



Mineralogy FAQs

What Causes the Origin of Iris Banding in Agate?

Agates are among the most beautiful and enigmatic of naturally banded rocks. The results of recent investigations suggest that their oscillatory layering arises from self-sustaining fluctuations in the fluids from which they formed.... Regardless of its origin, silica is by far the most abundant constituent of all agates, generally accounting for more than 99% by weight....

Iris banding. In 1813, the eminent Scottish scientist Sir David Brewster noted that thin slices of agate can yield spectral colors when held against a light, but it was not until 30 years later that he realized that this iridescence arises from periodic, concentric striations that act as a diffraction grating for visible light (like the modern-day grooves on a compact disc). This phenomenon indicated that the periodicities of these striations must be close to the wavelength of visible light [380 to 760 nanometers =(nm)] and that they must be regular and extensive.

Since then, repetitions of more than 8000 bands have been found within single agates. Light optical studies have demonstrated that iris banding is restricted to the fibrous chalcedony layers and that the bands are oriented perpendicular to the twisted fiber growth axes. Although iridescence is not obvious in all agates (especially those that are heavily pigmented), most specimens reveal iris striations on close examination. Nevertheless, the true nature of these striations remained a mystery for the 150 years following the work of Brewster. Some authors attributed them to the rhythmic segregation of amorphous opal within chalcedony, and others to regular changes in fiber orientation; however, subsequent examination of iris agate by x-ray diffraction and electron microscopy disproved both of these hypotheses.

The model that gained the greatest currency was proposed by C. Frondel. Frondel etched sawn sections of iris agate with hydrofluoric acid, and on investigating the partially dissolved surfaces with a scanning electron microscope, he discovered that the concentric striations that constitute iris banding actually consist of alternating zones with different physical properties. One zone (the L band) is highly resistant to acid etching whereas the neighboring zone (the H band) is highly susceptible. In the simplest case, iris agate consists of rigorous oscillations between H and L bands. Knowing that even trace quantities of interstitial hydrogen can dramatically weaken [...] quartz, Frondel proposed that the difference in etching rates between the H and L bands arises from modulations in hydrogen concentration parallel to the fiber direction.

In order to test this hypothesis, the concentration of hydrogen and other impurity elements within iris agates was investigated using secondary ion mass spectrometry (SIMS). With this technique, it was possible to tunnel through a series of iris L and H layers by bombarding an agate surface with oxygen-16 ions, and the ablated material was analyzed as it was being produced. The results obtained in this study did not support Frondel's model. Although SIMS is capable of detecting small changes in hydrogen concentration, no fluctuations in hydrogen content between the L and H zones were observed.

Brazil twins and moganite. In the absence of evidence for compositional variations, researchers next studied modulations in structure. These, it turns out, occur in abundance. Images of iris bands obtained by transmission electron microscopy reveal that the striations correspond to alternations in average crystal size. The H bands, which are easily etched with acid, are very fine-grained (with crystal diameters of 5-10 nm), whereas the acid-resistant L bands contain coarse crystals of 100 to 1000 nm in diameter. Moreover, the fine-grained H bands differ from the coarse-grained L bands in other important ways. Quartz, like many organic molecules, has a structural handedness. Crystals that contain right-handed zones intergrown with left-handed zones are described as Brazil twinned. The study with the transmission electron microscope revealed that the H bands contain a profusion of Brazil twin boundaries, whereas these structural defects are rare in the L bands.

When right- and left-handed quartz alternate regularly at the atomic scale, they create a new mineralogical hybrid called moganite, and it now is known that virtually all chalcedony fibers contain intimate intergrowths of quartz and moganite. A recent study indicates that the moganite within the chalcedony fibers of iris agate is segregated entirely into the fine-grained, Brazil-twinned H bands. In summary, the striations that correspond to iris banding represent oscillations in grain size, Brazil twin defect concentration, and moganite content.

This hypothesis suggests a chemical feedback that may explain the periodic quality of the iris bands. Field and laboratory evidence indicates that the spiral growth of chalcedony from polymeric silica occurs much more rapidly than the slow growth of defect-free quartz crystals from monomeric silica. If the influx of dissolved silica monomer into an agate cavity outpaces the loss of silica upon precipitation, then the concentration of silica within the vug will gradually increase. At some critical concentration of silica, polymerization will ensue, and fibrous chalcedony will precipitate. As this is a rapid reaction, the deposition of silica now outpaces the influx into the agate cavity, and dissolved silica concentrations decrease. When levels are sufficiently low, polymerization cannot be sustained, and defect-free quartz again precipitates from monomeric silica. Thus, iris textures in agates may reflect a steady-state disequilibrium in the chemistry of the system.

Article by Peter J. Heaney. Used by Permission. Extracted from Parker, Sybil P., Ed. (1998) McGraw-Hill Yearbook of Science and Technology. McGraw-Hill, New York, pp. 253-255.

Roland Bounds. On October 18th, 2002, Roland Bounds of Newark, Delaware, passed away. His sudden and unexpected death has deprived the Friends of Mineralogy of one of its staunchest members and officers. The Fall 2002 Symposium of the FM Pennsylvania Chapter was dedicated to Roland. As a long-time member and officer of both FM National and FM Pennsylvania Chapter, he will be sorely missed. FM extends its condolences to his family. FM received a thank-you note from Roland's family which read: "Dear Friends of Mineralogy, Thank you for the beautiful flower arrangement. Roland enjoyed minerals a great deal and he enjoyed making friends with all his fellow mineral lovers! He will be missed by many. Your kindness was appreciated, (signed) The family and friends of Roland Bounds".

Dues Notice: Dues are past due as of April 1. If you haven't paid your dues yet, please do so now. Please fill out and send in the form in this newsletter along with your dues. Former members of FM are strongly encouraged to re-join. We will be issuing a new FM National Directory by February 2003. Past due members will not be included. Please renew now if you'd like to be included in the Directory.

Andrew A. Sicree, Ph.D., FM National Newsletter Editor

Reports

MISSISSIPPI VALLEY CHAPTER OCTOBER 2002 SEMINAR REPORT

October 19-20, 2002 Seminar on "ILLINOIS-KENTUCKY FLUORSPAR DISTRICT". The third annual Mississippi Valley Chapter Friends of Mineralogy Seminar was attended by 14 regular members and 4 new members. The Seminar was held in the Hardin County Illinois and northern Kentucky Fluorspar areas and was lead by Bruce Stinemetz. The Chapter members wish to thank Bruce for all his hard work, his time and energy in providing our chapter with a first rate seminar. The event was interesting and well-organized. The San Damiano Retreat Center of Golconda, IL was the meeting place for the morning and evening activities prior to field work for both Sat. and Sun.

Thank you to the speakers Mr. Alan Goldstein, Mr. Eric Livingston, and Mr. Dean Stone. Alan Goldstein has a BS degree in Geology and a Masters degree in teaching. Alan authored the Mineralogical Record Fluorite edition. Eric Livingston is the current manager on site at the Ozark-Mahoning Company in Rosiclare, Illinois. Eric attended the University of Missouri-Rolla where he earned a BS degree in Geology. Dean Stone is the past president of the Midwest Federation and a director of the American Land Access Association. Bruce collaborated with other members to create the field guide books. The other members who participated in the creation of the field guide books included Mark Sherwood who provided the photography of the mineral specimens, and Ted and Carol Ferguson and Charley and Martin Mueller. Eric and Sheri Livingston hosted our group tour of the American Fluorite Museum in Rosiclare. Eric also conducted an informative tour of the fluorite processing plant in Rosiclare. The Ben E. Clement Mineral Museum in Marion, KY was also visited by the group. Some of the sites that were scouted for fluorite and associated mineralogy included the Rosiclare area, the Annabel Lee, the Columbia and Lafayette Mine areas. Chapter members are most grateful to Don Hastie of the Hastie Quarry for allowing our group to collect at this most interesting location.

The chapter determined the 2003 Seminar will be held in Keokuk, Iowa where geodes form of the Warsaw shale area and related geographical areas. Next Mississippi Valley Chapter of the Friends of Mineralogy will be held on Saturday March 9, 2003 at 9:00am at the Kansas City Gem and Mineral show at the KCI Expo Center.

Submitted by the Secretary: Carol Ferguson.

PACIFIC NORTHWEST CHAPTER SEPTEMBER 2002 SYMPOSIUM REPORT

The 28th Annual Pacific Northwest Friends of Mineralogy Symposium was held at the Red Lion Hotel, in Kelso/Longview, WA, Sept. 27 through 29, 2002. The theme was "Inclusions: The Inside Story," and was enjoyed by 82 registrants. A total of 18 displays were presented which included several presented by Symposium speakers.

There were three dealers on the main floor: Harvey Gordon Minerals, Lehigh Minerals, and Oxcart Minerals. As usual, our floor dealers brought a great selection of material from well-known localities and some new finds from both new and old localities. Fifteen satellite dealers had a variety of minerals including selections from commercially mined localities, private collections, and various discoveries by Northwest field collectors. We thank all of them for their part in making this a very successful symposium.

John Koivula opened the Saturday morning program with a superb slide presentation of photomicrographs displaying the myriad forms that inclusions may take in minerals. John White followed with a visual tour "Inclusions as an Art Form" utilizing the skills of many talented photographers (photomicrographers!). John Koivula and John White also gave afternoon presentations on the "Microworld of Diamonds" and on classic "American Gemstone" localities, respectively. The Sunday morning program started with PNW Chapter member Rudy Tschernich who presented theories on the formation of plume, moss, and sagenite agate using the Graveyard Point, Malheur Co., Oregon locality as a primary example. Paul Schlichta, also a PNW Chapter member, gave a presentation on one of his life-long interests, inclusions in halite. Si and Ann Frazier presented a slide tour of various pseudomorphs, also discussing the difficulties in identifying original minerals in pseudomorphs.

The annual and lively specimen auction, spearheaded by Bob Smith, was held during the Saturday night banquet and netted \$1,420. The proceeds were used to help defray symposium expenses. Silent auctions were held throughout the weekend and added an additional \$120 to the PNWFM coffers. All specimens and mineral-related items were donated by dealers, members and friends. Lorna Goebel, with assistance from Doug Merson and Ty Balacko, hosted the micromount table on the main floor. Bob Meyer organized the challenging contests and awarded two \$25 prizes at the Sunday morning meeting.

The Noble Witt award was presented this year to John Lindell for his long time support of the PNWFM Chapter and his many contributions towards the collection and preservation of mineralogical specimens. John has been a Chapter officer in several positions and is a continuous contributor to our Symposiums, providing artwork and production for T-shirts in addition to other Symposium Committee duties. Everyone enjoyed the interesting programs, lively speakers, spectacular slideshows, excellent displays and shopping for specimens with a great group of dealers. As always, old friends managed to catch up on latest finds and collecting tales.

Symposia

THE 25TH ANNUAL TUCSON MINERALOGICAL SYMPOSIUM

Minerals of the Andes

Saturday, February 15, 2003, Tucson Convention Center

*Sponsored by the Friends of Mineralogy, the Tucson Gem and Mineral Society,
and the Mineralogical Society of America*

- 10:00 am Introduction: Robert Cook**
- 10:10-10:20 am Llallagua, Bolivia – Mineral Associations and Habits Exhibited by Micromounts in the Collection of the National Museum of Natural History (Smithsonian Institution)**
Robert B. Cook, Dept. of Geology and Geography, Auburn Univ., AL 36849;
Paul Pohwat, Dept. of Mineral Sci., National Museum of Nat'l Hist., Washington, DC.
- 10:20-10:40 am Exceptional Apatites from the Siglo XX mine, Llallagua Bolivia**
John Rakovan, Dept. of Geology, Miami Univ., Oxford, OH 45056
- 10:40-11:00 am Japan-Law Quartz Twins from Bolivia and Peru**
Jaroslav Hyrsl, Heverova 222, 280 00 Kolin, Czech Republic
- 11:00-11:20 am Strange Minerals of a Salt Dome Caprock in Cochabamba Department, Bolivia**
Alfredo Petrov, 531 N. James Street, Peekskill, New York 10566-2401
- 11:20-11:40 am Bolivian Minerals in the Bandy Collection**
Anthony R. Kampf and Dorothy L. Ettensohn, Dept. of Mineral Sciences, Natural History Museum of Los Angeles County, 900 Exposition Blvd., Los Angeles, CA 90007
- 11:40-12:00 Discussion**
- 12:00-1:00 pm Lunch**
- 1:00-1:20 pm Refreshing a Regional Focus at Harvard: Szenics Collection of Chilean Minerals**
Carl A. Francis, Harvard Mineral Museum, 24 Oxford Street, Cambridge, MA 02138;
Terry Szenics, 4 Manchester Drive, North Massapequa, NY 11758
- 1:20-1:40 pm A Decade of Mineral Discoveries in the Atacama Desert of Northern Chile**
Terry Szenics, 4 Manchester Drive, North Massapequa, NY 11758
- 1:40-2:00 pm The Polymetallic Capillitas Deposit, Catamarca, Argentina**
Fernando Colombo, Museo de Mineralogía y Geología; Dr. A. Stelzner Facultad de Ciencias Exactas, Fisicas, y Naturales Av. Velez Sarsfield 299, (5000) Codoba, Argentina
- 2:00-2:20 pm Silver Minerals of Peru**
Terry C. Wallace, Department of Geosciences, Univ. of Arizona, Tucson, AZ 85721
- 2:20-2:40 pm Mineral-Producing Mines of Peru**
R. Scott Werschky and Alan R. Day, 5655 Riggins Court, Suite 15, Reno, Nevada 89502

SOUTHEAST CHAPTER SYMPOSIUM: NOVEMBER 8, 2003: CALL FOR ABSTRACTS

Julian Gray is the new President of the Southeast Chapter of Friends of Mineralogy. The Chapter was already begun planning their Fall 2003 Symposium, the theme of which will be "Phosphate Mineral Occurrences in the Southeastern USA", to be held on November 8, 2003. For more information please contact Julian C. Gray, Grad Asst., Dept. of Geology, Georgia State Univ., 24 Peachtree Ctr. Ave., Rm 340-Kell Hall, Atlanta, GA 30303, Main Office (404) 651-2272, FAX (404) 651-1376, <jcgray@gsu.edu>

Mineral Notes

CALL FOR VOLUNTEERS FOR THE FRIENDS OF MINERALOGY BOOTH, TUCSON SHOW

This coming year, for the first time, the Friends of Mineralogy will have a booth in the upper hall, the Gallery, at the Tucson Gem and Mineral Show, Feb. 13-16, 2003. We need volunteers to staff the booth, answering questions and handing out information about FM chapter events, etc. We will have a standing exhibit on a table with pictures and information and there will be handouts including information on each chapter, how to become a member, what our website address is, and what the national organization does. The FM booth will be in the same space as the Mineralogical Society of America and the Mineralogical Society of Canada to provide a 'one stop shopping' for mineralogical organizations!

Hours of operation for the booth are the regular hours of the show: Thurs., Feb. 13, 10 am-6 pm; Fri., Feb. 14, 10 am-6 pm; Sat., Feb. 15, 10 am-6 pm; Sun., Feb. 16, 10 am-5 pm. **If you can give an hour or two (or more!)** during your precious time at Tucson, please email Susan Eriksson at serikssn@vt.edu with the times that you staff the booth. If your chapter has samples of publications to put out, please send them, along with instructions on how to order, to Ray Grant, 3262 W. Monterey St., Chandler, AZ 85226 or bring the materials to Tucson. For questions contact Ray Grant by e-mail at raycyn@cox.net. This is a wonderful opportunity for the organization to gain visibility and serve a greater audience.

PEGMATITE INTEREST GROUP

The Pegmatite Interest Group is hosted by the MSA at <http://www.minsocam.org/msa/special/Pig/>. Dave London of the U of OK asks us to let FM members know of the site, and know that they are welcome to send him pegmatite-related (people, places, rocks, minerals) news, photos, information, etc., to post there. Contact: David London, School of Geology & Geophysics, Univ. of Okla., 100 East Boyd St., Rm 810 SEC, Norman, OK 73019; (405)325-3253, FAX (405)325-3140; or email: dlondon@ou.edu.

MINERALS AND MAN EXHIBIT

Ray Berry, secretary of FM Colorado and Editor of Colorado Springs Mineralogical Society newsletter, "Pick & Pack" has put a special exhibit in the Colorado Springs Pioneer Museum from October, 2002 thru May, 2003. It is called "Minerals and Man" and poses the question "Can modern man continue with our present civilization without mining?", then answers the question with a dozen specimens of metals and non-metals coupled with products using these minerals and again asking which ones the viewer would do without. The label for each mineral lists up to a dozen different uses, and includes samples of lipstick, eye shadow, baking powder and baking soda, matches, sugar, paper, chalk, dental crown, copper wire, wrenches, surgical instruments, etc. For more information, please contact Ray Berry at 7513 Tudor Rd., Colorado Springs, CO 80919, (719) 5987877, <rayber@peoplepc.com>

SPECIAL RECOGNITION FOR EDUCATIONAL CASES

At the Tucson Gem and Mineral Show, the Friends of Mineralogy sponsors non-monetary recognition for cases which help explain an aspect of mineralogy. There is no restriction on the theme, but the case should have some special "instructive" or "educational" feature. In keeping with the high standards of the TGMS, they should be aesthetically pleasing and contain specimens worthy of the show. Two certificates are awarded, one for private collections and one for museums. The winners are honored at the Saturday night banquet and their names are added to a plaque which will be featured at the Tucson show. No entry form necessary; all cases are judged. Educational/Instructive cases help the hobby grow and underline its scientific basis. Individual and institutional Tucson exhibitors are asked to consider seriously such a feature for their cases.

Past institutional and individual winners have been: 1999: U. of Bonn Mineral Museum – *German Mining Districts*; Mary Murphy – *Mineral Books*; 2000: Calif. Academy of Sciences – *Refractive Index*; Si & Ann Frazier – *Quartz Pseudomorphs*; 2001: Colo. School of Mines – *Mineral Fakes*; Jack Thompson – *Quartz*; 2002: Cincinnati Nat'l Hist. Museum – *Encrustation Pseudomorphs*; Chuck Houser – *Calcite Twins*.

Nominations

NOMINATING COMMITTEE REPORT: The Nominating Committee for the Friends of Mineralogy is pleased to submit the following nominations for members of the Board of Directors for the term of 2003-06:

Susan Eriksson is a mineralogist and igneous petrologist by training and has been curator of the Virginia Tech's Museum of Geological Sciences for 21 years. Her current work position as Associate Dean of the College of Arts and Sciences entails working with science and math faculty to produce more math and science teachers.

James F. Hurlbut has for the past 15 years volunteered in the Geology Department of the Denver Museum of Natural History as a Research Associate (500 hours a year). He has authored numerous publications and for 20 years taught "Rocks and Minerals of Colorado" in the University of Colorado Division of Continuing Education. Jim is a Past President of the American Federation of Mineralogical Societies and a member of the Society of Mineral Museum Professionals, Mineralogical Society of America, International Mineralogical Association, British Mineralogical Society and the American Association for the Advancement of Science. From 1955 to present, he has been president of the J. F. Hurlbut company, manufacturers representatives, selling scientific instruments and components to government labs and universities in the Rocky Mountain region. He is currently serving on the FM Board of Directors and as national Treasurer of FM.

Walt Lombardo is Senior Geologist and Chief of Southern Nevada Operations for the Nevada Division of Minerals. He worked as a geologist for the Water Resources Center of Desert Research Institute in Las Vegas; American Borate Company in Death Valley, California; as well as an exploration consultant for several gold-mining companies. Walt opened the Southern Nevada Office in 1988. Functions of the office include maintenance of the state database of producing mines; review of federal policies and decisions on mining and land use issues; liaison with federal, state, and local government agencies regarding mineral resource issues; liaison to law enforcement agencies on mining and precious metals fraud; and public information and education on mineral resource issues. Walt initiated the state IOF program with DOE and has acted as state-DOE liaison, facilitator of Best Practices training, and is coordinating the DOE Nevada Mining Industry showcase, scheduled for August 2003 in Elko, Nevada.

Anthony J. Nikischer is the founder and current president of Excalibur Mineral Corp., arguably the most prolific and well known supplier of rare mineral species in the United States. The company has specialized in rare minerals and meteorites since 1974, and added an analytical services laboratory with Energy Dispersive Spectroscopy capability in 1995. Anthony received his geological sciences training while majoring in geology at the City College of New York. He also holds a Bachelor of Sciences degree in Managerial Sciences from Manhattan college, studied X-ray microscopy at Lehigh University, and did post-graduate work at the University of Michigan. He has authored or co-authored numerous professional papers relating to earth sciences. He is a Life Member of the Mineralogical Society of America, a member of the Mineralogical Association of Canada, and a past member of the Spectroscopy Society and the mineral clubs. In 2001, the International Mineralogical Association's Commission on New Minerals and Mineral Names honored Anthony Nikischer with the naming of the new mineral "nikischerite", in recognition for his mineralogical discoveries and work with the scientific community.

Carol Smith (Broomfield, Colorado) is current president of the Greater Denver Area Gem and Mineral Council, the sponsoring organization of the Denver Gem and Mineral Show. She was twice chairman of the show, and before becoming the Dealer Coordinator, was the Exhibits Coordinator for six years. Her interest in minerals dates to 1976, when she met her husband Bill. They have collaborated on a number of magazine articles for Rocks and Minerals and the Mineralogical Record. Her real world experience was in local government in Maryland, where she was a computer programmer/analyst and semi-real world experience was in Democratic politics in Boulder County, Colorado.

Art Soregaroli has dedicated his professional career of more than 45 years to the study and application of geology to the search for and understanding of metallic, nonmetallic, gemstone and mineral deposits throughout the world. Most of his career has been in the mining industry, with brief but significant forays in academia and the Geological Survey of Canada. His interest in minerals and collecting was stimulated in grade school and has continued throughout his life. He served as a Director of the Friends of Mineralogy (1994-2000) and is currently a director of the Mineralogical Record (1997-present), a Director of the Pacific Mineral Museum Society, President of the British Columbia Museum of Mining, and has held various elected and appointed positions in several professional organizations.

The above nominees have all expressed their willingness to serve on the Board of directors, if elected.

A ballot for the election of directors is included with this newsletter; to be completed by members and mailed prior to January 27, 2003 to the Secretary of FM, Virgil W. Lueth, Ph.D., New Mexico Tech, 801 Leroy Place, Socorro, NM 87801.

*Respectfully submitted, Sharleen Harvey, Bill Dameron,
and Virgil Lueth, FM Nominating Committee*

Membership

Friends of Mineralogy ❖ Application for Membership (or Renewal) / Member Data Sheet

Last Name: _____ First Name: _____
 Street Address: _____
 City: _____ State/Province: _____
 Country: _____ Zip/Postal Code: _____
 Telephone: _____ (Home) _____ (Office)
 FAX: _____ (Home) _____ (Office)
 E-mail address: _____ Chapter Affiliation Desired: _____
 Signature: _____ Date _____

Friends of Mineralogy, Inc., is composed of members of 7 local chapters, plus national members not affiliated with a chapter. **Prospective national members should send their application and \$10.00/year dues to Jim Hurlbut, 2240 S. Adams St., Denver, CO 80210-4912. Phone 303-757-0283.** Prospective members of a chapter may submit form directly to the chapter contacts (Colorado, Midwest, Pacific NW, Miss. Valley, SouthEast, Pennsylvania, or Southern Calif.), to Jim Hurlbut who will forward it to the appropriate chapter. (You will be billed for your chapter dues, since they vary with individual chapters.)

Please Note: Dues are past due as of April 1. If you haven't paid your dues yet, please do so now. Please fill out and send in this form along with your dues. Former members of FM are strongly encouraged to re-join.

NATIONAL OFFICERS

President: Susan Eriksson, 1013 Draper Rd., Blacksburg, VA 24060, <serikssn@vt.edu>.
Vice President: Bill Dameron, 1609 NW 79th Circle, Vancouver, WA 98665, <baritebill@aol.com>.
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FM Web Site Address: <http://www.friendsofmineralogy.org/>.

CHAPTER CONTACTS

Colorado Chapter: President, Pete Modreski, 3555 Miller St., Wheat Ridge, CO 80033, (303) 425-9549, <pmodreski@usgs.gov>; V-P, Eunice York; Treasurer, Jim Hurlbut; Secretary, Ray Berry.
Midwest Chapter: Nelson Shaffer, 530 Cabot Ct., Bloomington, IN 47408, (812) 339-6623; <shaffern@indiana.edu>; website <http://www.indiana.edu/~minerals/index.htm>
Pacific Northwest Chapter: Sharleen Harvey, 2309 SW 1st Ave. #2142, Portland OR 97201-5080, (503) 248-4194, <bill-sharleenharvey@worldnet.att.net>; Jim Etzwiler, 3935 Interlake Ave. N., Seattle, WA 98103-8131, (206) 633-1512, <Kd7bat@arrl.net>.
Pennsylvania Chapter: Roland Bounds, 315 Stamford Dr., Newark, DE 19711-2723, (302) 731-8407, <25628@udel.edu>; website: <http://www.geocities.com/sajas.geo/FM/index.htm>
Southern California Chapter: Jack Nieberger, 25231 Pico Vista Way, Moreno Valley, CA 92557, (909) 242-1777; Bob Reynolds, 220 South Buena Vista St., Redlands, CA 92373-5129, (909) 798-8570, <jreynolds@empirenet.com>; website: <http://www.mineralsocal.org/scfm/welcome.htm>.
Mississippi Valley Chapter: Mark Sherwood, P. O. Box 436, Oak Grove, MO 64075-0436, (816) 690-8226, <msherwood@swbell.net>; Ted and Carol Ferguson, 3912 Queen Ridge, Independence, MO 64055 (816) 478-6418, <Hbkcphe@aol.com> or <Tferg62953@aol.com>.
Southeast Chapter: Julian C. Gray, Grad Asst, Dept of Geology, Georgia State U., 24 Peachtree Center Ave., Rm 340-Kell Hall, Atlanta, GA 30303; (404) 651-2272, FAX (404) 651-1376, <jcgray@gsu.edu>
Tucson Society: Peter Megaw <Tgmshg@azstarnet.com>.

Friends of Mineralogy, Inc., is affiliated with *The Mineralogical Record Magazine*, The Mineralogical Society of America, and the American Geological Institute.

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BALLOT FOR ELECTION OF FRIENDS OF MINERALOGY NATIONAL DIRECTORS 2003

(Vote for six)

- ____ Susan Eriksson
- ____ James F. Hurlbut
- ____ Walt Lombardo
- ____ Anthony J. Nikischer
- ____ Carol Smith
- ____ Art Soregaroli
- ____ (Other)
- ____ (Other)

Mail by Jan. 27 to: Virgil Lueth, FM Secretary, NMBGMR, New Mexico Tech, 801 Leroy Place Socorro, NM 87801.

See You in Tucson:
At the FM Meeting & Social