine, Arizona cerussite specimens; but a few elite specimens consist of thin, colorless natrolite crystals with visible terminal faces, standing perfectly straight up in skyscraper-like arrays on massive white natrolite. Two Argentinian dealers brought generous numbers of these specimens to Tucson: Jorge Raul Dascal (the hematite/magnetite cinder man) of *Patagonia Minerals* (patagoniaminerals@hotmail.com) and Eduardo Jawerbaum (rockhound@abaconet.com.ar).

We begin our Old World leapfrogging in northern Spain, where, as I mentioned from Munich, the still-active workings of the Emilia fluorite mine near the town of Loroñe, in Asturias, are busy turning out impressive **fluorite, calcite** and **quartz** specimens. The mine's lustrous, colorless quartz crystals of the "Herkimer" style sport likewise lustrous, colorless fluorite, as small cubic crystals either included in the quartz or resting on quartz prism faces; black flakes of hydrocarbon inclusions may also be seen within the quartz. Individual floater quartz/fluorite crystals reach 20 cm, and clusters attain even greater dimensions. Fluorite specimens of another type were found in October 2004: colorless to pale blue cubic crystals to 5 cm on edge in pretty groups of miniature to small-cabinet size. And the mine's calcite specimens offer their own simple beauty: sharp, indeed chiseled-looking, buttery yellow-orange, translucent calcite crystals to 5 cm perch smartly on pieces of gray-white limestone. At the Clarion, Luis Burillo had the best of the Emilia mine calcites, although other dealers had a few too; it was Jordi Fabre (enquiry@fabreminerals.com) who seemed to have the monopoly on the quartz/fluorite specimens.

Jordi also was rather hyped about a new occurrence of **wire silver** in Spain—first hit in October 2004, when the dumps of the Balcoll mine, Falset, Priorat, Tarragona, yielded about 150 attractive specimens from small-miniature size to about 10 cm across. Originally enclosed in calcite and exposed by acid etching, the silver appears as very thin (to hairlike) lustrous white wires, some stained black by acanthite, and thicker, spear-like silver crystals in dendritic growths. If, like me, you have always wondered about the source of the "Spanish silver" mined by the Romans to help fund the growth of their leviathan empire, this ancient mine may be part of your answer.

One more notable Spanish item offered in Tucson this year was brilliantly lustrous **marcasite** from the Reocin mine, Santander—an old zinc mine recently closed after having been worked for 60 years. Thin, coxcomb-shaped marcasite aggregates to 3 cm form loose, miniature-size clusters, or protrude individually, toothily, from matrix pieces coated by sparkling white dolomite druses; the marcasite looks entirely fresh and pristine on the dozen or so specimens brought to Tucson by Luis Burillo.

One major item appeared from France, and by the time I got wind of it some top collectors had already paid major bucks to acquire the few available specimens. About 15 matrix pieces showing magnificent **smoky quartz gwindels**, the largest gwindel about 20 cm across and the rest not much smaller, were collected in September 2003 and August 2004 on the French side of Mont Blanc, above Chamonix, Haute-Savoie, at an elevation of 3700 meters. These gwindels, besides being huge, are highly lustrous, totally gemmy, and exemplary in form, with a medium degree of smokiness; they were brought to Tucson by the indefatigable brothers Gobin of *Gobin Mineraux* (gobin@club-internet.fr).

That's about the end of the story for Europe this year, although I should mention that the very attractive new specimens of thin, colorless crystals of **barite** perching precariously on shards of brown siderite from the Turt mine, Romania (see my Munich report in the China Issue) were generally "around." Also I will pass on Ross Lillie's enticing report that there is some new mining, and plans for much wider and more thorough mining, in and around the famous "gold triangle" of Transylvania, source of all the cherished old Romanian **gold** specimens. Ross, of *North Star Minerals* (northstarminerals@comcast.net) even had three teaser specimens, secured through his contacts in eastern Europe: lustrous, loose, leafy plates, to 4 cm, formed entirely of gold microcrystals in tight herringbone-growth aggregates, from the venerable Rosia Montana, Transylvania gold mine.

The Imiter mine in southern Morocco is presently turning out silver ore, and is continuing to grope tentatively toward becoming

a major contemporary locality for silver minerals. Last year saw the emergence of some small, very nice groups of splintery **acanthite** crystals (see last year's Ste.-Marie and Munich reports), and in the Clarion in Tucson, Horst Burkard (Dornheckenstr. 20, 53227 Bonn, Germany) had dozens of dull gray clusters of subhedral acanthite crystals to small-cabinet size from the Imiter mine. Meanwhile, at the InnSuites, Ian Bruce of *Crystal Classics* (ian@crystalclassics.co.uk) offered six excellent Imiter mine specimens of **wire silver**, with dense nests of lustrous wires in matrix of massive galena, acanthite and quartz crystals, these specimens reaching 15 cm. And Horst Burkard was also showing off some very pretty, newly collected thumbnail clusters of sharp, lustrous, brownish green, untwinned **titanite** crystals to 1 cm on matrix of feldspar crystals, found in desolate outcrops in the Imilchil area, as well as Imilchil **epidote** specimens of the type I mentioned from Munich.

The vast subsaharan country of Mali, in former French North Africa, turned out a very significant hoard of excellent **prehnite/epidote** specimens just before the show; Chris Wright of *Wright's Rock Shop* (wrightsr@ipa.net) didn't even have time to clean them much before having to bring them to his room at the InnSuites. But the array of pieces, small-miniature to cabinet size, on several glass shelves in Chris' display case, was impressive anyway: pale green, translucent spheres of prehnite to 4 cm, singly and in great grapy clusters, are accompanied or impaled by sharp, dark green, medium-lustrous, doubly terminated epidote crystals to 6 cm. A major museum collection had already reserved the very best few of these striking specimens, but there were about 200 others, and the best bet is that the locality is just getting started. It is the Sadiola gold mine near Kayes, western Mali—stay tuned.

Tanzania checks in, first, with a handful of interesting little pseudomorph specimens that Jaroslav Hyrsl brought to the Clarion: gray-white, slightly rough-surfaced, short-hexagonal prisms of **kyanite after corundum** to about 2.5 cm, just found at Turiani, near Morogoro. Next, there is an intriguing new discovery of **spinel** and **clinohumite** crystals embedded in a "dirty" white marble from a contact-metamorphic deposit near Morogoro, Tanzania, these specimens having been brought to the new Executive Inn show by Jochen Hintze of *M. Jentsch Minerals and Rough Stones* (jentschmineral@aol.com). Mining for gem-quality red spinel began at this place about four years ago, and some of the sharp octahedrons indeed have small gemmy areas, although most are at best translucent. The spinel crystals, some of which are contact-twinned, occur in sizes up to 10 kilograms and in a range of colors including red, rose pink, dark blue, purple, and purplish gray. More unusual are the euhedral crystals, to 3 cm across, of clinohumite which have been found (so far) in only one lens of the marble; these are complex and equant, dark honey-brown, and in many cases wholly or partly gemmy. Euhedral **graphite** crystals to 1 cm and gemmy green **tremolite** prisms to several centimeters have also been unearthed, and Herr Hintze says that this Burma-like locality in the heart of Tanzania's gem province is truly a place to watch.

The African leg of the tour concludes at the famous N'Chwaning II mine, Kalahari manganese field, Kuruman, Northern Cape Province, South Africa. (By the way, the provinces of South Africa have recently been redefined; what used to be simply Cape Province is now two provinces, Northern Cape and North-West, and since the N'Chwaning/Wessels mine complex lies in the former, you might want to revise your labels). Around the middle of last year, a goodly number of fine specimens of the rare species **bultfonteinite** emerged from the N'Chwaning II mine, and a few appeared, if memory serves, in Denver; the specimens show little sprays of silky white, acicular bultfonteinite crystals to about 5 mm sprinkled over black matrix whereon they consort with opaque flesh-colored or translucent peach-pink crystals of poldervaartite. But a single pocket hit in November 2004 produced even better stuff: almost perfectly spherical puffball sprays, to 7 mm in diameter, of acicular bultfonteinite crystals, densely intergrown on seam linings in brownish black manganese ore. Individual crystals here are also silky white, but the sprays have a sort of pink chatoyancy as one looks down into them; moreover, some specimens harbor white microcrystals of the extremely rare species **oyelite**. Clive Queit (Box 1014 Fourways, Sandton, 2055 South Africa) had several flats of specimens, thumbnails through small miniatures, of this exotic material at his stand in the Clarion ballroom.

For a few years now we have been seeing scattered specimens with carpets of purple **amesite** crystals coating seam linings in massive black chromite, and brilliant crystals of deep green **chromian titanite**, in some cases resting lightly on the amesite carpets, from the Saranovskoe chromium mine in the Middle Urals of Russia. Last summer, the mine produced a limited number of record-high-quality specimens of this sort, and Mike Bergmann had about 15 at the Main Show, from miniatures to one very dramatic, 25-cm plate. The titanite comes as rich green blades to 3 cm, but what's more remarkable is that the amesite crystals of the substrate are prismatic and pointed—almost "needle" crystals, instead of the earlier squat pyramids with cleaved tips—and reach 1.5 cm long. They are lustrous, with a micaceous sheen, and of a rich medium-purple color.

Then, what's a sojourn in the Urals without a visit to the localities, old and new, which have turned out the world's best **perovskite** crystals? In recent times, very sharp, simple cubes of midnight-black perovskite to several centimeters on edge have appeared, in carefully prepared specimens wherein the perovskite crystals have been etched from enclosing calcite, and stand up on greenish schistose matrix. The locality most often given for these specimens is the Akhmatovskoye mine, cf. "Achmatovsk, Zlatoust district," given by my trusty old 1932 edition of Dana's *Textbook of Mineralogy*. Well, Russian perovskite of the above description was being offered by many dealers at this Tucson Show, but at the Smuggler's Inn room of Eugene Bobrychev of *Grana Ltd.* (tasha25m@yahoo.com) Eugene showed me some quite different-looking perovskites mined three years ago at a new site a few kilometers from the Akmatovskoye mine. Again here we have black cubic crystals (some with small octahedron faces), again occurring in calcite seams in grayish green chlorite schist, but these crystals are not at all smooth-faced; rather, their faces are complexly adorned with angular patterns of ridges, grooves and channels—most interesting and attractive. These new and "groovy" perovskite crystals are highly lustrous, and reach 2.5 cm on edge, Bobrychev's specimens coming as single, loose crystals, loose clusters of two or three, and matrix pieces to cabinet size with abundant, partly embedded crystals.

The famous Sar-e-Sang lapis lazuli ocality in Badakhshan Province, Afghanistan is best known, of course, for its lazurite, but good crystals of other species are found embedded in the distinctive, pyrite-flecked white marble of the locality. A few years back, equant crystals of **sodalite** to several centimeters, with winchite in marble, made a dramatic appearance on the western market. I had not seen them again until, at the Smuggler's Inn this year, Jamal ul-Hasnain Gillani of *Gillani Enterprises* (jamal_gillani@yahoo.com) showed me a few clean, very deep blue (though opaque) loose sodalite crystals to 3 cm. Also, Jamal had specimens showing lustrous, very dark green, slightly edge-rounded **diopside** crystals to 4 cm in marble; these were first collected two years ago. Sharing the sugary white matrix with the diopside, in a few specimens, are lustrous, translucent, yellow-green **dravite** crystals to 3.5 cm.

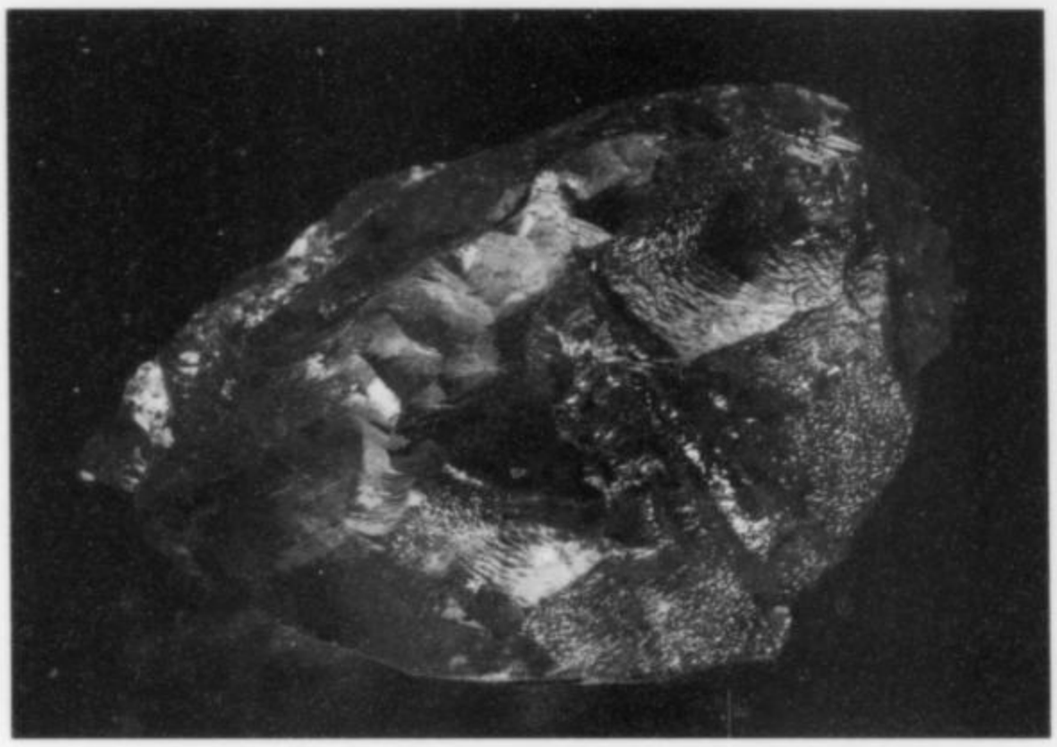


Figure 16. **Triplite crystals, 1 cm, from Alchuri, Shigar Valley, Baltistan, Pakistan.** ***Arkenstone*** **specimen; Jeff Scovil photo.**

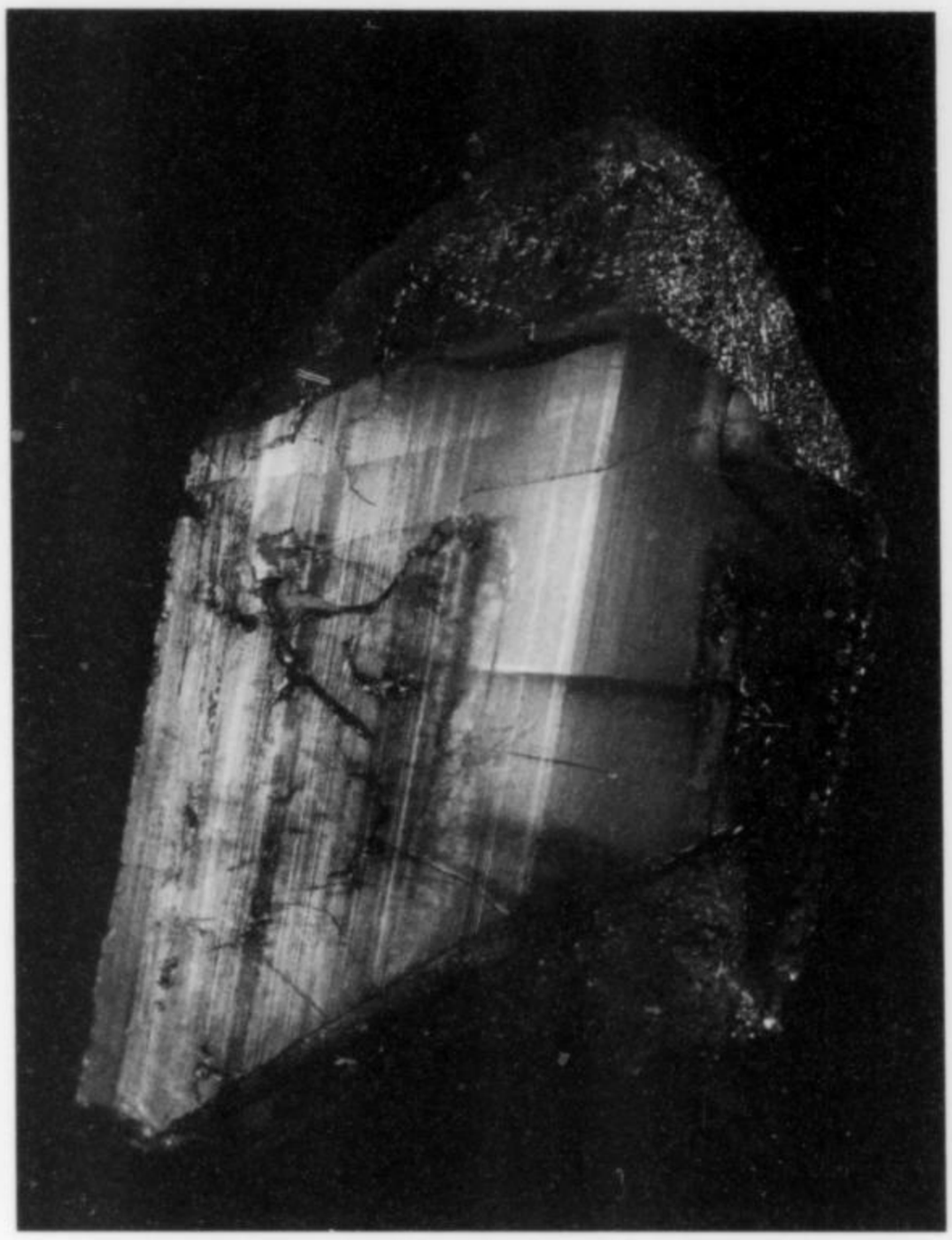


Figure 17. **Väyrynenite crystals, 3.1 cm, from the Shengus area, Gilgit district, Northern Areas, Pakistan.** ***Arkenstone*** **specimen; Jeff Scovil photo.**

Some major excitement was to be found in Rob Lavinsky's room at the Westward Look, where a rather emphatic Rob wasted no time in throwing a flying tackle and headlock on me as soon as I walked in the door, just to get me to look at three of his thumbnail crystals. All three are richly colored and gemmy, representing the finest known examples of three different species. His bright orange **triplite** crystal (from Alchuri, Shigar Valley), measuring just under 1 cm, looks like a fine, gemmy spessartine. Herb Obodda had a couple of these too, and according to Bob Kane of the Gemological Institute of America, the species has been confirmed by analysis. Rob's big pink **väyrynenite** crystal (about 3 cm, from the Shengus area, Gilgit) has the bladed habit of eosphorite, and is unprecedented. These two are from Pakistan, but the really big excitement from Afghanistan is the just-realized occurrence of fine crystals of **fluornatromicrolite** at Paprock (Paprok, Paprook, etc.), Nuristan. Recall that fluornatromicrolite is an extremely rare (I.M.A.-approved but not yet formally characterized) member of the microlite group, known up to now only as deep green octahedral crystals embedded in lepidolite from the Naipa mine, Alto Ligonha, Mozambique—see my Tucson reports for 2001 (vol. 32, no. 3, p. 252) and 2002 (vol. 33, no. 3, p. 273). The new crystals from Paprock are not green but an attractive, lustrous, translucent canary-yellow; they are octahedrons slightly beveled along the edges by incipient octahedron faces and on the corners by little cube faces. Like the Mozambique specimens, they occur in lepidolite matrix, which also commonly harbors the giant crystals of pollucite for which Paprock—though not Alto Ligonha—is famous. Rob's best specimen is a broken, whitish lavender lump of lepidolite from which a very sharp, perfect, partially transparent and highly lustrous 1.7-cm crystal of yellow fluornatromicrolite protrudes near the center (see cover of this issue). He also showed me other Paprock specimens with many more, but much smaller crystals of the same form and color peppered all through the lepidolite masses. So it seems that this exotic species occurs in desirable specimens both in Mozambique and in Afghanistan, and yes, its identity in the latter case has been confirmed analytically.

One of the big buzzes of this show concerned the extraordinary abundance of the world-class **brookite** specimens found last year in Baluchistan Province, Pakistan. I reported on these from Munich, and they are already quite familiar (being so common, at least for now), so I will resist the temptation to rhapsodize further here. Less familiar and much *much* less common are the exceptional specimens of **anatase** from the same locality—Herb Obodda (who should know, and who had the best anatase specimens from the place) gave Taftan (a town), near Dallbandi, Baluchistan, as the locality's name, though the term given on many other dealers' labels for the brookite is "Kharan." I'll try to get this cleared up, but meanwhile I invite you to imagine the wondrous anatase crystals in a handful of specimens at Herb Obodda's stand at the Main Show: they are highly lustrous, lightly horizontally striated bipyramids with small basal faces on both ends. They reach 2.5 cm, and are a lovely translucent golden brown. Morphologically they closely resemble the blue-black Norwegian anatase crystals, whereas in color they are just like old-time Binntal, Switzerland anatase. On one jewel-like thumbnail, a brilliant 2-cm anatase crystal rests piggyback on a slightly smaller but equally brilliant crystal, which perches perfectly on a sliver of matrix. It was near the end of the show and I was broke—I offered Herb my Ford Escort, my library of great literature, and a couple of lesser internal organs, but he was unwilling to deal. A few other dealers have anatase, as well as brookite, from this new place, but in nearly all cases the anatase is comparatively mediocre; watch closely for the good ones.

One other item from Pakistan which I'll note is a new discovery (last November) of bright, transparent, simple hexagonal prisms of **beryl**, nicely color-zoned in shades of very pale blue, palest pink, and colorless. Specimens consisting of loose single crystals, groups of two or three crystals, and crystals on sparkling quartz-microcline matrix range from 2.5 to 5 cm in size. Dudley Blauwet of *Mountain Minerals International* brought these beauties in from Baha, Braldee Valley, Baltistan, Northern Areas, Pakistan, and he had about 100 of them at the Main Show.

Dr. Hemant Merchant of *Mineral Decor* (mindec10@hotmail.com) offered one quite striking new Indian item in his room at the Clarion. Less than a month before the show an undisclosed locality somewhere in the Aurangabad district of Maharashtra state pro-

duced about 35 specimens showing white sprays and puffballs of acicular **mordenite** crystals, the sprays to 1.5 cm in diameter, strewn all over flat plates consisting of wormy masses of tubules of bluish gray **chalcedony**. The plates range between 15 and 35 cm across, i.e. these are large cabinet specimens, and they represent a quite distinctive mordenite specimen style. If indeed it is near Aurangabad, the locality is very far from Chinchvad, source of the earlier mordenite/chalcedony specimens which have been, until now, India's best (see p. 53 of Jan.-Feb. 2003—the Indian Zeolites issue). Merchant's room also held a couple of other new items of interests from the Deccan basalts: from somewhere near the Ajanta caves, **pseudomorphic casts of chalcedony after calcite** as rounded, translucent gray-blue forms to 10 cm; and from the Aurangabad district (again), lustrous, pale peach-colored **heulandite** in wheatsheaf aggregates to 8 cm, with smaller, white, adhering **stilbite** bowties, in about a dozen gorgeous cabinet specimens found in the spring of 2004.

Phenakite in its new incarnation—as gemmy, colorless or palest yellow prisms betraying penetration twinning on the terminations—from Momeik, Mogok, Myanmar (Burma) is also familiar enough by now not to need fresh verbiage, although, unlike the brookite from Pakistan, it is *not* common on the market. At Tucson, only three dealers had maybe a dozen crystals each: the photograph here should demonstrate clearly why you should get one of these lovely phenakite crystals while (if) you can.

Off and on for the last several years now we have been hearing of a locality called Luc Yen (or the Luc Yen mine), in Yen Bai Province, Vietnam—reportedly well north of Hanoi and near the border with China. From here have come pretty, Burma-like specimens with sharp red ruby corundum crystals embedded in white marble, and, even more recently (see my report on the 2002 Tucson Show) good, small, gemmy crystals of a tourmaline-group species. This year, Dave Bunk had about a dozen striking-looking tourmaline specimens from Luc Yen, from miniature to small-cabinet size, lined up alluringly on a shelf in his vertical glass case at the Main Show, and as I write this a couple of weeks later I can report that Rob Lavinsky has some specimens of the same material up on his *Arkenstone* website (www.irocks.com) as well. As to the species of tourmaline, well, anyone would think elbaite at first glance, but according to Rob, chemical analyses have established that the crystals are actually **liddicoatite** nearly all the way through, having only thin rinds of **elbaite**. The tourmaline is lustrous, translucent, and of a luscious pink to medium-rose color. A typical specimen consists of a loose, singly terminated, compound crystal, with parallel crystals shouldering up closely on the side and ending at different heights, producing stepped rhombohedral terminations. The compound crystals range between 3 and 8 cm long. The rare matrix pieces are quite dramatic, each consisting of a single tourmaline crystal lying down on or half rising from a thick piece of shimmering mica (the mica species is probably muscovite, although in some cases a very pale lilac color suggests lepidolite). As a locality for these impressive specimens, Dave Bunk has been given the An Phu mine, Luc Yen, Yen Bai Province, [North] Vietnam.

Outcrops of complex, high-grade metamorphic rocks in Colonna and Uva provinces, Sri Lanka, are occasionally visited by specimen-collectors, and once in a while their peculiar products show up at Tucson (see, for example, vol. 28, no 3, pp. 212; vol. 31, no. 3, p. 282; vol. 32, no. 3, p. 253). This year, at the InnSuites, some folks from the German-based dealership of *Amarasinghe* (amarasinghe@t-online.de) were showing some sleek, brilliant jet-black, specimens of iron-rich **spinel** collected three years ago in Colonna province, with mirror-faced, extra-sharp spinel octahedrons to 10 cm embedded in white calcite. The same folks also offered fine large crystals of **forsterite** and **edenite** in matrix from the same site, and sharp floater crystals of lustrous, translucent brown **zircon**, the best of them thumbnail-size, found six years ago at another of the area's diggings. Excellent crystals of **xenotime, sapphirine, enstatite** and white **apatite** likewise occur in these parts.

Ironically for this Year of China at the Main Show, there was almost nothing new in the way of Chinese minerals to be seen—although, of course, there were sterling specimens by the thousands of cinnabar, stibnite, ferberite, fluorite, etc. in about every fifth hotel room, and things like jade carvings, silkscreened prints, mahogany dragons, snuffboxes etc. were everywhere too. In the what's-new department I'll mention only that Rob Lavinsky had hundreds of Bisbee-like Chinese azurite/malachite specimens at the Main Show, and that, at the Clarion, Ivo Szegeny of KARP (karp@iol.cz) was showing off some nice crystals of **topaz** and **aquamarine** from a new, as yet undisclosed source in Yunnan Province. The topaz occurs as sharp, lustrous, transparent and colorless to palest brown crystals to 7 cm, with slightly frosted terminal faces. The aquamarine crystals are deeply colored, in large part gemmy, and occur as simple hexagonal prisms to 8 cm, either loose or resting lightly on matrix of quartz prisms and crude feldspar crystals.

Figure 18. **Phenakite penetration twin, 2.4 cm, from Momeik, Myanmar (Burma). John S. White collection; Jeff Scovil photo.**

EXHIBITS

Chinese minerals, of course, dominated the exhibit cases at the Main Show this year, and let's not forget to mention the wonderful Chinese lapidary objects as well. Standouts among these were five enormous carvings in jadeite and nephrite from the Lizzadro Museum of Lapidary Art; a serpentine vase standing a meter tall and downright fractal in its ornate detail, from the Rice Northwest Museum of Rocks and Minerals; and a meter-tall Statue of Liberty carved in lush green jade and mounted on a hand-crafted wooden replica of the architectural base of the original. Remarkably diverse barite specimens from China were shown by Bill and Diana Dameron, and four gigantic Chinese calcite specimens of very

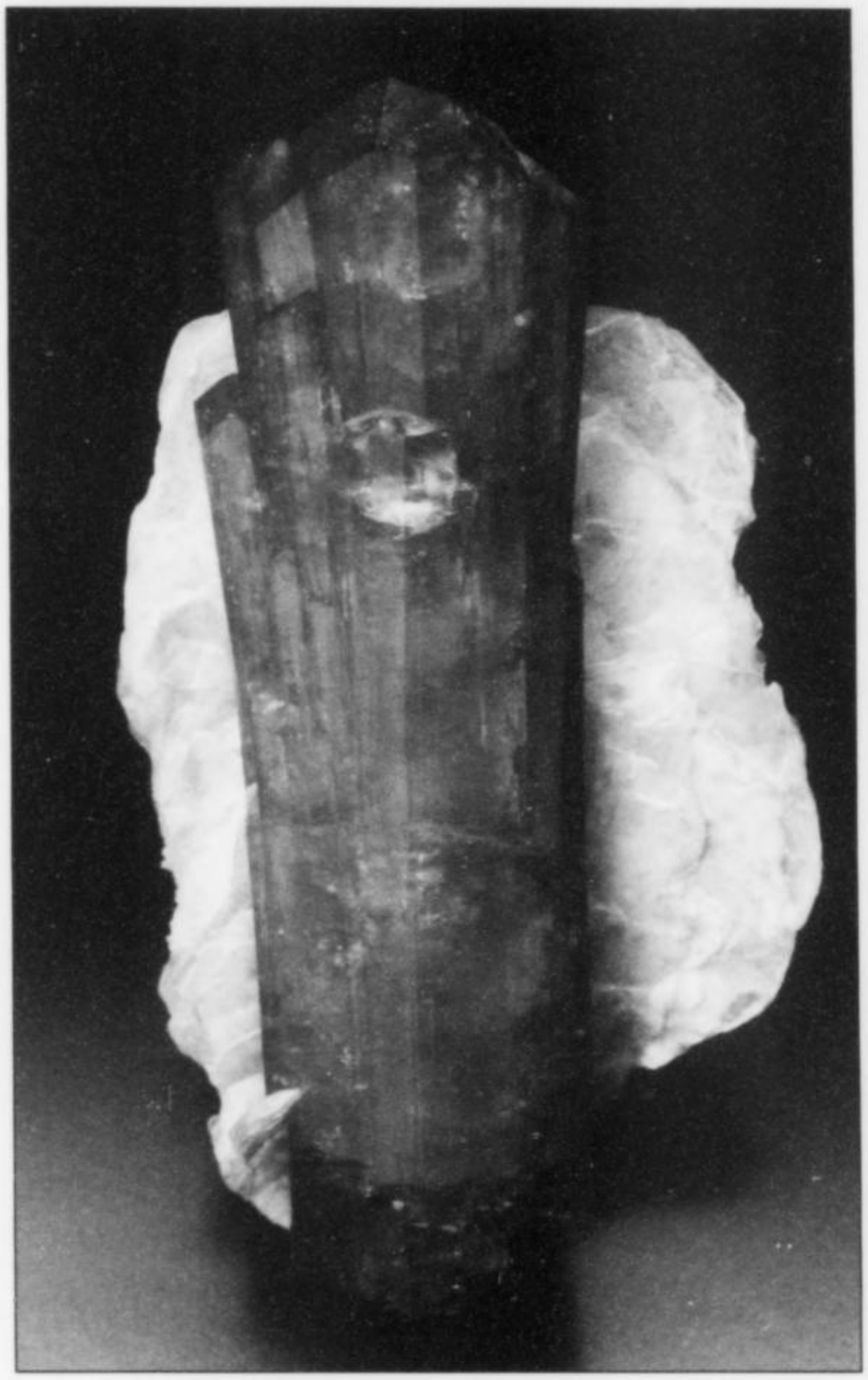


Figure 19. **Tourmaline (liddicoatite and elbaite) crystal, 10 cm, from the An Phu mine Luc Yen, Yen Bai Province, Vietnam. Jesse Fisher specimen and photo.**

different sorts were shown by Marty Zinn. A large array of exceptional Chinese specimens, common and rare, was shown by Bill Pinch, with a picture of the late Richard Bideaux looking down benignly from the back panel. Other excellent "general" presentations of Chinese minerals were put in by Pala International, the American Museum, the Los Angeles County Museum, Trafford/Flynn Minerals, the Royal Ontario Museum, and the Cincinnati Museum Center. My vote for most educational and creative China exhibit goes to Georg Gebhart, whose "Signs of Change" case showed specimens with text explaining how phantoms, inclusions, overgrowths, associations, etc. show evidence of changing conditions of formation—all these phenomena illustrated solely by specimens of fluorite from the Yaogangxian mine.

Splendid collections of miscellaneous minerals were shown by (among others) Sam Nasser (one case of cabinet specimens, two of thumbnails); Keith and Mauna Proctor; Irv Brown (these latter two presenting perhaps the show's most dazzling superspecimens in private hands); the Houston Museum; the Harvard Mineralogical Museum; the Carnegie Museum (Minerals of Bulgaria); the Mineralogical Association of Dallas; Bill and Elizabeth Moller; Matilda Pfeiffer; and KARP.

A series of *twelve* cases by Jeanne and Bill Larson and Rosalind and Gene Meieran showed "Birthstones," one case per species, as superb gem crystals. Evan Jones' case of Arizona wulfenite, the Arizona-Sonora Desert Museum's case of splendid Sonoran Desert pieces, and Dave Wilber's impressive assemblage of cut and polished nodules of condor agate were especially notable among the non-Chinese "specialty" cases, but there were many others . . . worldwide tourmaline (Jesse Fisher and Joan Kureczka); a case showing the finest of the newly won elbaite specimens from Mt. Mica, Maine (Gary Freeman); the new, earlier-mentioned, champion emerald specimen from North Carolina, all alone in a side case (the Houston Museum and North American Emerald Mines Company); a spread of wonderful old Franklin/Sterling Hill specimens (Sterling Hill Mining Museum); zeolites of the Pacific Northwest (Rice Northwest Museum); a monstrous open geode of Indian stilbite and fluorapophyllite (Gargoti Museum); those new, record-breaking Mt. Antero aquamarines (Collector's Edge); thumbnails from Bisbee (Gene and Doris Wright); a memorial case for the late Richard T. Liddicoat, with stunning polished slices of liddicoatite crystals (Gemological Institute of America); two fine thumbnail cases, one miscellaneous, one showing included quartz (Michael and Debbie Aussec). Among localities featured in special cases were Butte, Montana (Joan and Bryant Harris); Graves Mountain, Georgia (Weinman Mineral Museum); Ducktown, Tennessee (Henry and Patsy Schmidt); Bisbee, Arizona (Phelps Dodge Mining Company);

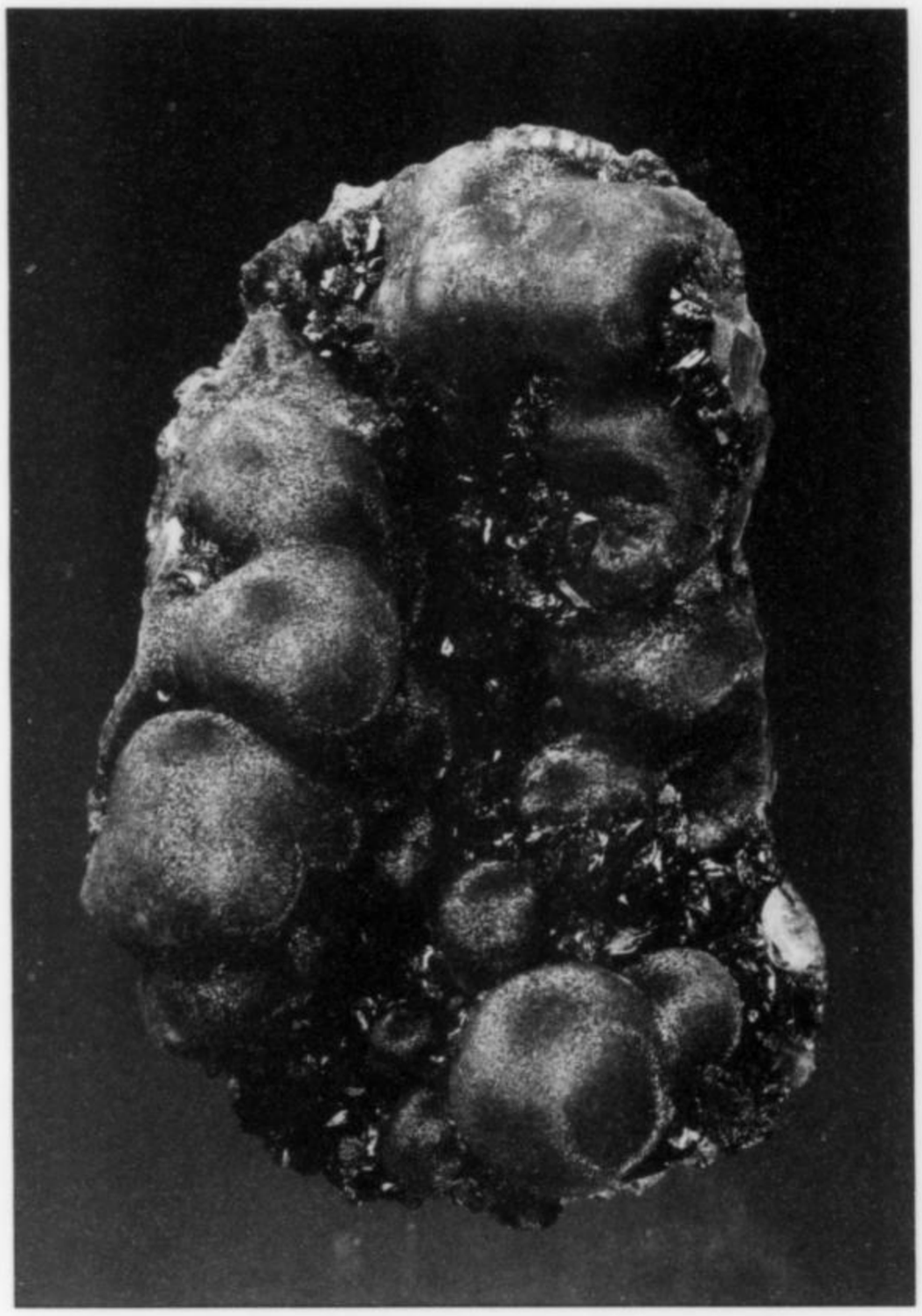


Figure 20. **Azurite and Malachite, 7.2 cm, from the Guichi mine, Guichi, Anhui, China. Rob Lavinsky specimen, now in the Marshall Sussman collection; Jeff Scovil photo.**

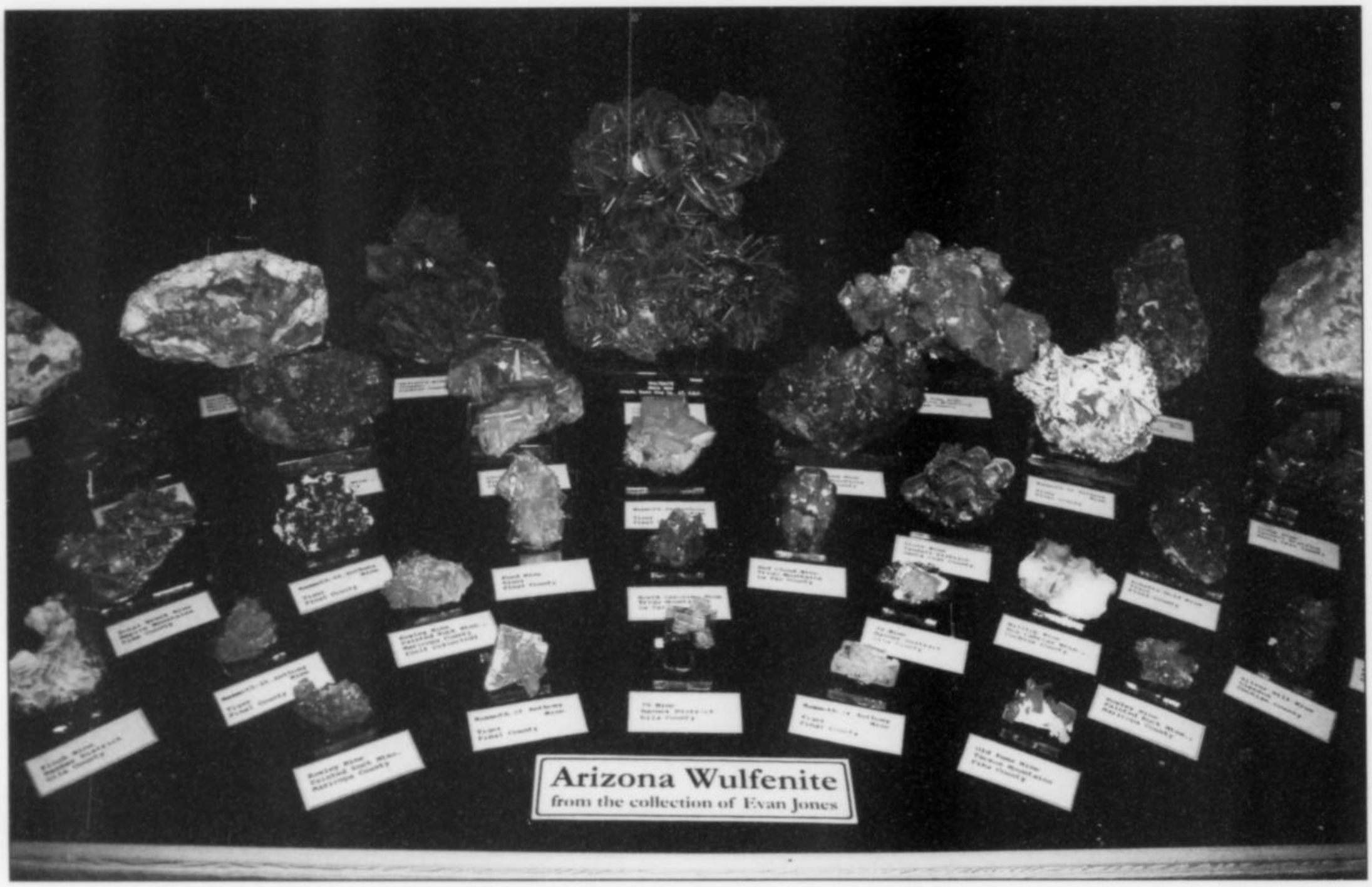


Figure 21. **"Arizona Wulfenite" case exhibited by Evan Jones. Wendell Wilson photo.**

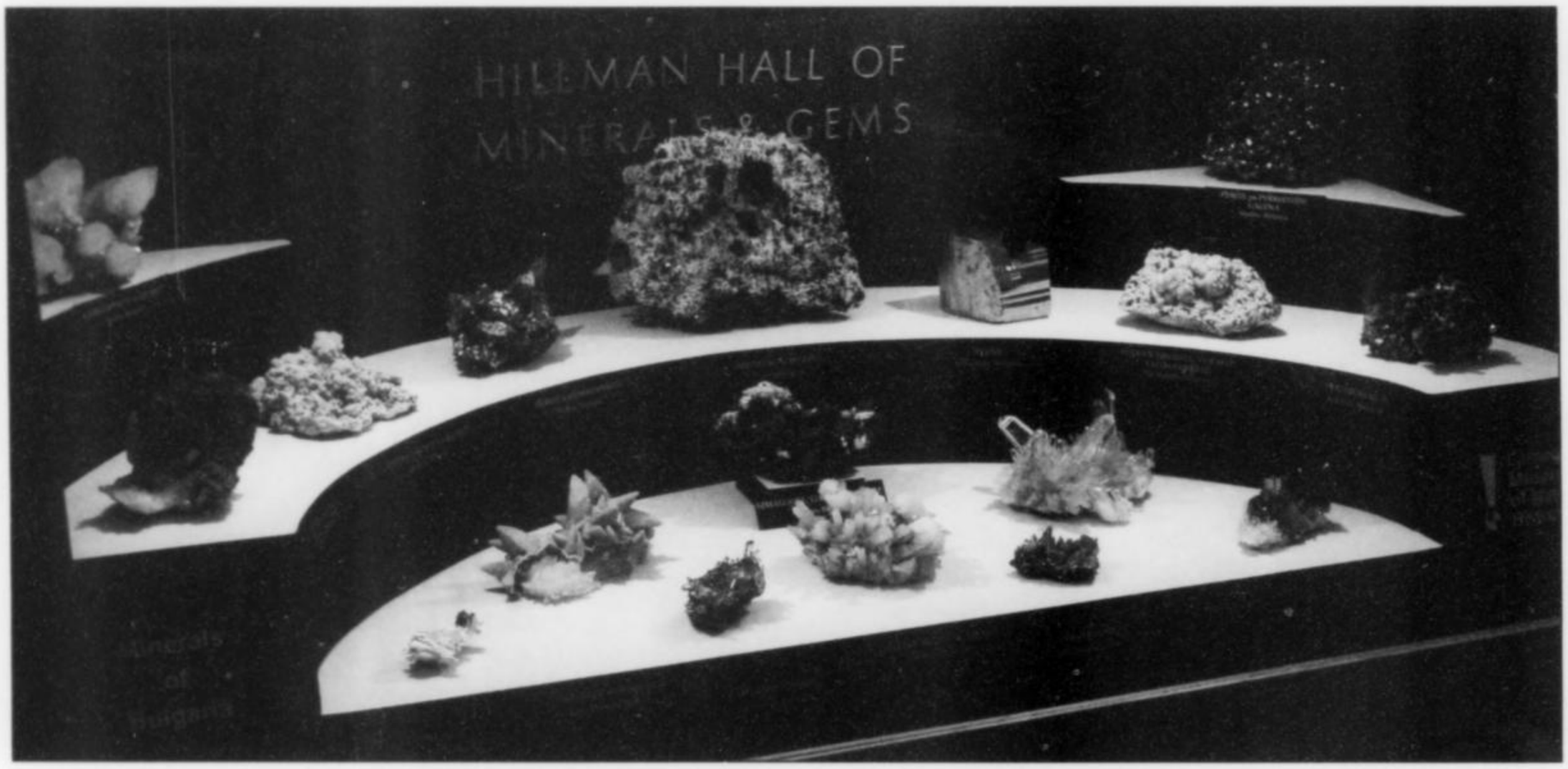


Figure 22. **"Minerals of Bulgaria" case exhibited by the Carnegie Museum of Natural History. Wendell Wilson photo.**

Zagi Mountain, Pakistan (Herb and Monica Obodda); the Rat's Nest claim, Idaho (John Cornish); and the planet Mars (with terrestrial samples of minerals now known to occur in those chill red plains—New Mexico Museum of Natural History and Science). And a big memorial case for Richard Bideaux by the Geo-Literary Society came off as tasteful, as cosmopolitan, and as polymath as the man himself had been.

In my humble opinion, the most wondrous exhibit case of all was the one called "American Classics" put in by the Smithsonian Institution. Such was the quality—and in many instances the sheer

Figure 23. **Topaz crystals, 5 cm, with quartz, from Ghundao Hill, Katlang, Northwest Frontier Province, Pakistan, exhibited in Irv Brown's case. Irv Brown collection; Wendell Wilson photo.**

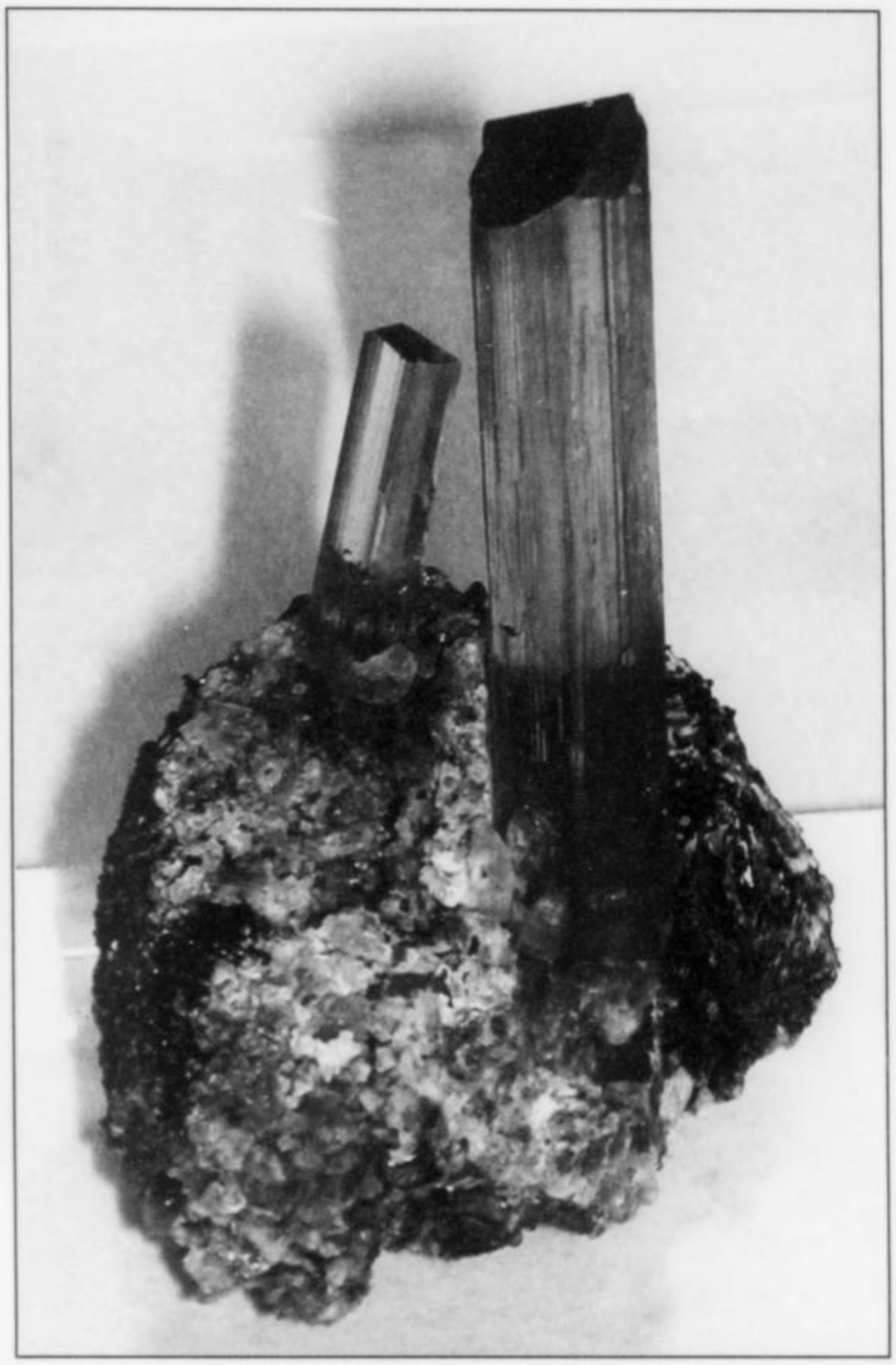


Figure 24. **Scapolite crystals to 12 cm, on matrix, from Badakhshan, Afghanistan. Bill Larson collection; Wendell Wilson photo.**

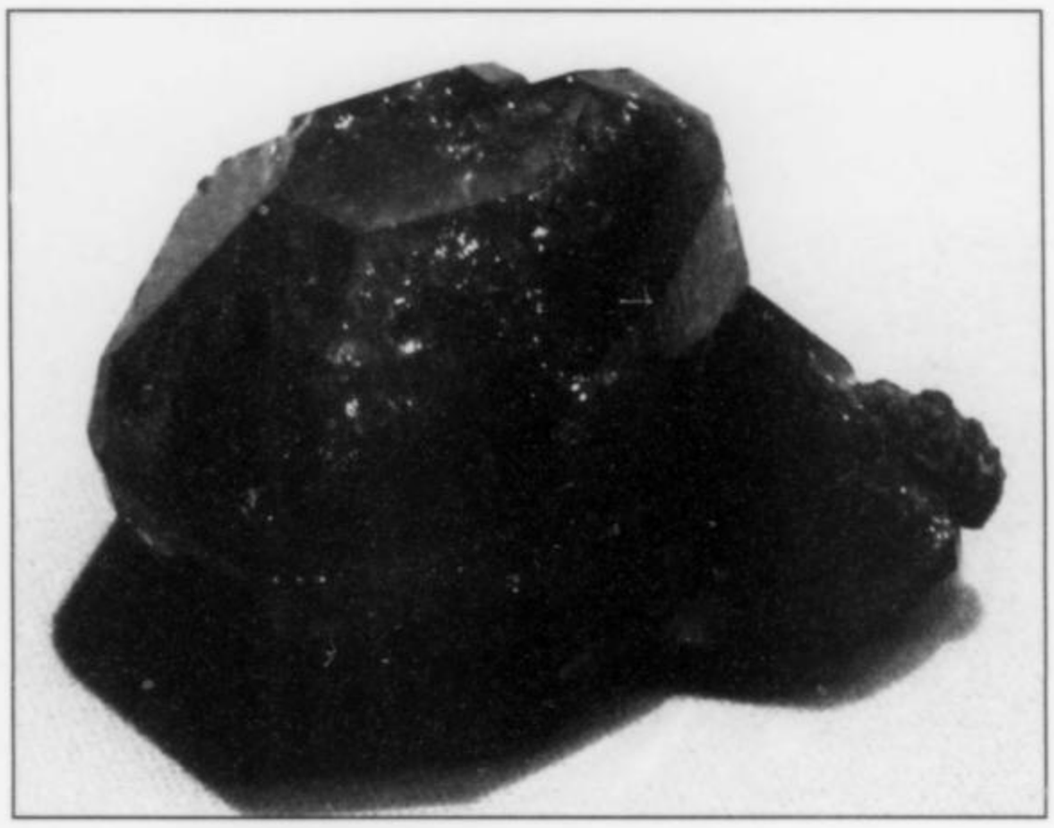
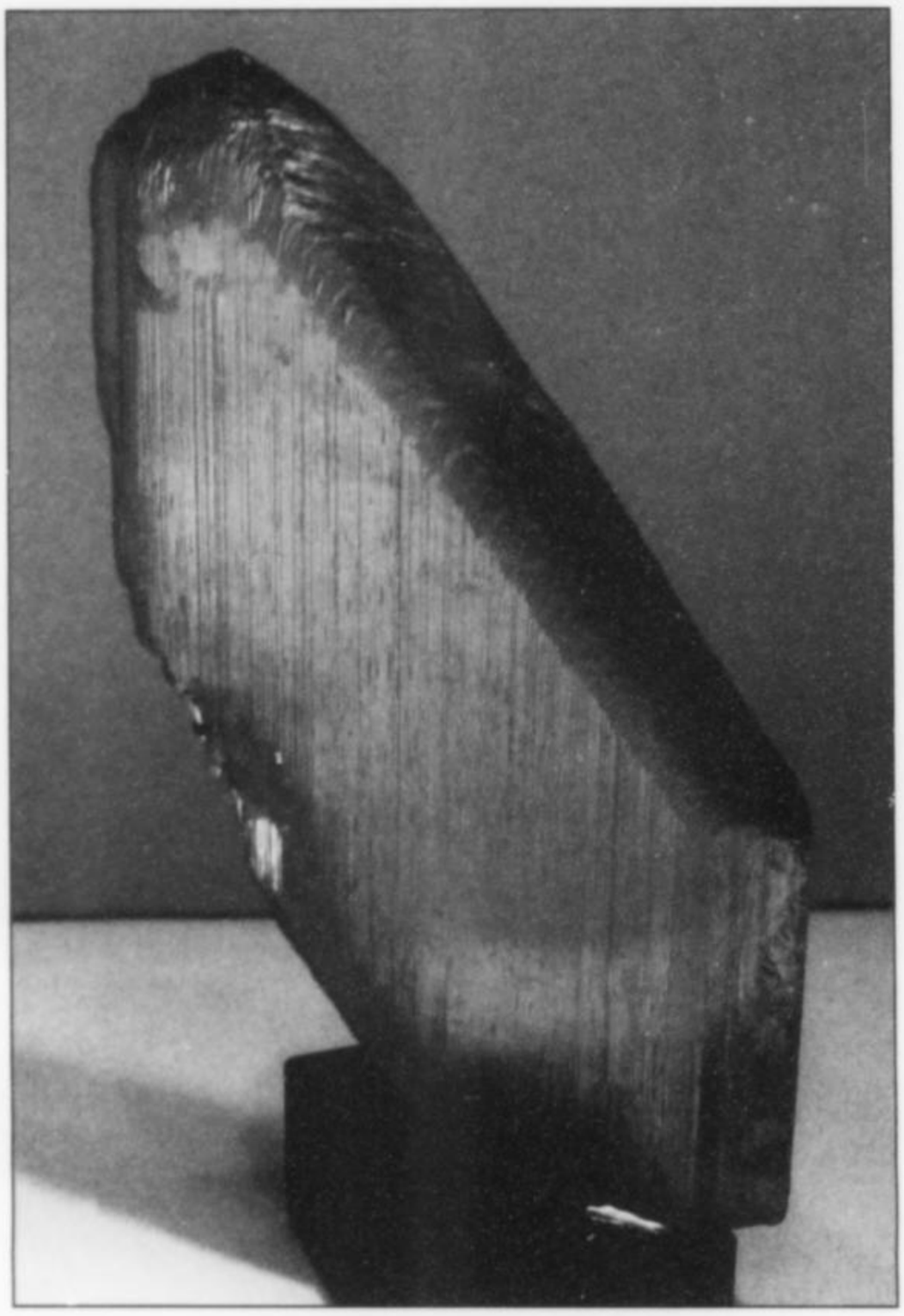


Figure 25. **Fluorapatite, 4.3 cm, from the Pulsifer quarry, Auburn, Maine. This is the famous "Roebling Apatite," displayed this year in the Smithsonian's "American Classics" case. Smithsonian Institution collection; Wendell Wilson photo.**

fame—of these great old specimens that one had the impulse to fall to one's knees; for here was the great, famous specimen with two crossed emerald crystals from Hiddenite, North Carolina; an unbelievably fine and beautiful Michigan copper/calcite; a complete octahedron of franklinite fully 12 cm on edge, in matrix, from Franklin, New Jersey; a marvelous Bristol, Connecticut chalcocite; and finally the "Roebling" fluorapatite from the Pulsifer quarry, Maine—surely one of the top, say, ten mineral specimens of any kind in the world. I'd not visited the piece since the old days of the "gem room" in the Smithsonian Natural History Museum, and I must say that it is looking as good, as lustrous and huge and richly gem-purple, as ever.

At the Saturday night awards ceremony I had the pleasure of seeing my old college buddy Doug Toland receive the Friends of Mineralogy award for best article in the *Mineralogical Record* during the preceding year: his account of 30+ years of collecting on Green Monster Mountain, Prince of Wales, Alaska. The Friends also recognized Jesse Fisher for having written the best article in *Rocks and Minerals*, and Herb Obodda for best article in *ExtraLapis English* (this is a new award named for Dr. Werner Lieber). Bill Larson took the Miguel Romero award for best Mexican specimen (his huge Guerrero amethyst), and Charles Key won the Pinch Medal for his contributions to mineralogy. Allan Young put in a dazzling competitive case of thumbnails, and for his trouble he



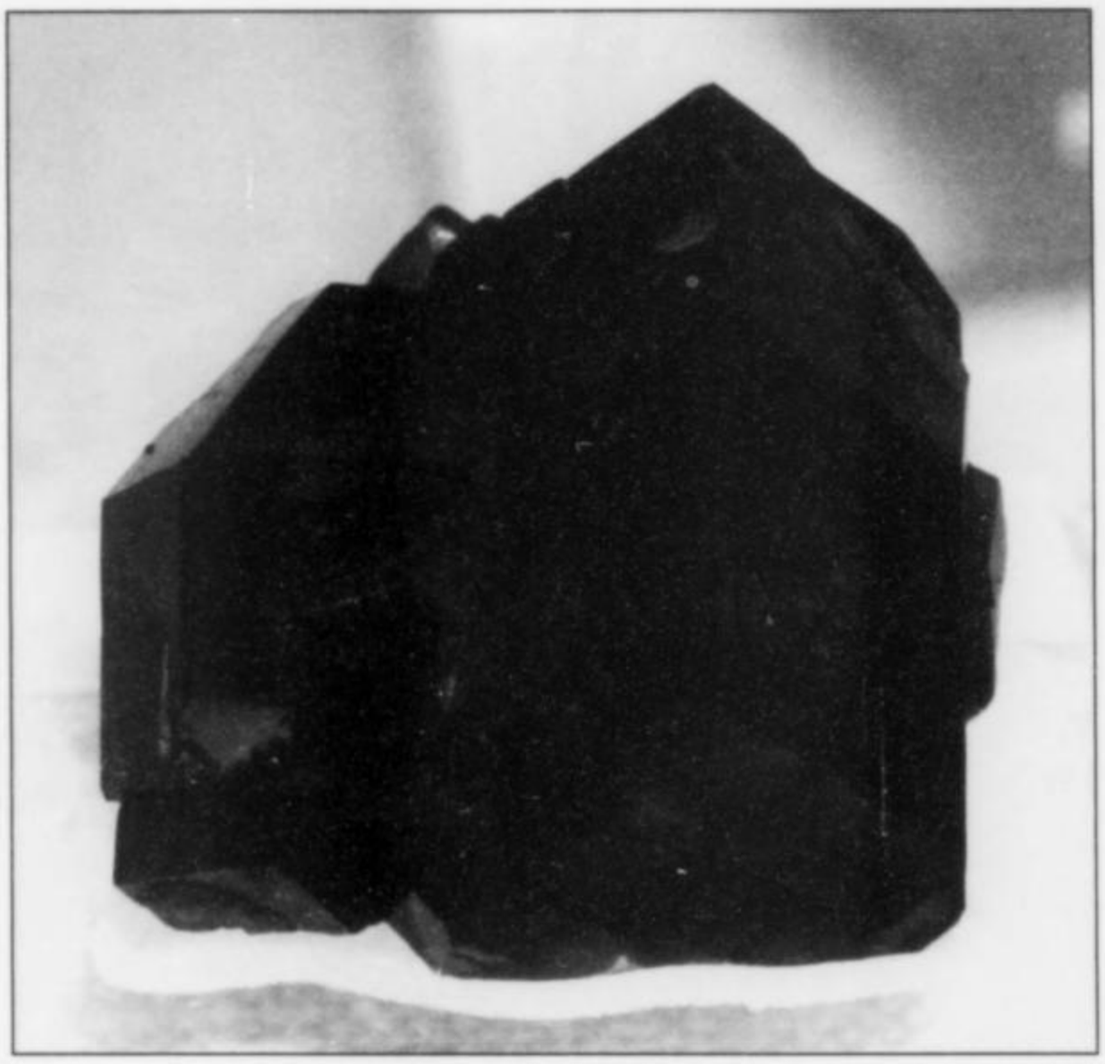


Figure 26. **Dioptase crystals, 2.9 cm, from the Tsumeb mine, Namibia. Wallace Mann collection, ex Wendell Wilson collection; Wendell Wilson photo.**

Figure 27. **Spodumene crystal, 16 cm, from Pala, San Diego County, California, as displayed in the Smithsonian's "American Classics" case. Smithsonian Institution collection; Wendell Wilson photo.**

Figure 28. **Dave Wilber's large case of polished slabs of "condor agate" from the Patagonia region, Argentina.**

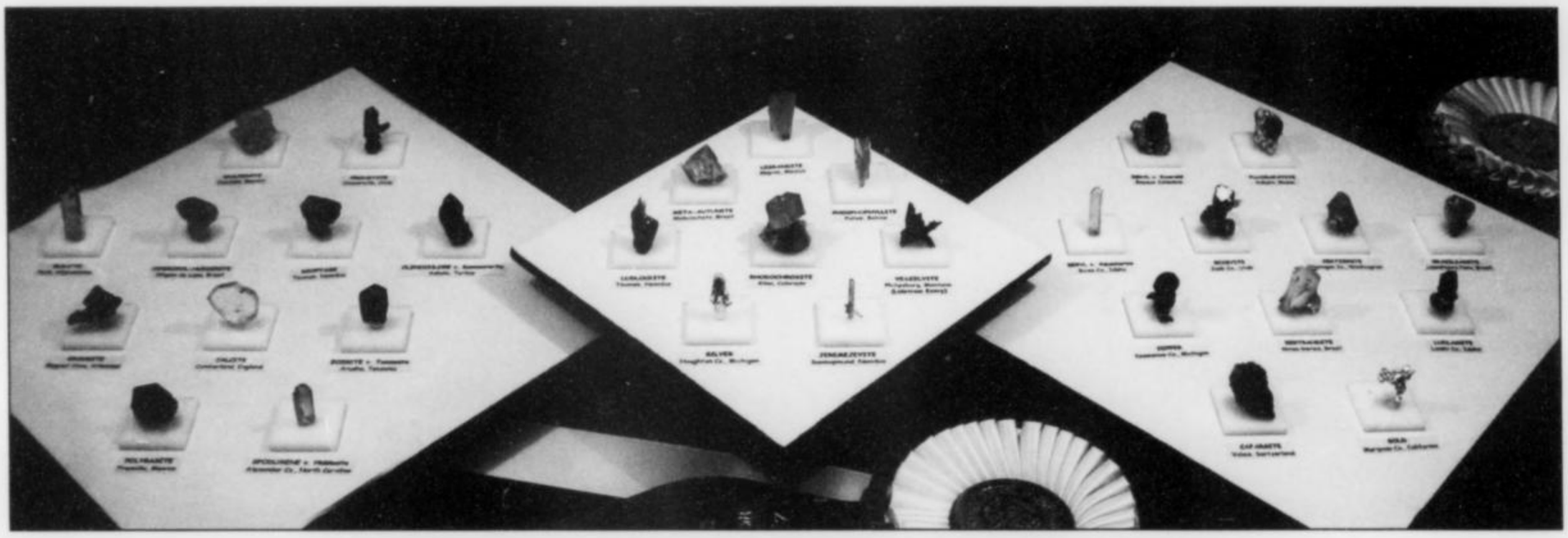


Figure 29. **Allan Young's thumbnail case, which won First Prize, Master Division, for competitive cases, as well as the Desautels Award for best case in show; in the middle pedestal on the right is the veszelyite specimen from the Black Pine mine, Montana, which won the Lidstrom Trophy for best single specimen in the show. Wendell Wilson photo.**

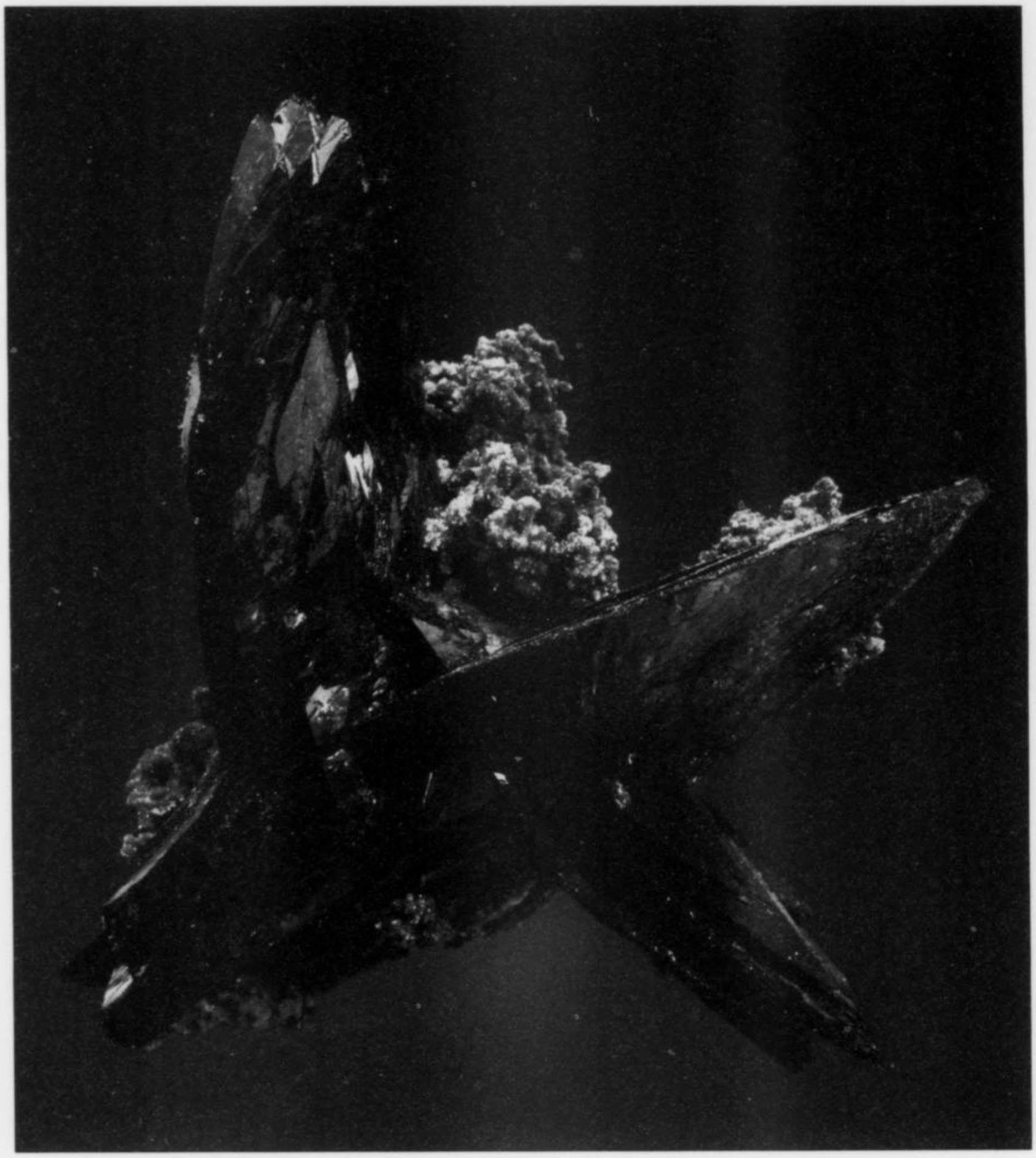


Figure 30. **Veszelyite thumbnail cluster, 2 cm, from the Black Pine mine, Phillipsburg, Montana—the Lidstrom Trophy winning specimen. Allan Young collection; Jeff Scovil photo.**

won a "Trifecta," taking not only the Master award for competitive cases but also the Desautels award for best case in the show and the Lidstrom Trophy for best single specimen (his veszelyite from the Black Pine mine, Montana). Bill and Elizabeth Moller won the newly created Richard A. Bideaux Memorial Award (which from now on will be given each year) for the best Arizona specimen in the show—the Mollers' cuprite from the Old Dominion mine took the prize this first time. Finally, the Carnegie Award for contributions to mineralogy went to former Houston Museum curator Joel Bartsch, who was recently appointed President of the museum. The crowd seemed to like Joel's brown suit and yellow necktie, and, even more, his urbane, self-deprecatingly witty acceptance speech.

I'll be seeing you all next year, when the theme at the Main Show will be the minerals of Canada!

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Who We Are

The Friends of Mineralogy (FM), formed at Tucson, Arizona on February 13, 1970, operates on a national level and also through regional chapters. It is open to membership by all. FM's objectives are 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.

Among its activities it sponsors awards for best articles each calendar year in *the Mineralogical Record*, *Rocks & Minerals* and e*xtraLapis English* and gives special recognition at the February Tucson Gem and Mineral Show for exhibits which help explain an aspect of mineralogy.

Friends of Mineralogy 2005 Awards

The Friends of Mineralogy presented the awards at the Saturday night banquet of the Tucson Gem and Mineral Show. The winners at the 2005 Tucson Show were:

Best Article 2004, ***The Mineralogical Record***, Doug C. Toland—Famous Mineral Localities: Green Monster Mountain, Prince of Wales Island, Alaska (v. 35, n. 5, p. 383-404, 419-420)
Best Article 2004, ***Rocks & Minerals***, Jesse Fisher—Fluorite from the Northern Pennines Orefield, England (v. 79, n. 6, p. 378-398)
Best Article 2004, *extraLapis English* *(Werner Lieber Award)*, Herb Obodda—Opening Pakistan's Mineral Market (No. 6—Pakistan—Minerals, Mountains, & Majesty)
Best Educational Case, TGMS, 2005—Individual, Members of Mineralogical Society of Cleveland—"Surprise Endings", an exploration of the types of overgrowths and terminations on minerals.
Best Educational Case, TGMS, 2005 —Institutional, California Academy of Sciences—"Am I Blue?", a discussion of the cause of blue colors in minerals and geological materials.

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

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Do You Exhibit at the Tuscon Gem and Mineral Show?

The Friends of Mineralogy sponsors non-monetary recognition at the Tucson Gem and Mineral Show (TGMS) for displays that help explain an aspect of mineralogy. There is no restriction on the theme, but the exhibit 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. The winners are honored at the Saturday night banquet and on plaques displayed in the FM case. Instructive exhibits 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 displays.

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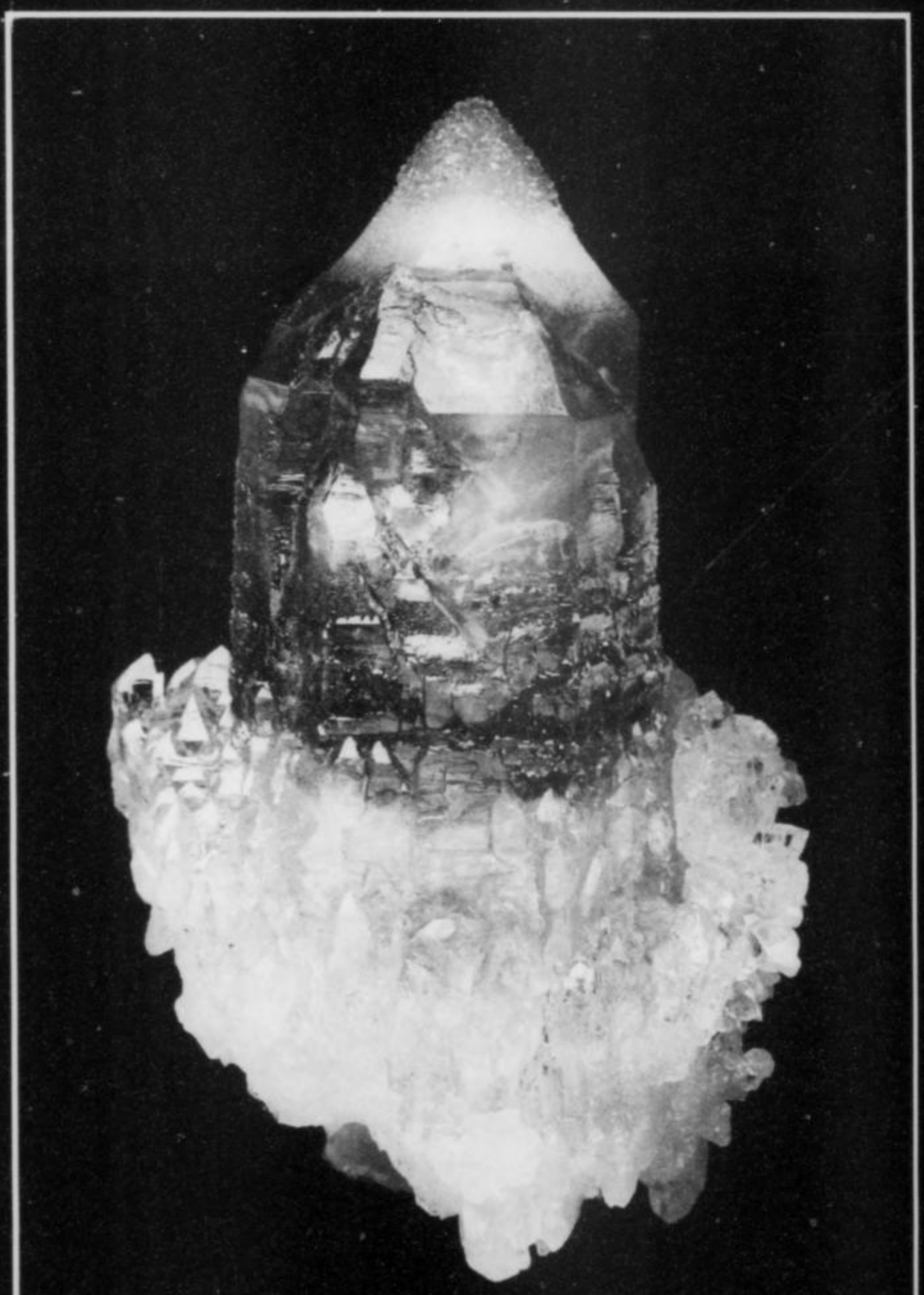

QUARTZ (rose, smoky & colorless). Sapucaia mine, Minas Gerais, Brazil. Photo by Harold & Erica Van Pelt.

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