CMS News

A Publication of The Clay Minerals Society

Vol. 7, No. 3 Winter 1995-96

CMS friends meet in Baltimore

Well, the annual CMS meeting has come and gone, and it has left me with a great feeling. It comes from knowing I belong to a scientific society filled with gracious, intelligent, and enthusiastic colleagues. Our society meeting atmosphere is generally relaxing and inviting, where receptive ears are waiting to exchange updates about the latest ideas, and this year was no different. As always, it was comfortable talking with just about anyone at the meeting, whether discussing technical matters or having light conversation, and there never seemed to be enough time to talk to everyone. Running into old friends and acquaintances

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Individual Sustainers

The CMS would like to welcome the following individual Sustaining Members: Dennis Eberl, Ross Giese, Bill Johns, Haydn Murray, David Pevear, Herman Roberson, and Ken Towe. Anyone who would like to become an individual sustaining member can do so by sending a contribution of $100 to the CMS Office. The funds are used to support our student research grant program, student paper awards, plenary speakers, and other Society programs.

George Grathoff, one of the excellent student speakers at the Baltimore meeting. *High Iron Photos*

NSF reps may visit CMS

Either one or two program directors of the NSF are tentatively scheduled (pending budget decisions) to speak at the CMS meeting in Gatlinburg and to answer questions concerning funding by the NSF. It is hoped that either Maryellen Cameron of the Petrology and Geochemistry Program or John Mancini of the Geology and Paleontology Program, or both, will be able to attend.

CMS affiliates with AIPEA

The Council of AIPEA (Association International pour l'Etude des Argilles, the international clay organization) has recently accepted the CMS as an affiliated society of AIPEA. This means that all North American CMS members are now automatically members of AIPEA, and that non-North American members will no longer be able to join AIPEA through the CMS. Of course, *all* members who have already paid AIPEA dues through the CMS for 1996 will be 1996 members of AIPEA. In 1997, however, non-North American members must join AIPEA through an affiliated society of AIPEA other than the CMS, or join AIPEA directly. We regret the inconvenience this

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Research Grant Deadline

Applications for CMS student research grants are due in the CMS office by May 1, 1996. Applications are available from the office.

Inside ...

CMS News is published thrice yearly by The Clay Minerals Society. Contributions of articles, letters, commentary, photographs, and drawings are welcome.

The newsletter is distributed to all CMS members. Membership rates (1996) are as follows: full membership, including a subscription to *Clays and Clay Minerals*, $60.00/year; student membership, $15.00/year; nonsubscribing membership, $30.00/year. Institutional subscriptions to *Clays and Clay Minerals:* $165.00/yr ($180.00 overseas) for the year 1996. Please contact the Society Office for information regarding new membership, and Allen Press (913-843-1221) for questions concerning current membership.

CMS News welcomes advertising. Inquire about rates to the Society Office. Articles and other contributions submitted to *CMS News* are subject to editing and are published on a space available basis. All opinions expressed herein are the opinions of individual contributors, and not of The Clay Minerals Society.

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Many thanks to our advertisers this issue, **J. S. Technical Services** and **Siemens Analytical X-ray Instruments,** for helping make this issue possible, and to **Chapman & Hall** and the **American Ceramic Society** for reciprocal advertising.

Internet News

Clay course on the WWW

Editor:

I don't know to what extent CMS members are taking advantage of the World Wide Web as a teaching resource, but it might be interesting to find out. Part of my summer's effort has been to get a home page started for the intro course I teach. If you have access to the web (i.e. Mosaic or Netscape) you can have a look at it at

http://ucaswww.mcm.uc.edu/geology/huff/intro_home_page.html . Any comments or suggestions for improvement will be most appreciated.

Warren Huff
Cincinnati, Ohio

Announcing the initiation of two new ventures into the unknown!

1) Very Low-Grade Metamorphism (VLGM) Homepage at:
http://www.rrze.uni-erlangen.de/docs/FAU/fakultaet/natIII/geo_min/vlgm/
2) VLGM E-mail group
Please join in and contribute!
THE VLGM HOMEPAGE
Contributing to the homepage is easy. Just send in your most recent address and a few lines about your research interests that you would like to be presented in the VLGM ADDRESS BOOK and research profile. You may also choose to send in a selection of your most recent (1994 onwards) or in-press publications that will be put on display in the VLGM PUBLICATIONS SECTION. Any special topics that you would like to advertise on this homepage may also be included; information about STANDARDS and available computer SOFTWARE systems (especially freeware) are most encouraged. The page is easy to use with built-in boxes to fill out. This page also includes a regularly undated MEETINGS page, as well as NEWS items and some extra GOODIES!!!!
The VLGM E-MAIL GROUP
An attempt to keep some form of continuum going, following the successful IGCP 294 project, Very Low-grade Metamorphism that ran between 1989 and 1994. We hope to continue unity by active discussion over the INTERNET and to lay out some proposals for continuing interaction in the future. To join, send an e-mail message:
subscribe vlgm yourfirst-name yourlastname
to listproc@geol.uni-erlangen.de
or fill out the box in the E-mail section of the VLGM homepage.

Stefan Krumm (Erlangen)
Laurence Warr (Heidelberg)

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Archives contributions

Many thanks for contributions to the Archives by J. Konta, R. Hall, W. Keller, and D. Pevear.

Thanks...

To the following people who contributed to this issue:

Gary Beall
Adrian Beserra
Dave Bish
Alex Blum
Eric Daniels
Dennis Eberl
Karuna Eberl
Steve Guggenheim
Bob Hall
Colin Harvey
Bob Hirsch
Warren Huff
Walter Keller
Kathy Nagy
M. J. Nash
Dave Pevear
Rich Pollastro
Don Scafe
Semeon Tsipursky
Ardeschir Vahedi-Faridi
Joe White

Effects of the USGS shutdown on services to the nation

A number of CMS members are employees of the US Government. The following article, released by the U.S. Geological Survey, gives an idea of the effects of the recent government shutdown on this branch of the government.

Because of its unique role and presence in all 50 states, the USGS provides vital water and earth science information that touches the lives of every citizen every day. As a result of the shutdown, that vital information link with the citizen has been badly damaged, and the effects worsen each day. At least 30,000 requests for information on water quality, earthquakes, maps, and a hundred related subjects have already gone unanswered. At the USGS National Center alone, 29 pallets of mail wait to be opened, and the same is true at 200 USGS offices across the country. The USGS is responsible for keeping tabs on the quantity and quality of the Nation's water resources and to provide quick information on earthquakes, volcanoes, landslides, and flood potential through a network of more than 50,000 instruments across the country. But that promise could be broken if the instruments cannot be kept running.

In New Jersey, wastewater treatment plant permits are on hold at 25 sites because the USGS is unable to provide the data on low flow of streams that is needed for discharge permits.

In Oklahoma, permits for solid-waste landfills require a topographic map, earthquake hazard map, and a floodplain map—all products of the USGS that are not available during the shutdown.

In South Dakota, more than 270 contract employees have been laid off at the EROS Data Center in Sioux Falls.

In New Mexico, 25 contract employees essential to the USGS mission to operate earthquake monitoring seismograph stations in the U.S. and around the world cannot be paid.

In Colorado the skeleton crew on duty at the USGS international earthquake information center has been swamped with requests for information as a result of recent earthquakes in southern California and Nevada. They can see little relief from the long hours without backup support, and can only hope there are no major earthquakes before the Shutdown ends. In addition, some $4 million in USGS earthquake hazard reduction work has not gone to small businesses, states, and universities as planned. In addition, $5 million in water research funding support for about 1,300 students at over 100 colleges and universities in every state has not been released.

In Michigan, local telephone and power companies have threatened to turn off power to USGS stream-gaging stations because funds are not available to pay utility bills. This will eliminate the first line of warning for flood alerts needed by the National Weather Service in northern Michigan.

Nationwide the USGS operates 3,500 stream stations that provide flood warning information to the National Weather Service and many city, county and State emergency management agencies. A small number of USGS employees has been called back to make emergency repairs to some critical gages, but the integrity of the entire network cannot be assured.

The USGS employees who have been called back to try and maintain the flood network are doing so at some personal sacrifice with no guarantee of pay:

In Iowa, Doug Goodrich, 42, of Coralville, was asked to come back to work on Tuesday (Jan. 2, 1996) to service streamgages on the Mississippi and Iowa rivers.

Goodrich, father of three girls, is working long hours in chilly, -5F° weather to maintain and adjust instruments in the streamgage. Although the government cannot pay Goodrich until the furlough is over, the instruments he works on are critical to the safe operation of some engineering structures along the Mississippi. The instruments sense and radio information about river depths and flows to federal, state, and local agencies, who use the data to forecast river conditions and operate engineering structures. The Mississippi River gage is operated for the U.S. Army Corps of Engineers, and the Iowa River gage is operated for the City of Marshalltown, Iowa. The City needs the data to operate the City water treatment and wastewater treatment plants. Goodrich's wife, Cindy, works for the Social Security Administration and is also an excepted employee who is working today, also without pay.

In West Virginia, Gary Crosby a lead hydrologic technician stationed in the U.S. Geological Survey office in Charleston, West Virginia, braved sub-freezing temperatures and snowy conditions to service streamgaging stations in the Gauley River basin, Wednesday, January 3, 1996. Making measurements of streamflow that require wading the streams, Gary, 44, was ensuring that the gages are in working order to provide flood warnings and information for water-resource management. Married and the father of an elementary-school-aged son, Gary has worked for the U.S. Geological Survey for 16 years. He is considered one of the foremost experts in his office in the collection of water-resource information.

Small towns across the country have been feeling the impact of the

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Interviews with the clay scientists

Kathryn L. Nagy

Drawing by M. J. Nash

K. L. Nagy is a research scientist at Sandia National Laboratories. She is co-editor, with Alex Blum, of the CMS Workshop Series volume, Scanning Probe Microscopy of Clays. *The interview was conducted by Alex Blum and Dennis Eberl in Boulder, Colorado in July, 1995.*

CMS: You were co-editor of the book on atomic force microscopy?

NAGY: Yes, I co-edited it with Alex Blum.

CMS: I've heard that that book is selling faster then any other workshop volume.

NAGY: That's what Jo was saying; after the meeting this year it was up to $3,000 worth of sales. It has lots of AFM images. I think people like to look at the pretty pictures.

CMS: How did you get interested in geology?

NAGY: I grew up on a farm in northwestern Pennsylvania, and I liked to roam the countryside collecting rocks and fossils as a kid.

CMS: A classic geologist? No, nobody is going to believe that!

NAGY: Okay, in junior high my family moved to Delaware, and I ended up attending the University of Delaware. I was actually going to become a lawyer in college and started out by majoring in history. I had to take two science courses, so I chose an introductory geology course my first semester. In the middle of my first semester, I changed my major.

CMS: You saw the light. So your background really has been in geology all the way through?

NAGY: Yes.

CMS: And I guess it's covered a fairly broad spectrum of geology, or at least geochemistry.

NAGY: Mostly geochemistry. I started out in low temperature geochemistry with a Bachelor's thesis investigating lead and hydrocarbon contaminants in salt marsh sediments in the Delaware estuary. Then I went to Brown for graduate work.

CMS: I hear that you had one of the most cited Masters theses ever done.

NAGY: Who told you that?

CMS: Bruno Giletti.

NAGY: Well, Bruno was my Masters thesis advisor! At Brown, I worked on hydrothermal isotope geochemistry, using both experiments and numerical models.

CMS: What kind of experiments did you do?

NAGY: I measured grain boundary diffusion rates of oxygen isotopes along the perthite boundaries in single crystal feldspars from Greenland. I heated oxygen-18 enriched water with cut feldspar crystals to 500 to 800 degrees C.

CMS: How did you do this?

NAGY: I cut cross-sections through the feldspar after the experiments. Then, I performed an analytical traverse along the boundary inward from the edge with the ion microprobe.

CMS: I'm amazed that you could see any diffusion at all.

Nagy, *continued*

NAGY: Well, it wasn't something you could measure with a ruler. I think the diffusion distance was on the order of microns.

CMS: And then you ended up at Texas A&M?

NAGY: I decided to leave Brown after my Masters in order to get married. We moved to Texas because Ray got a job teaching at Texas A&M.

CMS: Did your work change direction?

NAGY: I ended up working in low temperature geochemistry again. I attempted an investigation of calcite solubility in brines.

CMS: You didn't like Texas?

NAGY: No, although I had a really good clay mineralogy course from Joe Dixon, we wanted to move out of Texas to a place with more topography and cooler weather. I decided to try to find a post-doc position. I was interested in working with one of three people, and I ended up with my first choice, Tony Lasaga at Yale, where I met Alex.

CMS: Where we drank much wine. What project did you work on at Yale?

NAGY: First, let me clarify the wine comment. I, along with a group of graduate students and professor Bob Berner, formed a wine-tasting club called "The Knights of the Grape." Once a month we would meet and each bring a bottle of a type of wine, for example, cabernet sauvignon. Then we would sample the wines and rate them on a scale of 1 to 5. The ranking would have a final normalization to price of the bottle (the Ellery Ingall factor—Ellery was a bargain-hunting graduate student of Berner's). I provided the rankings to all the participants after the tasting. So the wine-drinking was an organized rather than random event!

At Yale, I worked on a project funded by the DOE, to obtain fundamental data on mineral reaction kinetics at low temperatures. The ultimate goal was to provide data or methodology to support the Yucca Mountain high-level waste repository site. When I went to Yale, Tony immediately high-tailed it to Cambridge, England, for six months. And Alex went away on a month-long vacation to Baja, California. On his way out, he said, "Here's the lab." So I did a few experiments, starting out with kaolinite dissolution. It took a few months to get any reproducible results. Finally, we started seeing congruent dissolution, and from there things picked up. I eventually acquired enough data to make up a story about kaolinite dissolution rates as a function of saturation state. Nobody had ever done that before. Then I decided to try a simpler mineral, and I started working with gibbsite. It reacted faster than kaolinite and was compositionally and structurally simpler. I was able to obtain a lot of good data on gibbsite dissolution and growth kinetics.

CMS: Does the rate of dissolution depend on the solution composition?

NAGY: We looked at solution composition in the sense of saturation states at constant pH and temperature. That is, for gibbsite, the only variable was the aluminium concentration.

CMS: And was there a regular dependence of dissolution rate on Al-concentration?

NAGY: Near equilibrium, there is a linear relation between dissolution rate and the ΔG (Gibbs Free Energy) of reaction. At a certain undersaturation away from equilibrium, the rates suddenly increase very sharply. Then they level out again, and become constant at even greater undersaturations. We don't really know why the increase occurs, but we concocted a story where the ΔG at which the rates increased suddenly corresponded to the ΔG necessary to overcome the strained energy around a dislocation core and start dissolving mineral away from the dislocation core.

We concocted a story where the ΔG at which the rates increased suddenly corresponded to the ΔG necessary to overcome the strained energy around a dislocation core and start dissolving mineral away from the dislocation core.

CMS: I remember some AFM photos you had of gibbsite.

NAGY: Yes, I took those at Stanford University on an AFM in Mike Hochella's lab right before I left Yale. I'm not sure what those photos really showed. It looked like the surfaces of the dissolved grains had pits in them, and the surfaces of the precipitated grains had growth steps.

CMS: How did you like Yale?

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Nagy, *continued*

NAGY: Yale was a great place to be. There were a lot of good geochemists and good students. I enjoyed my time there.

CMS: What was it like working for Tony?

NAGY: As a post-doc, I didn't work for Tony in the same way that his students did. Tony was not there much of the time. When he is there, he is very busy. I was doing experimental work, and he didn't know anything about the lab, not even how to turn on an electric balance, so that was good. It kept him out of my hair! Working with Tony turned out to be a great combination of independent research and scientific stimulation. Support from Tony and the whole geochemistry group at Yale made for a very positive environment in which to do creative science.

CMS: I was lucky. I caught Tony when he had first gone to Yale, and I was his only student. He had no commitments. The first two years, I had him basically to myself, and then he became overcommitted.

NAGY: He had six students when I was there, and that was a lot. And then he would leave periodically for a semester or summer at a time, and all these people would be wanting things from him. They would come to or call me, as if I were his secretary!

CMS: One of the things I liked was that everyone interacted. We geochemists talked and worked with the paleontologists, geophysicists, and oceanographers. There was a lot of interaction between very diverse groups.

NAGY: I'm sure there were politics there behind the scene, just like there are everywhere, but I didn't see very much as a post-doc. It was a very friendly place to be. Everybody did talk to everybody else, and you could always get help from people not in your field. I remember stopping Jeff Park, a seismology professor, in the hall the day I had my first set of gibbsite dissolution and growth data plotted up. Tony was gone somewhere. Jeff actually stopped, listened, looked at my plot, and asked questions.

CMS: From there you went to Exxon?

NAGY: Yes, to Exxon Production Research Company in Houston, Texas. Oh no, back to Texas! I guess I was hired to do similar research to what I had been doing at Yale. I worked with Dave Pevear, who introduced me to the Clay Minerals Society. Up until then I had thought that kaolinite and gibbsite were just minerals. Dave educated me that they were CLAY minerals. Exxon was a fine place to work and a good employer. When I went to Exxon, I was able to convince my boss that they really needed an AFM to help find oil, and they let me buy one. So that is the beginning of how I came to convene a CMS workshop.

CMS: Will the AFM help Exxon find oil?

NAGY: No, but but it might help them get it out! Actually I was doing something quite interesting, and I was sorry to leave in the middle of the project. I was trying to learn something about fibrous illite growth kinetics in North Sea sedimentary basins, by examining changes in morphology of the fibers as a function of depth and temperature. I was able to use a time-temperature burial history model that Exxon had for the basins to extract an actual growth rate based on the morphological data obtained from the AFM. For Exxon, I knew that I had to do something that wasn't just fun mineral surface physics or chemistry. I had to show them that the AFM was a tool that would be useful for finding out something about the sedimentary basin history. I wasn't there long enough to do much fun research with the AFM! But as far as I know, they're continuing that line of research.

CMS: Is it published?

Everybody did talk to everybody else, and you could always get help from people not in your field.

NAGY: In the workshop volume. It almost didn't get published. The timing of my job change was such that I was just able to complete the preparation of the workshop volume. It was right down to the wire.

CMS: Then you left Exxon and went to Sandia?

NAGY: Yes, in June 1994, I went to Sandia National Laboratories in Alburquerque. Finally, we got to a state with topography.

CMS: What are you doing there?

NAGY: Working in a national lab is interesting. Right now, I work on a number of projects, four or five. One is to investigate geological scenarios involving radioactive waste using EQ/36 and Bethke's REACT codes. I'm on another project with a colleague, Randy Cygan, and a sol-gel chemist, Jeff Brinker, and his post-doc Cathy Scotto, to devise protective coatings for limestone monuments to

Nagy, *continued*

Alex Blum and Kathy Nagy in Boulder, 1995. *Jo Eberl*

prevent them from weathering. I've been working with a student using an AFM on that project.

CMS: In using EQ3/6, one of the problems is in defining the thermodynamic data base.

NAGY: Yes, we haven't been working on clays very much, but my colleague on that project, Harlan Stockman, actually puts a lot of time and effort into improving the database. He recently fixed some serious problems with the silica database that were manifested when doing calculations with solutions at high pH's.

CMS: Where do you get your funding at Sandia?

NAGY: I'm funded partly through a contract from the Department of Energy, Office of Basic Energy Sciences/ Geoscience - DOE/BES. In the coming year I am going to have capital equipment funds to purchase a new AFM. Funding also comes from the U.S. Nuclear Regulatory Commission, and internal Laboratory-Directed Research and Development Funds.

CMS: You're on soft money?

NAGY: It's funny. I have a permanent position, but you can consider the money soft money. I guess if you cannot find your own "customers," management would help you find another job in the lab. My particular group, the Geochemistry Department, has funding from many different sources. Other groups, such as those that work directly on defense projects, don't have to worry about piecing together small contracts. For example, one contract I worked on about 20% of my time the first year was a DOE/BES project awarded to Pat Brady and Randy Cygan to look at the effect of organic acid anions on mineral dissolution and growth

CMS: Something like Joe Small's experiments at Manchester?

NAGY: Yes, but at lower temperature. I also have a small amount of funding to try to use molecular models to predict crystal morphologies. I have been working mostly with boehmite. The NRC funds us to study fundamental mechanisms of adsorption of radionuclides onto clay minerals. We have been studying Cs sorption onto kaolinite and later will start to look at montmorillonite. Pat Brady performs surface titrations. Randy Cygan uses molecular models to understand where on the surface Cs sorbs most strongly, and I have been using AFM to characterize the kaolinite particle morphology.

CMS: This is kind of a Chinese menu here—a little bit of academia, a little bit of history, and a little bit of the national labs.

NAGY: All that's left is the USGS!

CMS: How do you see the differences in the way science is done in the different organizations?

NAGY: Well, the most fundamental work is conducted in the universities, I think these days. Some is in the national labs, but we must have a more applied focus, even with our basic energy science contracts. There is very little fundamental science in the oil industry right now. Exxon is probably one of the few companies that is involved with basic research any more.

I was trying to learn something about fibrous illite growth kinetics in North Sea sedimentary basins, by examining changes in morphology of the fibers as a function of depth and temperature.

CMS: At least in this country.

NAGY: Well, I know BP has reduced their research labs. I don't know about Royal Dutch Shell, but I know they laid off some people last year. My husband was hoping

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Nagy, *continued*

for some consulting with a group there, so he went to a Society of Mechanical Engineers meeting in Chicago to give an invited paper and meet with this group from Shell. When he got there, he found out that they would soon be leaving Shell in the Hague!

CMS: Elf still does research.

NAGY: But even most of the research at Exxon, for example, what Dave Pevear does, is applied research. Much of the applied research is proprietary and can't be discussed.

CMS: You seem to have done a lot of different things, but you seem to keep coming back to clay mineralogy.

NAGY: Funny how that happens. The clay research started at Yale, and I didn't really realize I was working on clays at the time. I was just working on silicates initially. When I got to gibbsite, that seemed more like a clay. I did work with a student, Tim Burch, on feldspar as well. When I went to Exxon, I didn't really anticipate working with clays, because I wasn't considered a clay expert. After all, they had Dave Pevear. I actually did end up working on clays, illite, primarily to align myself with Dave (it was wise to have a strong mentor). Clays were important to Exxon. I figured that out after a while!

My main interest is to understand something about nucleation and growth kinetics, and clays just happen to be a nice phase because they have that flat basal surface perfect for characterizing surface analytical techniques.

CMS: So what's your favorite clay mineral?

NAGY: My favorite clay mineral! I don't know.

CMS: What's your favorite color?

NAGY: Oh, I practiced that one. Red.

CMS: You must like nontronite a lot.

NAGY: No, I don't like any of those complicated ones. I am sort of partial to kaolinite, my first clay experience. Harlan Stockman, who is a jokester in my group, told me that if you say my initials really fast, KLN, it sounds like kaolin.

CMS: Sounds like a natural! I noticed you had some OH's hanging off you.

NAGY: But I liked illite, that fibrous clay from the North Sea. Illite served me well.

CMS: You know how fibrous illite weathers?

NAGY: No.

CMS: Hair today. Gone tomorrow.

CMS: You also had one of the classic problems of a dual-career household. How has that worked out?

NAGY: Well, my husband is a structural geologist, and he was a professor at Texas A&M. When I was hired at Exxon, he also was able to get a job there, where he worked on solid structures. He's a theoretical structural geologist, and large structures are important to an oil company. When I had the opportunity to come to Sandia, we talked about it for a long time because we knew there would not be many opportunities for him in Albuquerque. We ultimately decided that it would be a better job for me, and we really, really wanted to leave Texas! So we decided to quit Exxon. He is now an adjunct professor at New Mexico Tech in Socorro. He obtained an NSF grant, and he plans to teach a class next semester.

CMS: This is a problem that has been coming up more often.

NAGY: Well, we decided that if he didn't work, that was okay, too. It has been really great for me because he shops for the food and cooks dinner every night.

CMS: What is your DOE/BES contract at Sandia?

NAGY: The title is, "Heterogeneous nucleation and growth kinetics of clays." While I was at Exxon, I learned that many clays appear to have nucleated and grown on pre-existing clay surfaces. For example, fibrous illite often appears to be growing out of micas. So, the proposal was to conduct experiments to determine kinetic mechanisms.

CMS: Illite grows on quartz, too.

NAGY: I'm not sure about that relationship. It's easier to envision how it grows on another clay surface. I proposed to first start off looking at flat mica surfaces that you can

Nagy, *continued*

look at and characterize with the AFM. Then I will grow gibbsite and/or kaolinite on those surfaces in experimental flow-through reactors. Randy Cygan, at Sandia, will be working with me to apply molecular modeling approaches to understanding the growth mechanisms. I'm also going to collaborate with Neil Sturchio and Ron Chiarello at Argonne National Laboratory. They've been using X-ray synchrotron scattering techniques at the Brookhaven synchrotron source to study calcite growth *in situ*. So we're going to do the same thing with the clays. Eventually we'll try the work at the Advanced Photon Source, under construction at Argonne.

Kathy Nagy in Boulder, 1995. *Jo Eberl*

CMS: Back to clays.

NAGY: Back to clays, but really my main interest is to understand something about nucleation and growth kinetics, and clays just happen to be a nice phase because they have that flat basal surface perfect for characterizing surface analytical techniques. The key to the X-ray scattering work is having a flat starting surface so it is possible to see just a few unit cell layers of growth on the surface.

CMS: X-ray scattering will get the structure?

NAGY: Yes, it can obtain the structure of the overgrowth and the nature of the interface between the substrate and the overgrowth.

CMS: Can you measure its thickness?

NAGY: Yes. With calcite, Sturchio *et al* actually measured the growth rate *in situ*, so hopefully we'll be able to do that, too. The high-intensity X-rays can actually pass through a thin layer of fluid.

CMS: How do they measure thickness using X-rays?

NAGY: I don't remember the details of the method.

CMS: Because we're working on a technique here. I'll show you later. I was wondering if they had the same technique.

NAGY: What's it called?

CMS: Warren-Averbach. We're also working on crystal growth and nucleation.

NAGY: Oh, really? Bill Casey had looked recently at pyroxene surfaces. He co-authored a paper in *Nature* a couple of years ago, in which they found the leached surface of pyroxene actually reconstructs to a certain extent. They hypothesized that if you just added some metal cations to the solution, you could perhaps start to nucleate clays. This ties in with Jill Banfield's work. She's done a lot of observational work on topotactic growth relations between secondary clays and primary phases, such as pyroxenes. I was going to try to see if I can nucleate clays on leached pyroxene or feldspar surfaces. Later I'd like to try some organic substrates. There are a lot of material scientists at Sandia who work with Langmuir-Blodgett films, so I'm going to try to learn how to make these things. To see if I can grow clay on organics.

CMS: Do you think that you can grow clay just from solution?

NAGY: On an organic substrate?

CMS: No, just from precipitation from solution.

NAGY: Nucleate? Well, possibly. I think they grow gibbsite that way, during ore processing. It's probably easy to do simple metal oxides, but much more difficult to grow an aluminosilicate. At low temperature in the laboratory, that is. Lots of people have grown clays from gels even at room temperature—that's been done a million times—but nobody really knows how it happens, or the rates at which it happens.

CMS: I X-rayed some stuff. It was mostly glass, from the San Juan Mountains. Then I boiled it in potassium hy-

continued on next page

Nagy, *continued*

droxide to get rid of glass. I X-rayed it again and got a really beautiful rectorite.

NAGY: Really?

CMS: So I don't know if I made it, or if it was just hidden in the glass.

NAGY: You might have made it. I guess when I think of growing things from solution, I don't think at all about extreme pH solutions, because I like to be more realistic in terms of what might happen in nature. But certainly, it is much easier to grow aluminosilicate minerals at high pH.

CMS: What else am I supposed to ask you about?

NAGY: I don't know. Denny must have some standard questions. When you interviewed Dave, there was a lot of funny stuff in there.

CMS: Oh, yeah. What are your politics? What do you think of the Republican party?

NAGY: Well, I voted for Clinton, but I'm not sure I would vote for him again.

I don't think we, as a society, are at the point yet where there are enough women and minorities to be able to keep things on an even course.

CMS: So you prefer Phil Gramm?

NAGY: Actually, I prefer the chance to vote for a woman.

CMS: You're sort of out of our generation. How old are you? How much do you weigh?

NAGY: I'm not sure how much I weigh. I feel fat in this chair. I think I weigh about 125.

CMS: My God! If you were in my generation, we'd be asking you about the Viet Nam War. That's what we asked Dave about.

NAGY: Well, I was still in high school.

CMS: What can we ask you that is controversial?

NAGY: Affirmative action, maybe?

CMS: How about the women in science angle?

NAGY: Angle?!

CMS: Do you think women should be allowed to do science?

NAGY: I think it's great that you men let us women do some science.

CMS: Do you think being a woman has ever really been an issue?

NAGY: For me? For the most part, no.

CMS: Do you think affirmative action has helped?

NAGY: I think it has. I think I would be a little worried if it disappeared completely. Because I don't think we, as a society, are at the point yet where there are enough women and minorities to be able to keep things on an even course.

CMS: The old boys are still in charge?

NAGY: Oh, absolutely. Every place I've ever been. People promoted into the management track are typically young white males. As much as I would like to think otherwise, often women and minorities are promoted into higher-level positions because there are governmental guidelines.

CMS: Males are chosen because there are so many of them, probably.

NAGY: Probably, but it's interesting. At Exxon, the general observation among non-management employees was that you not only had to be young and white, but you also had to be good looking!

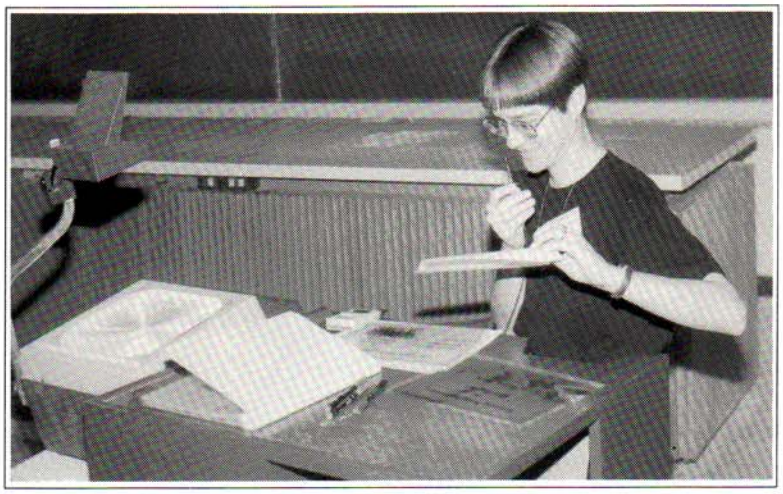
CMS: Pevear's not good looking!

NAGY: Yes, but he's not in management. Pevear's good looking. He just talks too much.

CMS: Perfect for a manager.

NAGY: They made him a group leader, which is kind of a baby level of management. But he decided he didn't want to do that anymore. He could have easily gone into management.

Nagy, *continued*



Kathy Nagy makes opening remarks for the Scanning Probe Microscopy of Clay Minerals Workshop, which she co-convened with Alex Blum in Saskatoon, 1994. *High Iron Photos*

CMS: What do you think about science for science's sake? Some of these congressmen make fun of studies being done that seem so esoteric.

NAGY: Those are the guys who probably didn't pass high school science or even take science in high school. You know, I've been working for over four years in jobs where I had to do applied science. Exxon, in particular, but even at Sandia, it's necessary to apply even basic research. I enjoy having a reason for doing what I'm doing, something I can apply it to down the road. I guess if I didn't have that reason, I'd have to have something in my head that was driving me as to why I was studying a particular problem. Especially if, to an outsider, what I was studying appeared to be something very basic and fundamental. But I've always had to have some reason why it was of interest.

CMS: You mean like a practical reason?

NAGY: Yes, something. I suppose researchers studying electrical conductivity at zero K thought they might get to an application eventually. I think that's where the general public has a difficult time connecting. They think you're just sitting there doing fun science projects, growing crystals or whatever.

CMS: That's what I would do, grow colored crystals.

NAGY: I like those, especially when set in 14K gold.

CMS: What do you think about controlling size of crystals? Sometimes in sandstones, in chlorites, you see all the crystals are the same size. How do you grow something where everything's the same size?

NAGY: I don't know. There's a scientist named Bill Carlson at UT Austin who has worked on this in metamorphic rocks. He studied garnet size distributions. He's now an MSA lecturer, so maybe you could have him come to Boulder.

CMS: What do you think of the Clay Minerals Society?

NAGY: It's a society I joined through Dave Pevear's urging. I didn't really even know about it until after I was at Exxon. I guess I was aware at Yale that Paul Schroeder used to go to the meetings. I like the Society. It's a small society, but not *really* small. It has a wide variety of people in it, which I like. I'm a member of the Geochemical Society and the Mineralogical Society of America, and I've always thought of the Geochemical Society as my society, but when I see the Clay Minerals Society, I realize that it represents a much broader spectrum of my interests. It has members from a wide variety of disciplines, which I find attractive—soil scientists, materials scientists, as well as geologists of all sorts. Also, from a wide variety of employers—universities, national laboratories, industry. I like that aspect. It also seems to be a friendly society.

There's a whole world out there that people haven't started really working on, in terms of growth kinetics from low-temperature aqueous solutions.

CMS: If you could make a discovery or think of a theory, what would it be? Where is your science going?

NAGY: This sounds like a job interview. I guess I've not thought of my science as a path to one end. I've always just wanted to keep a job! Find a job and live in a place I want to live in. I'd like to continue doing basic work on mineral growth kinetics. There's a whole world out there that people haven't started really working on, in terms of growth kinetics from low-temperature aqueous solutions. In particular, there's a lot that can be done at diagenetic to earth surface temperatures, especially with all of the new surface analytical equipment that exist now, such as synchrotron techniques or things like that. There's a big gap in understanding mineral/organic interactions. It's been talked about for a few years now in the geological sci-

continued on next page

Nagy, *continued*

ences, but no one has really done a lot yet. There's a lot of science that can be done with clays in terms of materials science. That might be an area in which to have a positive impact on society.

CMS: Kathy, I suppose you don't have any hobbies besides science?

NAGY: Right. Nothing but science. I play the flute, and I hike and camp. I used to be a long distance runner. I ran two marathons in my younger days (I never did answer that age question). I actually almost qualified to run the Boston marathon the second time, but missed by eight minutes. I hit the wall at mile 21.

CMS: Do you play the flute in an orchestra or band?

NAGY: No, typically just on my own, or now more frequently in Albuquerque, I play duets with other flutists. I prefer baroque and 20th century composers. I also like to cook.

CMS: You're a good house guest! What are some of your favorite recipes?

NAGY: I guess I got into this in Houston because there wasn't much else to do there. I started getting *Gourmet Magazine*, and I started making complete cover-page dinners. I'd make them for Dave and Adrian, because Adrian is a fantastic cook, and I had to reciprocate! I've done the southwestern dinner (even before I knew I would move to Albuquerque), and I've done the 1994 Thanksgiving dinner, minus some of the vegetable dishes. They came to Albuquerque for that one. Dave still remembers the pumpkin/pear pie with the creme Anglaise. Okay. That's it!

Answers to the Clay Names Quiz (page 22)

1. A
2. D
3. D
4. B

Internet, *continued*

Geosuspensions mail list

Dear colleagues,

I am happy to announce the birth of the mail list "geosuspensions." "Geosuspensions" is a discussion mail list about everything related to concentrated suspensions in geology (volcanic lavas, debris flows, magmas at spreading ridges, magmas of gabbroic or granitic intrusions, muds, lahars, pyroclastic flows, turbidite flows, etc.).

This list was born following a workshop in La Grande Motte, France (4-6 Oct. 1995), attended by about 60 participants, physicists and mechanicists working on granular media or concentrated suspensions, and geologists or geophysicists working on natural flows of similar materials.

From a scientific point of view, it appeared that concentrated suspensions and granular media represent an important stake, both for physicists and geologists. However, many features remain unknown in natural or model materials. We hope for future collaborations between the different communities, which may contribute to reinforce geologists' knowledge and to inspire physicists' research. The list "geosuspensions" is mainly an exchange tool: exchanges of informations and ideas, announcements of scientific meetings, proposals or call for collaborations, etc. Please forward this message to anybody who may be concerned by this initiative.

To register to the list:
send a mail to the following address:
listproc@dstu.univ-montp2.fr
with the following content:
subscribe geosuspensions <first-name> <surname>
(for instance: subscribe geosuspensions tryphon tournesol)

If you use Eudora, don't use the automatic signature, because it will be interpreted by the listproc program as an unknown command. When registered, you can send your messages to the following address:
geosuspensions@dstu.univ-montp2.fr
In case of any problem, contact directly the list manager (benoit@dstu.univ-montp2.fr <benoit ildefonse>) or the system manager (michel@dstu.univ-montp2.fr <michel peyret>).

Benoit Ildefonse
Montpellier, France

To join the CMS listserver,
send an e-mail message to:
listserv@vm.cc.purdue.edu,
and write a message as follows:
SUB CLYMIN-L Susie Q. Clay
(replace name with your own).

To see the CMS home page,
open a browser such as Netscape, and use the following address or location:
http://ctjrs.agry.purdue.edu/claymin/claymin soc.html

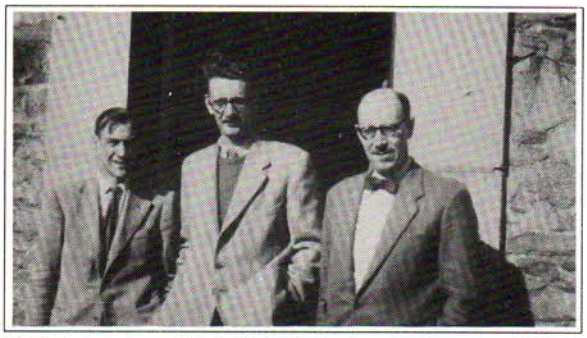
Archives

The following photos are part of the collection given to the CMS by Joe L. White, who is the photographer.

Per Jorgenson, Ivan Rosenqvist, Oslo August 1986.

Dr. & Mrs. Robert Robertson, Pitlochry, Scotland, August 1986.

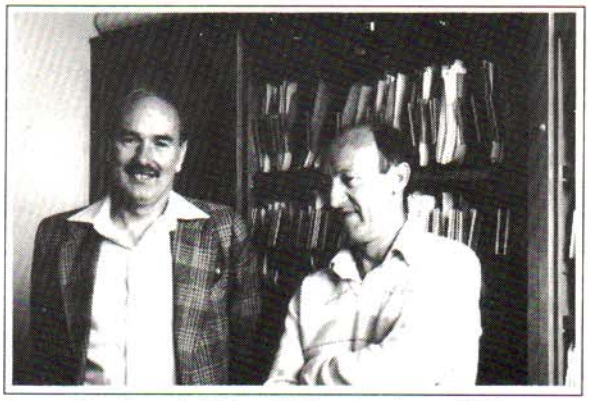
Dr. & Mrs. Reg Taylor, NATO Conference, September 1986, Ghent.



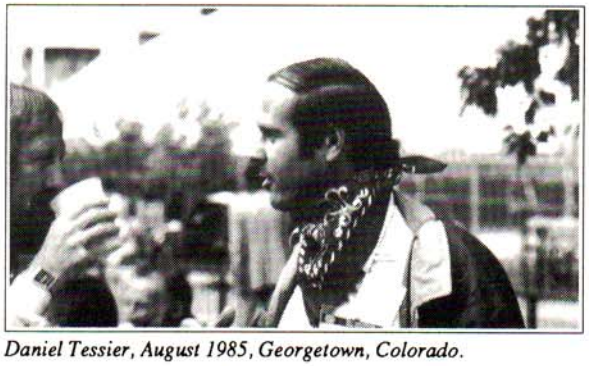
Bill Mitchell, Bruce Mitchell, R. C. Mackenzie, Macaulay, 1958.

C. W. Correns, K. Jasmund, Göttingen, August 1954.

R.A. Kuhnel, F. Veniales, Z. Kallai, L. Heller-Kallai, J. Konta, August 1985, Georgetown, Colorado.



Bernard Goodman, J. D. Russell, Macaulay, August 1986.



Daniel Tessier, August 1985, Georgetown, Colorado.

Teaching Clay

Teaching industrial clay mineralogy at Indiana University

Introduction

In common with many geology departments across the nation, there is serious concern at the diminishing numbers of students entering graduate geology programs. This has led to a "sinking lid" policy in many universities of not replacing retired faculty in specialty clay mineralogy positions. The other problem is research funding. With the current shrinking in research funds from NSF and similar agencies, there is a need to cast the net wider into the many aspects of environmental geology.

Since many of the Clay Minerals Society members are from academia, it occurred to me that by sharing some personal experiences in the newsletter, we might draw on certain positive developments which are working in some universities and which might be applicable to others.

My personal views are based on a four-year involvement in research and teaching in clay mineralogy at Indiana University. My initial position was as a Visiting Researcher under Haydn Murray. Haydn is now *Emeritus* Professor, and I have a Visiting Associate Professorship for the current academic year. These views are offered as a stimulus for discussion within or outside the newsletter. They include:

* The relevance of clay mineralogy to current student interest areas
* The limited number of students in classes
* The difficulty in getting research funds

Industrial clay mineralogy

Indiana University has won a world-wide reputation in industrial clay mineralogy through the leadership of Haydn Murray. At Indiana University we have both excellent analytic facilities plus an applied testing laboratory in which we can evaluate kaolins, smectites, palygorskites, and other industrial minerals on both a laboratory and pilot scale.

Over the past twenty years, the majority of the Masters level graduates and virtually all of the Ph.D. students who have researched clay topics have been successfully recruited into the industrial mineral field. This reflects the very strong connections between Haydn and industry. Indiana also has attracted significant support in the form of industrial minerals fellowships. The E. J. Grassman Fellowship, for example, has supported at least nine current Society members, including Jessica Elzea, Jean Hemzacek Laukant, Tom Dombrowski, Bob Pruett, Tim Salter, Cliff Ambers, Jason McCuistion, Huitang Zhou, and myself. Oil-Dri Corporation of America has supported Roland Merkl, Karan Keith, Franz Reisch, and Jean Hemzacek Laukant, and ITC has supported Huitang Zhou.

During 1995, there were six students currently completing Masters and Ph.D. programs. Their projects include:
Master's level:

* Hydraulic conductivity of regional clays for use in landfills
* Geology of Tennessee ball clays

Ph.D. level

* Geochemical and related studies of Georgia-Florida palygorskites
* Geology, mineralogy, industrial applications, and properties of some Chinese attapulgites
* Effects of various pollutants on the hydraulic conductivity of clay landfill liners
* Studies of shales in Indiana sedimentary basins

Four of these studies are supported by industry.

Clay Mineralogy as a support tool for other concentration areas

A generalized breakdown of concentration area of the geology graduate student population at IU Bloomington is as follows:

1. The growth in environmental geology and hydrogeology has been enormous. At least 30% of our current graduates are in these concentration areas.
2. At Indiana there is a very strong organic geochemical group under John Hayes, Simon Brassell, and Lisa Pratt, which attracts maybe 30% of the graduates.
3. Clay mineralogy is on a par with ge0physics in terms of student numbers (about 10% each), with the balance of the other students spread amongst the other areas of geology.
4. We have several archeology students interested in the properties of materials and specifically source clays for ceram-

ics.

At the introductory graduate level we have no students who come out of the undergraduate programs looking for an industrial clay program. However, we do attract some more mature graduates from industry who choose to return to University to obtain higher degrees.

I currently have 11 students in the clay class out of a graduate student group of approximately 60 students. The reasons given for participating in the course include:

* its relevance to environmental geology (landfills, effects on hydrological processes, etc.)
* its relevance to organic geochemistry, oil generation, and basin analysis
* its relevance to hydrogeology, soils, and surficial processes
* its relevance to geoarchaeology

Course Structure

I have structured the class to accommodate these interests so that in addition to covering the more traditional aspects of clay minerals, a specific set of lectures has been given on well-defined topics.

Breakdown of lectures (approximately 33 in the Fall Semester):

Introductory overview topics	2
Structures and chemistry of clay minerals	4
Physical and chemical properties	3
Identification techniques including laboratory training in size separation, X-ray diffraction, DTA, and dissolution techniques	6
Mixed-layer clays and NEWMOD©	2
Clay-surface interactions and zeta potential	1
Clay-organic reactions, catalysis, oil generation, and the origin of life	2
Clays in oil exploration, log analysis, and basin analysis	2
Clays as barrier materials, adsorption, and hydraulic conductivity	2
Industrial uses of clays	4
Clays in ceramics and archaeology	1
Clays in geothermal systems	1
Exploration and mining methods	1
Exams and individual research projects	2

Field Trip to Industrial Clay Operations - Tennessee - 2 days

Part of the course requirement is a significant term paper on a clay topic related to the student's personal research topic or interests.

Response of the students to this structure has been very positive. They appear strongly motivated by the potential to apply a component of clay mineralogy to their research topics. Having a semi-automated Philips diffractometer readily available with the user-friendly JADE program has proven to be a powerful and popular analytical tool.

We also have an automated Scintag Diffractometer, but this is used almost exclusively by Ph.D. students.

Student Research Interests

Of the 8 students currently enrolled and 3 auditing the class, the breakdown of class projects is as follows:

2	Geoarchaeology	Source clays in southern Indiana and Greece
4	Environmental	Clay mineralogy of palaeosols
2	Hydrogeology	Metal adsorption processes on clays
		Clay mineralogy of Idaho lake sediments
1	Geophysics	Measuring electrophoretic mobility and zeta potential of selected clays and fault gouge
1	Basin analysis	Introductory work on NEWMOD©
1	Organic geochemistry	Clay-organic reactions

continued on next page

Indiana, *continued from page 15*

Research Funding

An attempt to atttract NSF funding back in 1993 was not successful. I therefore focused on the potential for funding in the environmental geology area. I have been successful in obtaining a significant grant, in co-operation with our hydrogeology group, to study the removal of clays and pyrite from coal fines by high gradient magnetic separation. The level of funding is in excess of $100,000 for 1996. The funding will permit us to fund two Research Assistants at the Masters level, upgrade our high gradient magnetic separator, and purchase some additional laboratory equipment. The study will incorporate mineralogical and high gradient separation studies of coal fines, plus hydrological and coal characterization studies of many coal fine ponds.

Favored Teaching Texts

We have found Bruce Velde's book *Introduction to Clay Minerals* to be a very useful overview text. For the structural lectures and some X-ray interpretation, we have used Brindley and Brown. Dewey Moore and Bob Reynolds' book has been invaluable for X-ray diffraction with some students moving into NEWMOD©. Cliff Johnston's presentation in last year's workshop was a great introduction to clay organics supported by Van Olphen's *Introduction to Clay Colloid Chemistry. Kaolin Genesis and Utilization* (Haydn Murray, Wayne Bundy, and myself) has been the pillar for the industrial clay sector. Eric Eslinger and Dave Pevear's SEPM Short Course has stimulated many students; and Chuck Weaver's *Clays, Muds and Shales* has been a source of inspiration for so many aspects of weathering, sediment transport processes and diagenesis. The laboratory program builds on Marion Jackson's invaluable manual.

General Comments

By offering a course structure that introduces the students to the diversity of clays and then describes the applications of clays in the student's area of interest, it has been possible to attract both first and second year graduate students to the course. Once they are in the course and can appreciate just how fascinating clays can be, then one has the opportunity to motivate them for long-term research projects.

I believe that there are significant opportunites for research funding in the field of environmental geology, and this will be the focus of our research applications during 1996.

Colin C. Harvey
Bloomington, Indiana

Shutdown, *continued from page 3*

shutdown. In Rolla, Mo., the USGS provides a weekly payroll of $385,000 in a town of 15,000 people. In Sioux Falls, S.D., the weekly $300,000 USGS payroll is vital in a town of 85,000 people. Also in Sioux Falls—as in many USGS facilities—food and other services are supplied by handicapped contract employees. Dick Cole and his family (he and his wife, both visually handicapped) lost their sole source of income with their jobs in the USGS cafeteria due to the shutdown.

Small business and private companies are getting caught in the squeeze. Contractors who provide guard services, for example, are mandated by law to protect life and property. Yet despite the mandate, the government has no funds to pay for these services. In Lakewood, Colorado, oil and other industry groups are being denied access to the USGS Rock Core research Center that is critical to the search for energy and mineral resources around the world.

The Federal Government is losing $50,000 a day in the sale of USGS maps, but more important, thousands of citizens and public and private organizations have not been able to obtain the basic mapping and cartographic data needed to plan, build and enjoy the Nation's resources.

More than 80,000 chemical analyses on 4,800 samples of the Nation's rivers, lakes and ground-water resources could not be made by the USGS during the first three weeks of the Shutdown, leaving unanswered questions about changes in water quality and possible threats to human health and the environment that local, state and other Federal agencies depend on the USGS to detect.

AIPEA, *continued from page 1*

causes. To join AIPEA directly, write to Dr. P.M. Huang, Department of Soil Science, University of Saskatchewan, Saskatoon, SK S7N 0W0, Canada.

The next AIPEA meeting will be held in Ottawa in June, 1997, in conjunction with the CMS annual meeting. For information on this meeting, please contact, Dr. Jeanne B. Percival, Geological Survey of Canada, 601 Booth Street, Ottawa, ON K1A 0E8, Canada. (percival@gsc.emr.ca)

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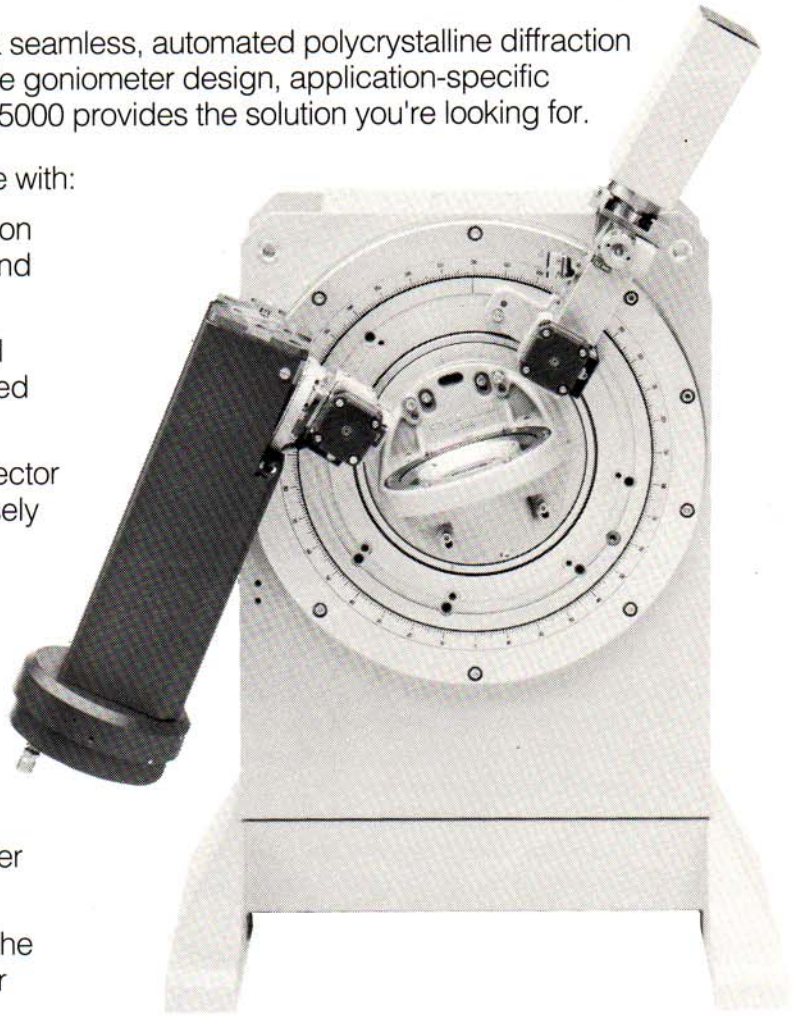

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Clays In & For The Environment

Workshop (Saturday, June 15)

Isotope Geology of Clay Minerals From Isotope Crystal Chemistry to Petrogenesis
organized by T. K. Kyser and F. L. Longstaffe (Tel: 519-661-3177; fax: 519-661-3198)

Symposia

Clay Sciences for Environmental Remediation and Waste Management
Chet Francis and Mark Elless (tel: 615-576-8192; fax: 615-574-7420)

Isotope Geochemistry and Environmental Research
Claudia Mora (Tel: 615-974-6010; fax: 615-974-2368)

Colloid Characteristics and Transport
Paul Bertsch (Tel: 803-725-2472; fax: 803-725-3309) and John McCarthy (Tel: 615-576-6606; fax: 615-576-8643)

Application of Clays for Nanocomposite (Clay-Polymers) Material Development
Gary Beall and Simeon Tsipursky (Tel: 708-392-4600; fax: 708-506-6199)

Clay/Biology/Health
George Guthrie (Tel: 505-665-6340; fax: 505-665-3285) and John Naim

Field Trip

Soils and Geomorphology of Valley and Ridge Province
organized by Dave Lietzke, John Foss, and Michael Clarke

Technical Program Chairs

Claudia Mora, Department of Geology Sciences
The University of Tennessee, Knoxville, TN 37996
Tel: 615-974-6010 Fax: 615-974-2368

Paul Bertsch, Savannah River Ecology Laboratory
University of Georgia, Aiken, SC 29801
Tel: 803-725-2472 Fax: 803-725-3309

General Chair

S. Y. Lee, Environmental Sciences Division
Oak Ridge National Laboratory, Oak Ridge, TN 37831-6038
Tel: 615-574-6316/7359 Fax: 615-576-8646 E-mail: SYL@ORNL.GOV

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The Clay Minerals Society

33rd Annual Meeting

June 15-20, 1996

Park Vista Hotel
Great Smoky Mountains National Park
Gatlinburg, Tennessee, USA

Ask the Clay Doctor

(Not a real doctor)

Dear Clay Doctor: An ancient but very learned and wise friend of mine has said that *Homo sapiens* is a gross misnomer. The correct Linnaean classification ought to be *Homo stupidens*, or *Homo Ignorens*. This revision seems particularly apt when one observes the U.S. legislature's effort to balance the Federal budget. What is your candidate for the most stupid clay mineral? My candidate is congressolite, a soil contaminant prevalent in the District of Columbia. It is a mixed-layer in which both layers expand when solvated with PACjuice.

Disillusioned in Duluth

Dear Disillusioned: It is true that clays in general must have very small brains, if they have any brains at all. Despite this, they do have a sense of humor, which often tends towards the ironic. For example, glauconite is full of irony. Nontronite is one of the most ironic clays I know.

Dear Clay Doctor: I have heard a great deal about hairy illite, but am still unsure what it is. Could you enlighten me?

Ignorant in Ishpeming

Dear Ignorant: Interestingly enough, hairy illite came into existence quite by accident. In 1947 a careless laboratory technician in Teeds Grove, Iowa, spilled a bottle of Miracle Hair-Gro© on some clay slides awaiting analysis by X-ray diffraction. The next morning, the technician was startled to see a luxuriant growth of a fibrous substance on the contaminated slides. Knowing the lab supervisor would appear any moment, the normally dull-witted technician deftly combed and coiffured the fibers into a variety of stunning hairdos. One was upswept in back with a charming pink ribbon at the top; another parted in the center and slicked back in a dashing, carefee style; and a third had the fibers draped over one corner of the slide in a provocative, come-hither fashion. The supervisor, upon seeing the usually tidy lab in such disarray, was, to put it mildly, speechless. And the technician, who joined the ranks of the unemployed with a record-breaking swiftness that still stands today in the Guiness Book, nevertheless went on to fame and fortune in the hairy clay field, specializing in illite. What appeared to be a happy ending, however, came to an abrupt halt in the early 80's with the popularity of spike hair styles. It seems only the 1Md polytype is suitable for this, and there simply isn't enough of it around in pure form. Things were pretty quiet in that area for a while, until North Sea researchers reported some of the stuff in well cuttings. Has the pendulum started to swing back? Perhaps.

Dear Clay Doctor: I like clays and I like college football. If Tommy Frazier, quarterback for the University of Nebraska football team, were a clay mineralogist, what clay would he study?

Corn Husker, Lincoln

Dear Corn Husker: Rectorite.

Dear Clay Doctor: Can clay be used to fabricate weapons?

Slobodan Lesonofavich, Belgrade

Dear Lesonofavich: Yes. One nation had a clay bomb so powerful that it had to be tested in French Polynesia, half a world away from the presence of "the" civilized people.

Dear Clay Doctor: The language of geology is riddled with imagery that is potentially offensive to large portions of the population. For example, terminology concerned with mountain building includes words such as "rupture," "thrust," "thrusting," and "orogeny." Similarly, we speak of a drill "penetrating" strata. Don't you think that students would be less uncomfortable in coeducational laboratories if we made simple changes in the words that we use?

Cum Laudely, Boston College

Dear Ms. Laudely: Broadly speaking, I agree. Clay scientists also need to clean up their language. Therefore I suggest we remove the "lay" from clay science. The French have a perfectly good word for clay, "argille," a term that is much less offensive to the hormonally challenged. Along with this change in nomenclature, we need to change the name of our society, from The Clay Minerals Society (CMS) to the Argille Studies Society.

Dear Clay Doctor: What are clays fine-grained for?

Der Witt, Deadwood

Dear Der: That very question was posed to the famous clay scientist, B. F. Wadley, during the first annual Clay Minerals Society think-off in 1957. After five minutes working on the problem, his eyes began to bug out. After ten minutes, his brain started to smoke. He never did answer it, and after the meeting, he took up golf.

Feats of Clay

Necip Güven has been invited to join the honorary editorial advisory board of the two fossil fuels volumes of the new 50-volume *Encyclopedia of Life Support Systems*. Necip will organize these two volumes, select other editorial board members for each section, contribute three papers on the role of clays in the discovery and recovery of petroleum in the oil and gas volume, and write a chapter on high-temperature mineral reactions during the retorting of oil shale for the other volume.

Dewey Moore and his wife **Shelley** recently spent some time building houses in the Yucatan at a U.N. refugee camp for Guatemalan refugees.

Sridhar Komarneni was elected Fellow of the American Society of Agronomy.

Andreas Jazdanian and Ardeschir Vahedi-Faridi, two CMS research grant recipients, at the meeting in Baltimore. *Jo Eberl*

Jim Aronson recently married **Susanna Heschel,** a professor in the Religion Department at CWRU. They are spending this semester at Dartmouth.

Mark Ellis and **Margaret Kasim** were recently married, and went to England and Scotland on their honeymoon.

Rolf Nueesch's wife **Ruth** gave birth to a son, **Stefan,** to join **Fabian, Simon,** and **Sarah** during their year's stay in Boulder.

David Veblen is the Tage Erlander Guest Professor in the Geology Department at the University of Lund, while on sabbatical in Sweden. **Dougal McCarty** has taken a year's position at Montana State University in Bozeman. **George Kacandes** is spending at least the year in Greece, supposedly working on clays.

Ardeschir Vahedi-Faridi, a student of **Steve Guggenheim,** has been awarded the 1996 Kraus Crystallography Research Grant from the MSA.

Franz Reisch has taken a position at American Colloid.

Colin Harvey has been named the new Managing Editor of *Applied Clay Science.* He has also received a grant of over a quarter of a million dollars from the state of Indiana, TVA, Electric Power Research Institute, and Southern Indiana Gas & Electric Company.

Crawford Elliott has taken a position with the Geology Department at Georgia State University.

Zhenzhong Zhang has taken a position with the US EPA in Athens, Georgia.

Edward Lowe, the inventor of Kitty Litter, died.

The Dutch Clay Group has become active again after a long period of rest. The group had its first meeting on October 13, 1995, on the initiative of R. A. Kühnel, S. J. van der Gast, J. T. (Theo) Kloprogge (all three CMS members) and Roland Vogels. The Dutch clay group will meet on four thematic days every year and will act as the Dutch representative of the European Clay Groups Association. The organization of this group will be in the hands of Sjerry van der Gast and Theo Kloprogge.

Clay Names Quiz

(From the Namencloture Committee)
Answers from: Mitchell, R. S. (1979) *Mineral Names, van Nostrand, 229 p.*
Answers on page 12

1. CHRYSOTILE is named for
   A. Greek words for gold and fiber
   B. Chris O'Tile, Irish mineralogist
   C. The Chrysot Mining District, Quebec
   D. Ancient use in glaze for ceramics

2. KINOSHITALITE is named for
   A. Kinosha area, Japan
   B. A game mineralogists generally lose
   C. Locality in a bat cave
   D. K. Kinoshita, Japanese geologist

3. BITYITE is named for
   A. Small crystal size
   B. Very small crystal size
   C. Extremely small crystal size
   D. A mountain

4. PARAGONITE is named for
   A. Its similarity to gonite
   B. Greek word for "to mislead," as it looks like talc
   C. Locality in Paragon region of Spain
   D. Discovery site near difficult Scottish golf course

New Members

We welcome the following people who have recently joined The Clay Minerals Society.

John H. Barnes
PA Geologic Survey
Dept. ofConservation & Natural Resources
PO Box 8453
Harrisburg, PA 17105

Mr. Robert N. Barnett
c/o G & W Base & Industrial Minerals, (Pty.) Ltd.
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Wadeville 1422
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Ms. Helen J. Bray
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ENGLAND

Dr. José Bernardo Rodrigues Brilha
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Depart. de Ciencias da Terra
Campus de Gualtar
4700 Braga
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Kagoshima 890
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Fort Collins, CO 80526

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Sciences de la Terre
Univ. du Quebec a Chicoutinmi
Chicoutimi, QC G7h 2B1
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Gaborone
BOTSWANA

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Caixa Postal 151, Sete Lagoas
Minas Gerais 35701-970
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Aiken, SC 29802

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Rodovia Raposo Tavares 3175 F/ 128
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Miguel Lillo 251
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Ione Minerals and Refractories
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Ione, CA 95640

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Texas A & M University
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Mr. Terry M. Valladares
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Mr. Wei Min Wang
Soil Lab.,
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Taipei
TAIWAN

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Floridin Company
1101 N. Madison St.
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Mr. David C. Williams
Floridin Company
1101 N. Madison St.
Quincy, FL 32351

Baltimore, *continued from page 1*

from all over the world and being immersed in the fundamental debates of clay science are among the first of many good reasons I have for attending these meetings, and I was not disappointed!

This year's meeting came together beautifully and was a great success. The setting was an older hotel in the middle of the city, just a skywalk away from the inner harbor of Baltimore. The weather was pleasantly warm and sunny, still feeling like springtime should. It was well planned and organized, which I think owes a great deal to the hard work of Delvin Fanning, Ginny Colten-Bradley, and the rest of the Organizing Committee. The student assistants also deserve much thanks for their hard work. I found them particularly helpful, resourceful and friendly,

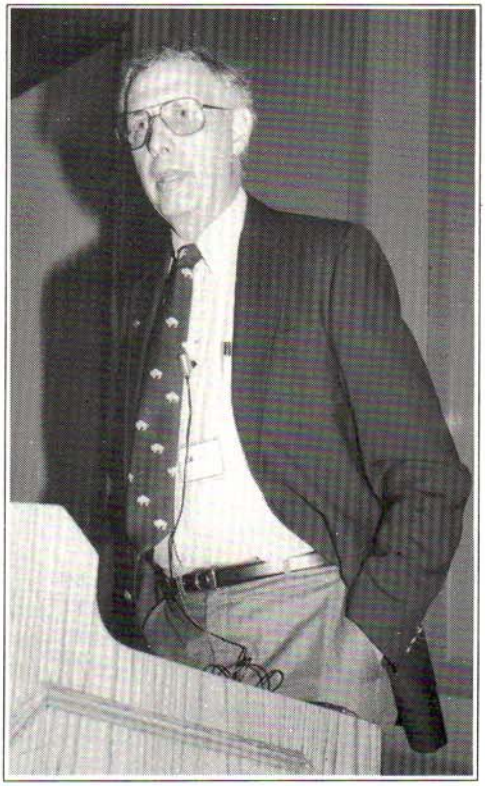
Gerhard Lagaly delivering the 1995 Brindley Lecture. High Iron Photos

and heard the same praise from the "accompanying persons" crowd who attended the various day trips.

Needless to say, there were many excellent presentations. Many talks made me stop and think, and some showed me a surprising thing or two. There sure is a lot of ingenuity out there. I noted that the student presentations were, overall, very high in quality. The technical program reflected the diversity and scientific breadth of the society and showed our continued growing emphasis towards environmental and geotechnical applications. The decrease in studies related to the oil industry was notable, as pointed out by Eric Eslinger. One common thread across the various subdisciplines of our society that I enjoy is an emphasis on understanding clay geochemistry and chemical reactions of clays with the geologic environment.

As I sat in the Wednesday morning session on the "Smectite To Illite Transformation" symposium, it struck me that one thing has not changed since I started attending meetings, and that's the discussions about the "I-S" word. The debates about illite/smectite never seem to change. A hardcore group has kept asking for decades how illite/smectite forms, grows, ages, and transforms. We can't even reach consensus on whether it is one phase or two. How has this "slippery" mineral managed to elude being pinned down after such long and intense study by so many intelligent people? One person, at least,

Dave Bish (third from left), 1995 Jackson Lecturer, standing with Marion L. & Chrystie M. Jackson and Dave's wife Karen. High Iron Photos



Ross Giese delivering his Presidential remarks in Baltimore, 1995. High Iron Photos

gave us an answer: Bruce Velde announced that he has finally fulfilled his clay destiny—his quest to answer the question, "What is illite?" (If you didn't hear the talk, then ask him—I'm sure he'll be happy to tell you!) Illite appears to be a horse of many colors to some, and a lifetime career opportunity for many!

I always look forward to the poster sessions, as they provide a chance to examine studies in more detail with the presenters, and also facilitate lots of technical gabbing. Of particular interest to me were two research studies being conducted at the University of Pennsylvania on underclays in Pennsylvania, one of which helped provide me with an answer to a lingering question I've had from my thesis.

The highlight of the technical sessions for me was "One Hundred Years of X-Rays," which was well organized by Dewey Moore. This was a chance for us to take a look at the discovery and history of X-rays, the source of energy that has fueled clay science. Not only did we learn about the profound impact that X-rays had on all of science, but on the scientists themselves who have studied this brand of electromagnetic radiation. (This led me to later reflect on the unique personalities of those who have followed the clay path.) The talks and discussions that followed were as enjoyable as they were insightful, as was the historical photo and artifact display accompanying the session.

Rustum Roy, 1995 Pioneer in Clay Science Lecturer. High Iron Photos

Meeting regulars Dennis Jenkins, Richard Brown, Bill Miles, Sarkis Ampian, Marc Herpfner, and Bill Moll chat during a break. High Iron Photos

Attendees at CMS '95 investigate Soldier's Delight chromite mine opening on the field trip. High Iron Photos

The banquet was a nice, enjoyable affair, and the food was excellent. The banquet was capped by a talk from this year's Pioneer in Clay Science, Rustum Roy. To tell the truth, I didn't know who Rustum Roy was before the talk, but I was interested to hear about his enormous body of fundamental work on hydrothermal silicate synthesis experiments, which helped provide the underlying fundamental basis for experimental petrology over the last 40 years. As his talk turned from his research to the practical reality of science in today's world, I was dismayed to hear him echo the same argument I have heard lately from corporate America and the Republican Congress, one that claims that fundamental research is now not worth the expense, that it is now unnecessary because we have somehow managed to unearth all of the fundamentals we need.

continued on next page

Baltimore, *continued from previous page*

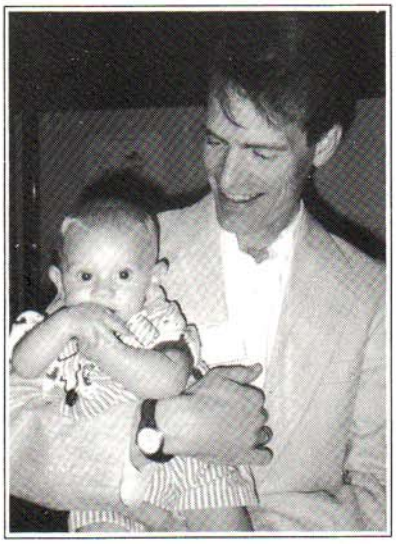
Such an absurd and short-sighted view I feel undermines the integrity of our national technological foundations, and to hear it from this pioneer of fundamental science was frustrating. Rustum Roy asked near the end of his talk, "Show me what useful discovery has come from fundamental scientific studies over the last five years?" My answer—ask me that again in 2035!

An especially enjoyable extracurricular activity was the dinner at the Baltimore Aquarium. Upon entering the building, we were greeted with a spread of wine and appetizers to start off the evening. We brought glasses of wine along as we took an enlightening and ascendant stroll through the cavernous structure, past dozens of interesting and informative displays of marine life. Upon reaching the top floor of the aquarium, we discovered our buffet meals and a view of the harbor, complete with an oyster bar and other delicious entrees. Following our subsequent descent through the large and well-designed shark tank, we arrived back at the main lobby where we were rewarded with an assortment of tasty and elegant mini-dessert confections, comfortable conversation, and mesmerizing bubble columns.

All together, I left our annual meeting having enjoyed spending time with all of you who were there, talking and learning about my favorite subject once more. See you all next year in Tennessee!

The 1996 Annual Meeting will be held in Gatlinburg, Tennessee, June 15-20. For more information, contact S. Y. Lee, Environmental Sciences Division, Oak Ridge National Laboratory, PO Box 2008, MS-6038, Oak Ridge, TN 37831-6038; phone

Ginny Colten-Bradley, Technical Chair of the Baltimore meeting, with Pat Costanzo. *Dave Pevear*



Steve Rice visiting with young clay fan Matthew Elzea-Kogel. *Dave Pevear*

Bill Johns, 1995 Distinguished Member, on the field trip. *High Iron Photos*

Sharon Jacobs and Eric Daniels after the banquet, Baltimore, 1995. *High Iron Photos*

Del Fanning, Chair of the successful Baltimore meeting. *High Iron Photos*

615-574-6316; fax 615-576-8646; e-mail: syl@ornl.gov. Plenary speakers will be Victor A. Drits, Distinguished Member, Samuel M. Savin, Brindley Lecturer, Darrell G. Schulze, Jackson Lecturer, and Max M. Mortland, Pioneer Lecturer.

Gene Yuan presenting a paper, Baltimore, 1995. *High Iron Photos*

Students Yul Roh, Caifen Xu, and Dongfang Huo at the Student Reception, Baltimore 1995. *High Iron Photos*

Jan Srodon, Salah Shata, and Heilang Dong chatting at the Student Reception, Baltimore, 1995. *High Iron Photos*

The 1997 meeting will be held in conjunction with the 11th International Clay Conference, June 15-21, 1997. For more information, contact Hideomi Kodama, Center for Land and Biological Research, Agriculture Canada CEF, Ottawa, ON K1A 0C6, Canada; phone:613-759-1913; fax: 613-995-1823; e-mail: kodamae@ncccot.agr.ca

Eric J. Daniels
La Habra,
California

Part of the Michigan Mafia: Hailiang Dong, Gejing Li, and Vicky Hover. *Dave Pevear*

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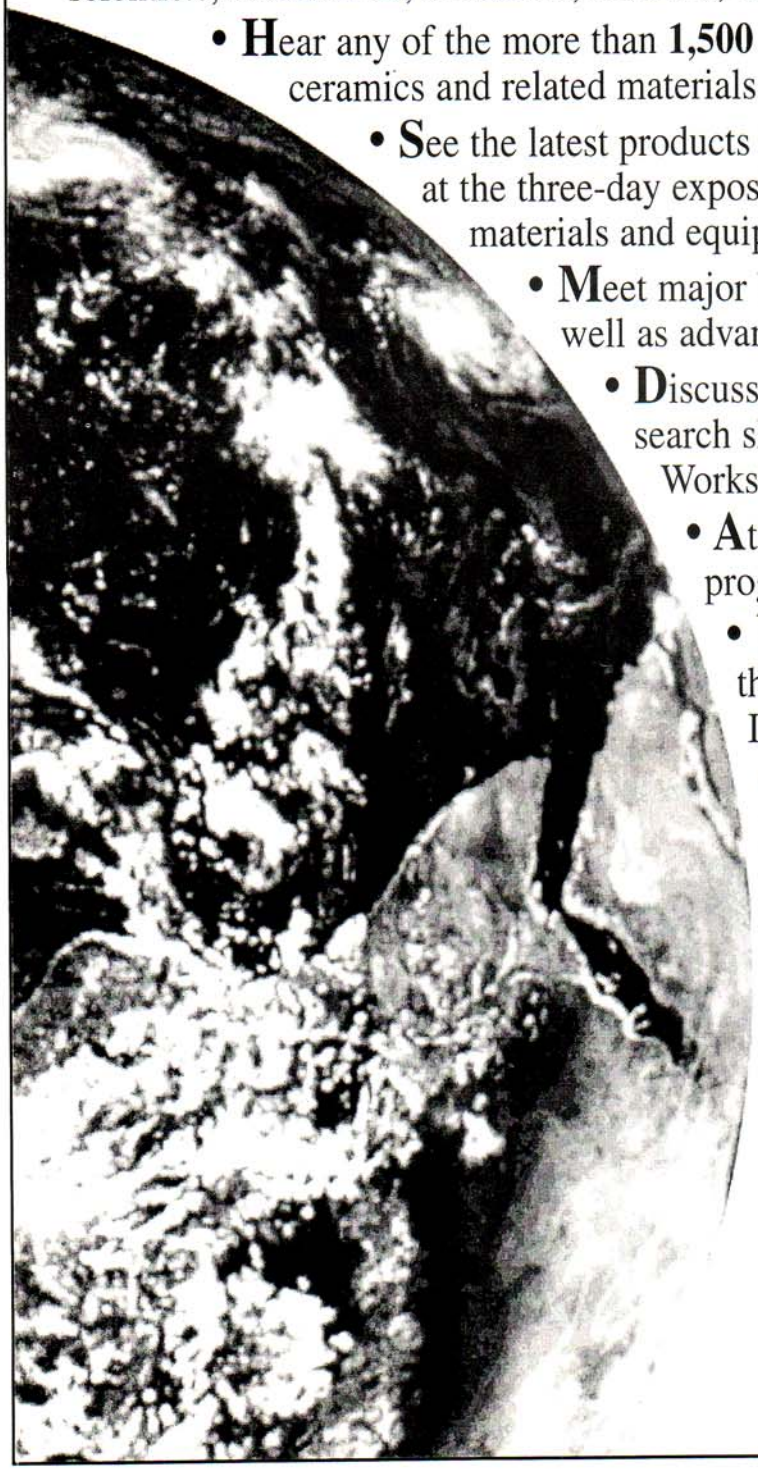

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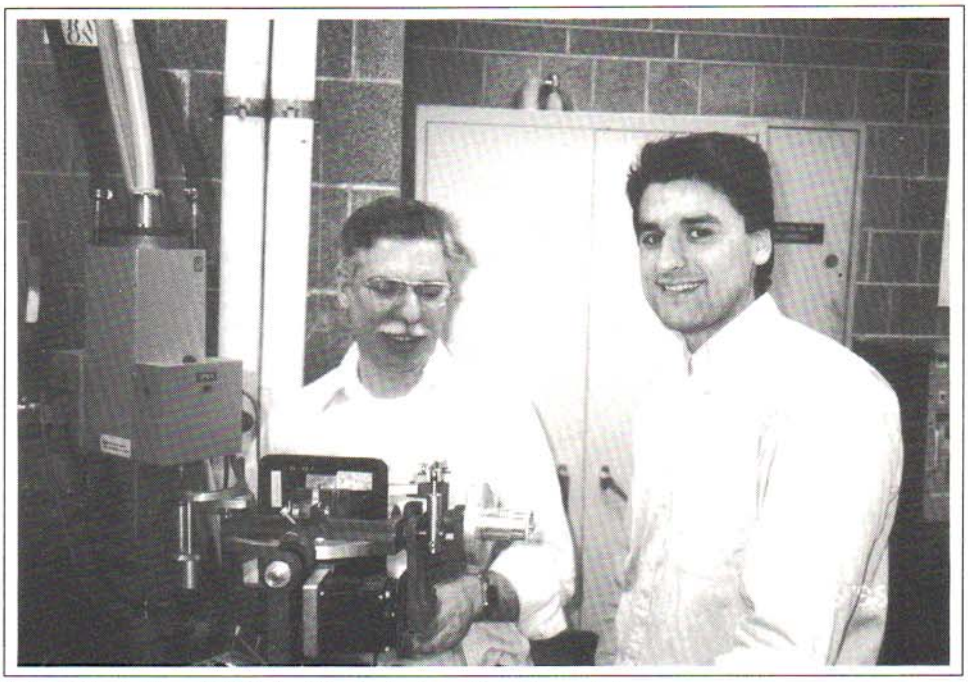
Student Profile

Ardeschiv Vahedi-Faridi



Ardeschiv Vahedi-Faridi (right) and his thesis advisor Steve Guggenheim. *Courtesy A. Vahedi-Faridi*

Nationality: I was born in Munich, Germany, on February 7th, 1965. I have a double German/Iranian nationality, as my mother is a German and my father is Iranian. In 1966 my father was offered a professorship in physics at the University of Teherán, Iran. We moved to Teheran, where I spent my early childhood and teen years. I cherished my double heritage by attending the German School Teheran. The islamic revolution in 1979 forced us to leave the country, and we returned to Munich, Germany.

Place of Study: Ph.D: University of Illinois at Chicago.

Thesis Advisor: Stephen Guggenheim.

Interest in Clays and Thesis Topic: My interest in environmental sciences lead me to get some undergraduate training in geography. In 1986 I went on to get my Masters in chemistry from the Ludwig-Maximilian-University in Munich. My Masters thesis was on testing and improving of separation and identification techniques for alpha-emitting isotopes in Bavarian soils. I did this work for the Bavarian Environmental Agency.

I became interested in clays at the University of Munich under the influence of Professor Armin Weiss who introduced me to clays during his lecture series on silicate chemistry. Because of my continued interest in environmental sciences and clays, I decided to pursue my carrier in getting a Ph.D. in geological science. I contacted my present advisor professor, Stephen Guggenheim, at the University of Illinois at Chicago. Currently I am working on a Ph.D. thesis: "The Crystal Structures of Organo-Vermiculite Intercalates."

Organo-clays intercalated with small organic cations (e.g. TMA, TEA) are commonly called pillared-clays. These organic cations hold the clay layers apart and produce organophillic interlayer cavities, which greatly enhances the adsorption properties of these clays towards polar and non-polar organic molecules. The shape selective adsorption capabilities of certain pillared clays, such as TMA-smectite, are potentially important for use in environmental remediation. However, the systematic determination of the crystal structures of these pillared clays has not been attempted previously because the intercalates generally lack three-dimensional periodicity. We have solved the periodicity problem by using high-crystallinity vermiculite (Santa Olalla, Spain) as a template for exchange.

Other interests: Evolution theory, the origin of mankind, astronomy, ancient history, paranormal phenomena and sports. I have been trained in Martial Arts, and I am in possession of the red belt in TAE KWON DO. I also enjoy skiing and windsurfing, both of which I unfortunately cannot pursue in the Chicago area.

Editor's note: Mr. Vahedi-Faridi is a current CMS research grant recipient and the recent winner of the MSA Kraus Crystallogaphy Research Grant.

Sustaining Member Profile

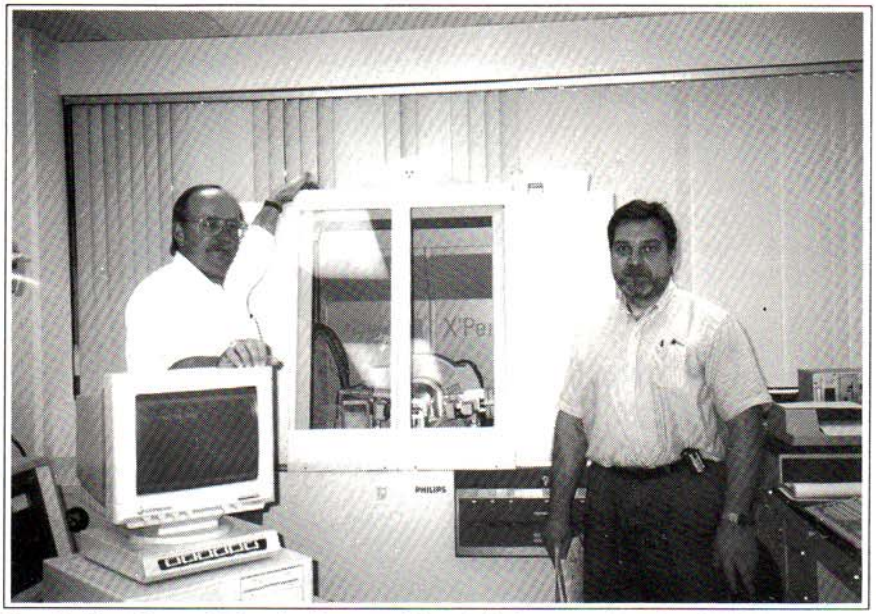
American Colloid

American Colloid is one of the world's leading producers of natural bentonite. Founded in 1927 to capitalize on bentonite's commercial potential in the foundry industry and oil exploration applications, the company today holds an impressive market share in a wide array of industrial and consumer-oriented markets.

From the time it was established until well into 1981, American Colloid built its markets and profits in the heavy industry sectors of oil well drilling, foundry metalcasting, and iron ore pelletizing. Then, with the radical decline in oil well drilling in the early 1980's, the Company embraced a change in its business strategy, one which would diversify the company and lessen its reliance on cyclical market sectors. Over time, American Colloid recomposed its product offerings to a more balanced durable/consumable mix.

While continuing to serve the durables industries, where its expertise spanned more than 60 years, American Colloid also aggressively expanded into a number of emerging niche areas for more consumer-oriented markets such as cat litter, absorbent polymers for personal care products, agricultural chemicals, and ceramics.

To meet specific end-market needs in the personal care products industry and in the environmental arena, Chemdal Corporation was formed in the 1980's to produce and market polymers, and CETCO (Colloid Environmental Technologies Company) was formed in 1992 to provide products and technical services to the wastewater treatment, groundwater monitoring, and landfill lining markets. Both subsidiaries were first formed within American Colloid Company, but now operate as part of the AMCOL International family of companies. This year, this entity, with more than $265 million in annual sales, launched its newest subsidiary, a specialty chemical operation called Nanocor, Inc. Under the AMCOL banner, each operating company focuses on its independent growth opportunities. American Colloid Company is now back to its business of developing technologies for bentonite use.



Gary Beall and Semeon Tsipursky, directors of the technical center at American Colloid.

Courtesy American Colloid

American Colloid mines and processes two basic types of commercial bentonite in the United States—western and southern—otherwise known as sodium and calcium bentonite. The western, or sodium bentonite, clay is mined predominately in Wyoming, Montana, and South Dakota's Black Hills region, while the southern, or calcium bentonite, is mined in Alabama and Mississippi.

One of American Colloid's greatest strengths is its ability to take a customer back to the beginning—to the bentonite itself—and then work with that customer to create a meaningful, value-added product. These include: custom-blended products to strengthen foundry sand molds for cast auto parts; farm implements; railcars and home appliances; clays to bind iron ore into pellets for steel production; lubricators and thickeners for oil and gas well drilling fluids; clay absorbents that clean up spills; traditional and bentonite-based scoopable cat litters; clay carriers for liquid herbicides and pesticides; pelletizing agents for animal feed; humic acid-based turf builders; gelling, binding, thickening, plasticizing, and emulsifying agents for cosmetics, pharmaceuticals and household products; and finally, color/odor removal agents for edible oils.

The company operates one of the world's largest networks of foundry compounds blending operations. In August 1995, American Colloid announced plans to build a foundry compounds blending plant near Lufkin, Texas, bringing the total

continued on next page

number of blending operations worldwide to nine. Throughout the United States and Canada, strategically positioned facilities service the major foundry centers of North America. Subsidiaries/joint ventures in England, Canada, Australia, and Mexico, together with long-term distribution arrangements in Asia, Europe, and South America, round out the company's global supply capabilities.

From its corporate technical center in Arlington Heights, Illinois, the company continues to introduce innovative applications for bentonite and other minerals. Working independently and in partnership with customers, research and development operations shape products to meet changing market needs. Research scientists are dedicated to being first in their fields with breakthrough technologies. Combining broad market knowledge with advanced scientific instrumentation, they develop new value-added uses for bentonite clay.

The technical center, under the direction of Drs. Gary Beall and Semeon Tsipursky, has changed significantly in recent years. It now houses 24 professionals in fields covering chemistry, geology, biochemistry, polymers, agriculture, ceramics, cosmetics, coatings, wastewater, engineering, and pharmaceuticals. The Center occupies over 15,000 square feet of space. Recent upgrades in equipment include a new X-ray diffractometer, X-ray flourescence, GC/mass spectrometer, BET surface-area analyzer, petrographic microscope, FTIR-spectrometer, and inductively-coupled plasma emission spectrometer. These changes and improvements enable the technical center to provide not only strong analytical support, but also important research and development capabilities for the future.

Meeting Calendar

June 15-20, 1996, Gatlinburg, Tennessee: The Clay Minerals Society Annual Meeting. Contact: S. Y. Lee, Environmental Sciences Division, Oak Ridge National Laboratory, P.O. Box 2008, Bldg. 1505, MS-6038, Oak Ridge, TN 37831-6038, USA. Tel: 615-574-6316; fax: 615-576-8646; e-mail: syl@ornl.gov

July 22-28,1996, probably England: 4th International Symposium on the Geochemistry of the Earth Surface. Sponsored by the Int'l Association of Geochemistry & Cosmochemistry. Contact: GES-IV Conference Secretariat, Continuing Education Bldg., Univ. of Leeds, LS29NG, UK. Fax: 44-113-233-3240.

August 3-8, 1996, Denver, Colorado: Denver X-ray Conference in conjunction with the XVII Congress of the International Union of Crystallography. Special session on Phase Quantification. Contact: D.L. Bish, Los Alamos National Laboratory, MS D469, Los Alamos, NM 87545 USA; Tel: 505-667-1165; fax: 505-665-3285; e-mail: bish@lanl.gov

August 4-14, 1996, Beijing, China: 30th International Geological Congress. Abstract deadline: Nov. 1, 1995. Contact: Prof. Zhao Xun, Deputy Secy. General, 30th I.G.C., P.O. Box 823, Beijing 100037, P.R. China. Tel: 86-1-8327772. Fax: 86-1-8328928.

August 26-30, 1996, Grenoble, France: 9th International Conference on X-ray Absorption Fine Structure. Special session on Environemntal Sciences & Geochemistry. Contact: Alain Manceau, Environmental Geochemistry Group, LGIT - IRIGM, BP53, 38041 Grenoble cedex 9, France; Tel: 33-76-63-58-68; fax: 33-76-51-44-22; e-mail: manceau@lgit.observ-gr.fr; or Dale Sayers at Dale_Sayers@ncsu.edu

August 29-31, 1996, Bristol, UK: The History of Degassing the Earth. Contact: http://www.gly.bris.ac.uk/www/research/cetsei/cetsei.html or e-mail: Margaret.D.Wilkins@bris.ac.uk

October 6-9, 1996, Denver, Colorado: Society of Petroleum Engineers. Box 83386, Richardson, TX. Tel: 214-952-9393. fax: 214-952-9435.

October 9-13, 1996, Chania, Crete, Greece: GSA Penrose Conference on Exhumation Processes: Normal Faulting, Ductile Flow, and Erosion. Contacts: Mark T. Brandon, Dept. of Geology & Geophysics, Yale University, P.O. Box 208109, New Haven, CT 06520-8109, UUSA. Tel: 203-432-3135; fax: (203) 432-3134; e-mail: mark.brandon@yale.edu; and Uwe Ring, Institut fur Geowissenschaften, Johannes Gutenberg-Universitat, Postfach 3980, 55099 Mainz, Germany. Tel: 49-6131-392164; fax: 49-6131-394769; e-mail: ring@mzdmza.zdv.uni-mainz.de

October 21-25, 1996, Antwerp, Belgium: International Conference on Chemistry at Interfaces. Organized by the University of Antwerp and the International Association of Colloid and Interface Scientists. Contact: Dr. P. Van der Voort or Dr. E. F. Vansant, University of Antwerp, Dept. of Chemistry, Universiteitsplein 1, B-2610 Wilrijk, Belgium; Tel: 32-3-820-23-68; fax: 32-3-820-23-74; e-mail: evansant@schs.ula.ac.be

October 28-31, 1996, Denver, Colorado: Geological Society of America, Mineralogical Society of America. GSA, PO Box 9140, Boulder, CO 80301. Tel: 303-447-2020.

June 15-June 21, 1997, Ottawa, Ontario, Canada - Joint AIPEA/CMS Meeting. Contact: Jeanne B. Percival, Geological Survey of Canada, 601 Booth St., Ottawa, ON K1A 0E8, Canada. Tel: 613-992-4496; fax: 613-943-1286; e-mail: percival@gsc.emr.ca

October 5-8, 1997, San Antonio, Texas: Society of Petroleum Engineers. Box 83386, Richardson, TX. Tel: 214-952-9393. Fax: 214-952-9435.

October 20-23, 1997, Salt Lake City, Utah: Geological Society of America, Mineralogical Society of America. GSA, PO Box 9140, Boulder, CO 80301. Tel: 303-447-2020.

1999, Krakow, Poland: Euroclay 1999. Contact Jan Srodon, Institute of Geological Sciences PAN, Senacka 1, 31-002 Krakow, Poland. Fax: 48-12-221609; e-mail: ndsrodon@cyf-kr.edu.pl

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