

CMS News

A Publication of The Clay Minerals Society

Summer 1994

See you in Saskatoon

The 31st Annual Clay Minerals Society Meeting will be held from August 13 through August 18, 1994, in Saskatoon, Saskatchewan. Organized by A. R. Mermut of the Department of Soil Science, University of Saskatchewan, the meeting will include sessions and symposia on smectites (convened by N. Güven), Isotope Geochemistry of Clays (convened by F. J. Longstaffe, T. K. Kyser, and S. M. Savin), Clays and the Environment (convened by P. M. Huang and H. Kodama), Geotechnical Engineering of Clays (convened by M. D. Haug), Fundamental Properties of Clay Minerals (convened by D. L. Bish and C. Johnston), as well as general sessions.

A pre-meeting workshop, Scanning Probe Microscopy of Clays, will be held on Saturday, August 13, led by Kathryn Nagy and Alex Blum. Topics will include High Resolution SPM, Interpretation; Molecular

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Creative people don't have to be neat



Professor Walter D. Keller, CMS Treasure, in his office.

L.G. Patterson of the Columbia Daily Tribune

Two new volumes to be published in August

The CMS is happy to announce that two new volumes in the Workshop Lectures Series will be published this summer.

Jeff Walker, Special Publications Editor, reports that Volume 6, *Layer Charge Characteristics of 2:1 Silicate Clay Minerals*, edited by A. R. Mermut, and Volume 7, *Scanning Probe Microscopy of Clay Minerals*, edited by



Keller's award-covered wall.

L.G. Patterson of the Columbia Daily Tribune

Kathryn L. Nagy and Alex E. Blum, will be ready for distribution at the meeting in Saskatoon in August. Volume 6 is a collection of papers presented at the workshop at the 1992 CMS annual meeting in Minneapolis. Volume 7 will accompany

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The Clay Minerals Society



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CMS News is published 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 are as follows: full membership, including a subscription to *Clays and Clay Minerals*, \$40.00/year; student membership, \$17.00/year; nonsubscribing membership, \$15.00/year. Institutional subscriptions to *Clays and Clay Minerals*: \$140.00/yr (\$155.00 overseas) for the year 1994. Please contact the Society Office for information regarding new membership, and Allen Press (913-843-1221) for questions concerning current membership.

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The Clay Minerals Society

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Letters

International scope of *Clays and Clay Minerals*

Editor:

The latest issue of *Clays and Clay Minerals*, v. 42-2, 1994, included 13 papers from the following sources: Indiana, USA, and China; Mexico; Australia; France; Switzerland; France; Denmark; U.K. and France; Wisconsin, USA; Switzerland; New York, USA; Spain; and Japan.

I can remember when it was 10 1/2 USA and 2 1/2 foreign.

What does the above tell us, good or bad? Any reaction to it?

From a fossil mud-dauber
W. D. Keller

Czech clay concerns

Editor:

In response to Dr. Sucha's contribution to the Czechoslovakian meeting on clay mineralogy and petrology, published in *CMS News* February 1993, page 19, we would like to add some facts and correct some of his information.

The first Scientific Conference on Clay Minerals and Clay Rocks in the former Czechoslovakia was organized by the Department of Petrology in the building of the Geological-Geographical Faculty of Charles University in Prague on Prof. J. Konta's initiative in 1958.

Reciprocal advertising

The CMS has embarked on an effort to exchange information about our publications with other societies via newsletter advertising. If you think a related society to which you belong would be interested in such an arrangement, please contact the Society Office.

This newsletter printed on recycled paper.

The second one, held also in Prague, already had a broad international participation.

In November 1963, Prof. Konta together with his collaborators Dr. E. Slansky, Dr. K. Melka, and Ing. J. Neuzil asked for including the starting Group on Clay Mineralogy and Petrology to the Czechoslovak Society for Mineralogy and Geology of the Czechoslovak Academy of Sciences. Regular conferences were organized, mostly in three-year intervals: (*The Editor has chosen not to list conferences individually.*) 1958-1961: organized solely by the Department of Petrology/Charles University; 1964-1990: organized with the participation of the Group on Clay Mineralogy and Petrology of Czechoslovakia; 1992:

organized with the participation of the Czechoslovak National Clay Group.

The Czechoslovak Group for Clay Mineralogy and Petrology was also the main organizer of the 5th Meeting of the European Clay Groups held from August 31st to September 3rd, 1983, in Prague.

Papers submitted to the conferences were published in their sepa-

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Thanks...

To the following people who contributed to this issue:

Scott Argast
Krishna P. Awal
Bull Bailey
Dave Bish
Zdenek Borovec
Dennis Eberl
Karuna Eberl
Del Fanning
Michele Hluchy
Bette Hughes
Warren Huff
W. D. Keller
Sridhar Komarneni
Karel Melka
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M. J. Nash
Dave Pevear
Tom Pinnavaia
Rich Pollastro
Bob Pruett
Don Scafe
Julie Sheets
Vlado Sucha
Bruce Velde
Jeff Walker
Joe White

Letters, continued

rate volumes at Charles University. Prof. Dr. Jiri Konta was the editor of these proceedings. The last meeting in Bratislava, 1992, was something of an exception. Some contributions presented at the XIIth Conference were published in the journal *Geologica Carpathica-Clays*.

Each year two or three half-day meetings were organized either in Prague, Bohemia, or in Bratislava, Slovakia, but sometimes also in other towns.

In March, 1991, the Czechoslovak National Clay Group was registered as an independent scientific society. Until then it was active within the framework of the Czechoslovak Society for Mineralogy and Geology of the Czechoslovak Academy of Sciences. After the Czecho-Slovak split, Czech and Slovak members reached an agreement on mutual cooperation in clay science. They decided to form a single organization, the Czech and Slovak National Clay Group. Conferences on clay mineralogy and petrology will be organized alternately in the Czech and Slovak Republics. Regular half-day seminars during the year will be held in both states independently, and both parts will inform one another about their activities.

The National Clay Group is registered as a member of AIPEA and also of the European Clay Groups Association.

The XIIIth conference is now being prepared by the Czech part of the Society in Prague. It will be held from August 29th to September 2nd, 1994. All the clay scientists and experts abroad are cordially invited to attend this conference. It will cover all aspects of theoretical and applied clay science. The scientific program will

include spoken and graphic presentations and will be divided into the following sections: 1. Weathering, soils, environment; 2. Geology, petrology, mineralogy and geochemistry of clays; 3. Research methods in clay science; 4. Artificial alterations of clay minerals; 5. Clays in the service



Jana Zoubkova and Karel Melka, Prague 1992.

Jo Eberl

of man.

As a new idea, the exhibition "Clay and Man: Clay Raw Materials in the Service of Man," under the guidance of Prof. J. Konta, will be put on during the conference.

A half-day excursion to Prague's historical areas should show the building and sculpture stones in historical monuments attacked by weathering and how they look after reparation.

A geological excursion to Cretaceous kaolinite claystones in the neighborhood of Prague is also planned, including a pottery workshop.

Final date for the submission of one-page abstracts in English is March 31, 1994.

Chairman of the conference: Dr. Karel Melka. Secretary: Dr. Jana Zoubkova. Contact address: Dr. Jana Zoubkova, Czech Geological Survey, Malostranske nam. 19, 188 21 Prague 1, Czech Republic. Telephone: 42 2 7980724. Fax: 42 2 7980965.

Karel Melka, Prague
Zdenek Borovec, Prague

Sucha responds

In keeping with our editorial policy, the author of the article in question was asked to respond to the criticism.

Editor:

The problem started when my contribution concerning our clay conference was published in *CMS News* last year. There is one mistake in the first paragraph. There it is written, "The first conference of the Slovak Academy of Sciences was held..." instead of "The first conference on clay mineralogy and petrology was held..."

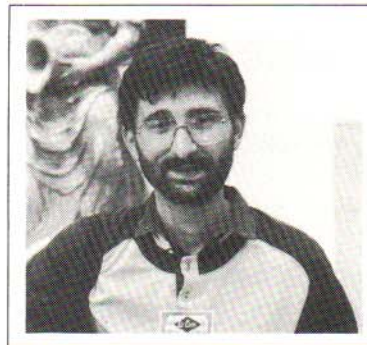
The mistake was probably made during the typing of the text. It is clear to everybody here that it is only a technical mistake because the Academy represents many institutions with different fields of interest, and it does not organize any conference. I noticed this mistake,

but it does not change the content of the contribution; it is absolutely not significant. Only people in our country would know about it; certainly people from abroad would not notice it. And the purpose of the article

was to inform clay scientists from other countries about the conference.

People from Prague, personally K. Melka, of course, also noticed the mistake and wanted me to ask you to publish the correction. I refused to do so because I was sure that any discussion about this irrelevant problem was simply a waste of time. I sent them the original of my contribution to read, but as you saw, they were not able to understand it.

Vlado Sucha
Bratislava



Vlado Sucha, Bratislava 1992.

Jo Eberl

Interviews with the clay scientists

Max M. Mortland

Max M. Mortland is an Emeritus Professor of Soil Science at Michigan State University. He is a past President and a Distinguished Member of The Clay Minerals Society. The interview was conducted by Thomas J. Pinnavaia, also a past President and Distinguished Member of the Society, and a professor in the Chemistry Department at Michigan State. The interview took place in Minneapolis in November 1992, during the joint CMS/SSSA annual meeting.



Drawing by M. J. Nash

CMS: Why don't we begin by finding out where you were born and where you spent your early childhood?

MORTLAND: I was born in Streator, Illinois. I lived on a farm near there for 18 years before I went to the University of Illinois. My junior year, World War II broke out, so I was in the Navy for three years, came back, and finished up my B.S.

CMS: So your undergraduate training was interrupted by the war.

MORTLAND: Yes. I was majoring in general agriculture at that time. I was going to be a vocational ag teacher, going to teach high school boys how to farm. But when I was in the Pacific during the war, I made some decisions along the line. I didn't think that was what I wanted to do.

CMS: Were you ever a student in such a class?

MORTLAND: No. In high school I took all science and math.

CMS: Were your parents farmers?

MORTLAND: Yep.

CMS: Yet you didn't see yourself as carrying on the family tradition?

MORTLAND: No, my older brother really did that. He stayed on the farm, and he's still there, though retired.

CMS: But you had science in mind at a very early age?

MORTLAND: I used to be an amateur astronomer. My brother and I made our own telescope.

CMS: Is that right?

MORTLAND: For a long time I was going to be an astronomer.

CMS: So when did you build your first telescope?

MORTLAND: I was in high school. It took us two years to make a reflecting mirror for a Newtonian type telescope. Took us two years to grind the lens. Walking around a barrel, grinding it to the right curvature and polishing it.

CMS: Is that right? So you were already sort of clued in or keyed in on a science career.

MORTLAND: Yes. I had a high school physics teacher who was quite supportive.

CMS: So obviously coming out of a rural agricultural community, knowing the importance of agriculture, starting out wanting to teach agricultural sciences was an understandable thing. How did the war influence your thinking about your career and what you might do?

MORTLAND: When I was a kid, the most important

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Mortland, *continued*

man in the county was probably the vocational ag teacher or the county extension agent. But of course, during the war I widened my horizons quite a bit. So when I was in the Pacific, I realized I didn't want to be a vocational ag teacher; I wanted to go into something else. And soil science was a required course which I had not yet taken. So I decided when I came back to take that course, try to get an A out of it, and maybe get into graduate school.

CMS: So you came back to the University of Illinois?

MORTLAND: Right.

CMS: Took soil science?

MORTLAND: Right. And quantitative analysis, chemistry, and went to John Giesecking, who became my advisor, and got into a graduate program.

CMS: So you finished your undergraduate work, and then you went right on into graduate school?

MORTLAND: Right. In fact, I finished four academic degrees all at once, without interruption.

CMS: Four?

MORTLAND: I took a Master's in agronomy and one in chemistry, and a Ph.D. in soil chemistry.

CMS: Plus your undergraduate degree in general agriculture. So when did you first meet Giesecking? Was he an undergraduate teacher?

MORTLAND: No. He had only grad students. He didn't teach any undergraduate courses, but the head of the soil section took me and introduced me to John Giesecking and told me that he was going to be my advisor in graduate school. And John then immediately put me in all kinds of rigorous chemistry courses, which really is the reason for my having the career of the kind I've had, whatever it may be.

CMS: So you were a student, then, also of chemistry as well as of soil sciences?

MORTLAND: Right. As a grad student, I took mostly chemistry courses. I took some advanced soils courses. In fact, most of Giesecking's students, by the time they got their Ph.D.'s, had as much course work in the Chemistry Department as any Ph.D. chemist would have had.

CMS: So you were there really at the heyday of Illinois chemistry with people like Noyes.

MORTLAND: Right. And Roger Adams. Herb Laitenen. C. S. Marvel, and so on.

CMS: So who else, besides Giesecking, can you recall being very influential in forming your orientation towards chemistry?

MORTLAND: I think G. L. Clark, who was an X-ray diffraction man in the Chemistry Department. I took two years of X-ray diffraction from him, and he was a very enthusiastic person who understood the application of X-ray to science in all its facets. And he was in some ways like you, Tom; he was interested in clays, in minerals, and so on, not just straight chemistry.

CMS: So what topic did you research for your Ph.D. thesis?

MORTLAND: I worked on the interaction of enzymes with clays. In fact, the title, if I remember right, was, well I'm not sure about the title, but it was the interaction of organic phosphates and phosphatase enzymes with clays. Hydrolyzing organic phosphates in the presence of clays and looking at the effect of clays on this hydrolysis. Of course what happened was that all these enzymes were absorbed, which interfered with their catalytic properties and so on. That was it. Essentially a biochemistry project.

CMS: But these enzymes were suspected of having some influence on pesticides or nutrients in the soil?

I used to be an amateur astronomer. My brother and I made our own telescope.

MORTLAND: Well, at that time the pesticides hadn't really come on the scene so much, but there had been a lot of work done on organic phosphates in the soils, and so I just selected that as a topic to see how phosphatases were affected in their activity in the presence of clays. Giesecking had shown striking effects of clays on proteolytic enzyme activities.

CMS: Very interesting. So once you finished your Ph.D. degree, what sort of position did you take up as a new Ph.D. in soil science?

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Mortland, continued

MORTLAND: My first position was at the University of Wyoming, where I went in 1950, and I was the only soil scientist in the university. I taught all the courses, did all the research, did all the extension in the whole state of Wyoming, which was a good learning experience. I was there three years, and left in 1953 to take a job offered to me at Michigan State University in the area of soil physical chemistry.

CMS: So this gave you the opportunity to enter a research environment?

MORTLAND: Exactly, Tom. It gave me an opportunity to focus my research abilities, whatever they are, in a more serious way, I think, in a more fundamental way. That's what I did. When I got to Michigan State University, I could select any research program I wanted to carry out, so that was a very good thing for me.

CMS: When did you become interested in smectites? Was that a long-standing interest with you?

MORTLAND: Well, John Giesecking, my major advisor, early on had done a lot of work. In fact, he was one of the first people to really look at the absorption of organics, specific organic molecules, on clay surfaces. He showed, for example, the phenomenon of organic cation exchange

When I was a kid, the most important man in the county was probably the vocational ag teacher or the county extension agent.

onto clays in 1939 as a function of cation exchange properties. And then he and a graduate student, Leonard Ensminger, absorbed proteins on clays and showed how they were protected from enzymatic reaction by the clay surfaces, by the complexation with the clays. So he was really an early pioneer in clay organic investigations.

CMS: So the importance of smectites in soil chemistry was made very clear to you very early on?

MORTLAND: Well, in fact I've done so much work with them, they have a high surface area, so you can maximize whatever chemistry is going to occur with those as compared with kaolinite or something like that. I guess



Good friends, good colleagues: Tom Pinnavaia interviews Max Mortland at Minneapolis, November 2, 1992.

High Iron Photos

the assumption is that once you understand the surface chemistry going on in smectite, perhaps you can project it to other kinds of clay mineral surfaces, at least to some degree.

CMS: Even though they might have lower surface area, the same basic chemistry may apply.

MORTLAND: Yes.

CMS: That was very good thinking. I know that one of your favorite smectites is the Wyoming montmorillonite. Did you become oriented towards that particular mineral while you were in Wyoming, or is that just coincidence?

MORTLAND: No. Not particularly. When I got to Michigan State, at that time there were some reference samples of clays available from the American Petroleum Institute, and I bought some of those clays. Actually the smectite that I looked at the most and studied the most through my whole career was the Upton, Wyoming, because it had a lot of data on it, and the American Petroleum Institute had published a book on the properties of its reference clays. I knew a lot about it, so I just used that as a research material.

CMS: Very good. I think this is perhaps the most studied clay in the clay world today. And certainly your contributions have helped greatly in understanding the organic surface chemistry of clays. When next did you focus in on the importance of the exchange cation on the surface chemistry of smectites?

MORTLAND: When I first got into applying infrared spectroscopy to investigating clay-organic complexes, I

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Mortland, continued

could soon see that the spectra of some of these complexes depended on the nature of the exchange ions on the surface of the clay. It's obvious that different kinds of cations made different kinds of complexes with the organics.

CMS: I know that one of the very first times I met you in the Soil Science building at Michigan State, in one of the conference rooms, there was a very nice picture of you as a young scientist standing next to an X-ray diffractometer. I think that was probably the first instrument that you purchased when you joined the faculty there at Michigan State. So a lot of your early work made use of X-ray diffraction.



Max Mortland, San Diego, 1993.

High Iron Photos

MORTLAND: Right. When I first went to Michigan State in 1953, we just had bought a Philips diffractometer, goniometer, and recorder, so I used that machine all my career until moving into a new building two or three years ago when we bought a new machine. That was an excellent piece of equipment.

CMS: Did you do a lot of work on weathering of clays in your early days at Michigan State before the infrared work?

MORTLAND: My earliest work at Michigan State was on weathering of micas, where I washed particles of biotite in sodium chloride solutions, measured the rate of potassium release as a function of particle size, as a function of leaching rate, and so on, to kind of come up with some idea about how potassium was being released from the mica. And coming up, along with some other people, with the idea that diffusion is the mechanism by which these ions are released; by that, I mean diffusion is the rate limiting process.

CMS: I know infrared spectroscopy didn't really become commonplace until the early '50s for lack of commercial grade instruments, but how did you become interested in infrared spectroscopy?

MORTLAND: In 1960, I had a Fulbright grant which I

took in the University of Louvain with Fripiat, José Fripiat. Of course, he was well-founded in infrared spectroscopy, and that's where I was first initiated into applications of infrared spectroscopy. That particular leave really re-oriented my whole research program, because from that time on, for a number of years, I applied infrared spectroscopy to understanding the mechanisms of organic/clay interactions.

CMS: One of the things that perhaps your name is most frequently associated with is the surface acidity of clays and the importance of surface acidity in organic binding mechanisms. Can you tell us a little bit about that aspect of your contribution?

MORTLAND: The beautiful thing about infrared spectroscopy is that you can tell when a molecule has become protonated. For

example, Fripiat and I used ammonia as a proton acceptor to determine how good a Bronsted acid clay surfaces were. You can differentiate between ammonia and ammonium ion with infrared spectroscopy, so that was the secret. You can't do it with any other technique that I can think of, to get at that particular application. Later K. V. Raman and I, through a number of techniques, determined how much ammonium ion was formed as a function of

I finished four academic degrees all at once, without interruption.

several variables, for example, exchange ion, water content, kind of smectite, and so on, under equilibrium conditions.

CMS: Well, it certainly was classic work, and a lot of it has permanent significance, and it certainly elucidated our understanding of clay surface chemistry. I know, Max, that you collaborated with many scientists in your long and distinguished career. Can you tell us about some of the early people you worked with in addition to José Fripiat?

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Mortland, *continued*

MORTLAND: Well, John Gieseck, of course, my major professor at Illinois, was a great inspiration. He was a good chemist and channeled my training along appropriate lines of rigorous chemistry. I think it was from him that I learned that research was really a lot of fun.

CMS: I know that has had a big impact on your thinking and philosophy in soil sciences because you expect most of your graduate students to perform very well in chemistry.

MORTLAND: Right. How can you be a good soil chemist without understanding the discipline of chemistry? It has always been my view that a soil chemist or clay chemist should be as good a chemist as a "real chemist."

That particular leave (with Fripiat) really re-oriented my whole research program, because from that time on, for a number of years, I applied infrared spectroscopy to understanding the mechanisms of organic/clay interactions.

CMS: Sure. That's right. I think it's really shown in the success of your former students and their contributions to soil science. So I know that Gieseck and Fripiat were early influences on your career, and then once you were established, you did collaborations with other internationally recognized people. I know you worked with Colin Farmer at Aberdeen. Can you tell us a little bit about that work?

MORTLAND: Actually, when I had the Fulbright in Belgium with Fripiat, that following summer I took a trip up to Aberdeen and met Farmer for the first time. And at that time, we had a very good rapport. When I got back to Michigan State, I applied to NSF for a grant and got my very first National Science Foundation grant, in about 1962 or 1963. I brought Farmer over on this NSF grant to work on interactions of amines with clays. We were using infrared. I had just bought a new IR-7 spectrometer. That was another wonderful interaction. I consider Colin Farmer one of the top scientists in the world on application of infrared spectroscopy to mineral systems. It was a very good learning experience for me.

CMS: I think you and Colin did some classic work on pyridine binding in smectites. Can you tell us a little bit about that?

MORTLAND: That was a paper where Colin and I again used infrared spectroscopy to look at the pyridine interacting with smectite, containing different kinds of exchange ions. We used copper, magnesium, and others. The most important thing to come out of that work was the establishment of water bridge binding, where a metal ion holds on to its inner shell of water of solvation which hydrogen bonds to another molecule, in this case pyridine. We established that with infrared spectroscopy and to my knowledge, that's the first paper to show or establish or prove the existence of the so-called "water bridge." Another contribution from that paper and another we did on ethylamine-clay complexes was that when you have excess organic base on a H⁺-clay surface, two organic base molecules may share the same proton to form a symmetrical H-bond.

CMS: Right. And that work was done in the early, mid '60s.

MORTLAND: Yes. I should add, Tom, that my twenty-year association with you, and the science we did, is one of the most important aspects of my career.

CMS: Soon after that, you and your students focused on organics with less obvious functional groups, for instance, aromatics. I am thinking specifically of your work with Harvey Doner. Can you tell us about some of that?

MORTLAND: Yes. Harvey and I were again using infrared, looking at interactions of benzene with smectite that had different exchange cations on it. One Friday

How can you be a good soil chemist without understanding the discipline of chemistry?

night we put several of these clay films in a dessicator along with P205 as a dessicant, and benzene in a little dish. On Monday we came back and the clay with the copper exchange ion on it had turned a brilliant red, so we knew we had some kind of chemistry occurring. So we did infrared spectroscopy on that, and it showed that the spectrum was not that of benzene at all any more. It had lost all its aromatic properties and so on. We actually

continued on next page

Mortland, *continued*

Joe White, José Fripiat, and Max Mortland, Georgetown, Colorado, 1985.

Joe White

published a paper in *Science* on the basis of that particular experiment. Two or three years later, Tom Pinnavaia and I and other people, J. P. Rupert, for example, showed that these are radical cations formed by the donation of an electron to the exchangeable copper, reducing the copper and forming the organic radicals.

CMS: I have to admit that the reaction leading to the red benzene complex on Cu (II)-clay was probably the most important reaction in my career because it brought you and me together.

MORTLAND: Your first comment when we started talking about that, was that perhaps some of the P205 had spilled over on to the clay in the experiment.

CMS: Right. I thought we were looking at P205 clay chemistry, not benzene-clay chemistry. Anyway, those were great days, and that reaction brought you over to chemistry where I got to know you, and of course, you stimulated my own interest in clays from then. But you continued your work through the '70s, studying aromatic systems, and initiated work in what I believe was one of the forefront areas of soil science, and that is the role of clays in the environment, and, in modified form, materials for remediation of polluted environments. Can you tell us about some of the absorption studies you did with the organo-clays and organic molecules?

MORTLAND: Yes. Way back in 1977, Murray McBride, who, a little before that, had been a graduate student at Michigan State University, and I and you, as you well know, published a paper on the use of hexadecyl

trimethylammonium smectite as an absorbant for taking aromatic molecules out of water. And at that time, in 1977, we suggested or proposed the utility of some clay organics for improving water quality, by removing these kinds of pollutants. To my recollection, that's the first paper suggesting that particular application of clay-organic complexes. After that, you and then another young man, Steven Boyd at Michigan State, published a lot of papers showing the effects of different kinds of organic cations on clays in the absorption of these kinds of molecules from water, and improving the technology and possible application of these systems for environmental purposes.

CMS: Now, it is amazing how many absorption mechanisms you unravelled in your career for the binding of organics and clays. I'm thinking back also to the work you and

Vaughn Berkheiser did on some of the first metal complex pillared clays, and that was back in the mid-'70s.

MORTLAND: Yes. We used the protonated form of DABCO, which is triethylene diamine. It is a divalent cation which holds the clay layers apart. Since it's divalent, you don't have as many cations in the interior of the smectite, so that there's lots of surface available. So this

On Monday we came back, and the clay with the copper exchange ion on it had turned a brilliant red.

was a pillared material, not resistant, however, to heat. It could decompose at high temperatures, but at ordinary ambient temperatures, it was quite a nice pillared system and a very good absorbent for certain species.

CMS: I also have to think back to the work that Dave Clementz contributed to your group. He did the orientation work on the copper smectite using ESR spectroscopy.

MORTLAND: That was a beautiful work. I'm not taking any credit for it, particularly because it was not my idea; it was his idea. The paramagnetic divalent copper has a signal which is orientation-dependent, so we could put this cation within the internal surfaces of the smectite and then orient the film in the magnetic field and actually get some idea about the status of the hydrated cation, what sort of coordination habit it had, what the effect of ver-

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Mortland, *continued*

miculite versus smectite on the orientation of the hydrated copper ion was, what the effect of water content within the interlamellar regions was, which at maximum swelling ($d = \approx 20\text{\AA}$) indicated a freely spinning hydrated cation in the interior of the clays. This, of course, tells us something about the liquid nature of the water in the interlayer. Of course, at lower water contents, i.e. $d = \approx 14\text{-}15\text{\AA}$ or $\approx 12.5\text{\AA}$, the CuII ion was more restricted.

CMS: Those were really exciting days.

I'd hate to see the surface chemistry aspect of clay science disappear from the Society and from the Journal.

MORTLAND: Yes. And that paper is published in the *Journal of Physical Chemistry* in 1973 or 1972. Shortly after that, Murray McBride extended that work using similar methods, and that was also published in the *Journal of Physical Chemistry*.

CMS: Well, Max, I know you're retired, but you come to the lab every day. Can you tell us a little bit about what sort of things you're interested in today?

MORTLAND: Well, I come to the lab every day and read the scientific journals, do correspondence, but most importantly, talk with the post-docs and the grad students that happen to be around. For me, it is a good relationship to be able to talk with them, to discuss their work and science in general.

CMS: I know you've had a tremendous impact on young people and motivating them in clay science, clay research. It's good to know that you're continuing that impact in your retirement years. What sort of things do you do when you're not looking at clays or studying clays or reading about clays? What other sorts of things do you do?

MORTLAND: Well, some of you who were at the '88 conference know that I do some singing. I sing in several groups, play a lot of tennis, play bridge, go fishing when people invite me to go fishing. I've been spending winter months out in Arizona the last two or three years. Keeping pretty busy, actually.

CMS: It's marvelous. I know you served as an officer in the Clay Minerals Society and helped guide the develop-

ment of the Clay Minerals Society. What is your perspective of the future of the science that you've helped build through the years?

MORTLAND: I think it's very important that we have a balance of subject matter within the Society. For example, I'd hate to see the surface chemistry aspect of clay science disappear from the Society and from the journal. I would be a very strong advocate for us all as members, trying to maintain a balance of subject matter. I see some indication of a decrease in the surface chemistry aspect of clay science as reflected in the journal and papers at meetings.

CMS: I think that's something we all appreciate—the diversity of our society and the multi-faceted research that the various members bring to it. I know that in addition to your extracurricular interest in things like astronomy and so forth, you have a key interest in history. I know, for instance, that you're very strong in European history and very strong with the history of World War II. Can you tell us a little bit about those interests, how they developed?

MORTLAND: I've always been interested in that—archaeology, anthropology, all those subjects. I was active for a number of years in the Michigan Archaeological Society where we went out and excavated Indian campsites, and so on, and in history in general. Most recently, Civil War history, my daughter has been very interested in that. I don't know why, but...

CMS: I know you spent a lot of lonely time on a battleship, warships in the Pacific Ocean. Was that experience important in your focusing on history?

MORTLAND: It was more important, Tom, in me focusing on my career. Because the time I was sitting out there

I would be out mapping the soils and come across what I thought might be an old Indian campsite or a burial site.

on that warship, I had looked back at what I had been doing as an undergrad at the University of Illinois and said, "Is this really what I want to do?" And it was at that time that I made the decision that I certainly didn't want to be a vocational agricultural teacher. I just sort of rationalized, "Well, what courses have I been most effective in?" And it turned out to be chemistry and courses in the physical sciences. I had soil science to take yet, which required

continued on next page

Mortland, *continued*

chemistry, and so on. And so, I said, "Well, I'll do a good job in that required course for my B.S., and then I'll go on to graduate school in something else." And that's exactly why I'm here. I got my Bachelor's in general ag, and then went on to graduate school in soil science and really got a firm background in chemistry. By the way, I took Ralph Grim's clay course the first time he taught it.

CMS: So it had more of an effect on your career in soil science than on your interest in history.

MORTLAND: Yes, I guess so. Although I was off Japan at the time the atomic bomb was dropped. The cruiser Indianapolis was sunk by the Japanese close to that time; we had to have been very close to it. We were on our way from the Phillipines to Hawaii to load troops to invade Japan. During that trip, both atom

My tastes run from the Renaissance, through the Baroque, through the Classic, up to the Romantic.

bombs were dropped, and the war was over the day we sailed to Pearl Harbor. Our course during that voyage must have put us near the area where the Indianapolis was sunk.

CMS: That's very interesting.

MORTLAND: I'd say that my experience in the Navy in World War II was a maturing experience.

CMS: I know that when you were a young student, as part of a way of earning some money, you did some mapping of soils in Illinois. I remember you telling me on one occasion that you became familiar with Indian artifacts and burial sites and so forth.

MORTLAND: Yes. I would be out mapping the soils and come across what I thought might be an old Indian campsite or a burial site or something like that. Many



Max Mortland during World War II.

M.M. Mortland

times I was sure of it, because I would find artifacts, pots and so on. I would take these back to the archaeologist at the university, and he would identify the culture that they were from, and locate them on his map, so he had the location of these sites that were heretofore unknown. He was happy to have that information, and I enjoyed doing it.

CMS: I know you have very strong anthropological interests, and that you are a very broadly based individual with interests that span a wide spectrum of science and the arts, and I know that a very important part of your life is music, and I'd like you to tell me a little bit more about your talents and tastes in music, if you could.

MORTLAND: My tastes range from the Renaissance, through the Baroque, through the Classic, up to the Romantic. With the exception of a couple of composers like Brahms in the Romantic, I guess my tastes are pretty much within that group. I've done a lot of singing over the years. It has been, as you say, a very important part of my experience.

CMS: I know you play a recorder. Do you still take part in the madrigal singers group which performed at the 1988 CMS meeting in Grand Rapids?

MORTLAND: No. The Renaissance Singers was a good group. I was with them for about 14 years, but have resigned. Since they memorize all their music, I've become lazy and decided that's too much work, but I am still singing in some other groups.

CMS: Is that something you do on a regular basis?

MORTLAND: Three nights a week I have rehearsal.

CMS: That's pretty amazing. Do you have any final comment?

MORTLAND: I have been extremely fortunate to have had a career in science I have really enjoyed. The interaction with graduate students, post docs, and peers has been a great blessing. The other activities are also part of who I am.

Report of the Eastern European Liaison Committee

This report is published in the hope that individual contacts can be established with eastern European scientists. Some CMS members have contributed subscriptions to the journal to colleagues in the East. Members who have participated in such a way include Joe White, Bill Johns, Fred Mumpton, Jeff Walker, and Dennis Eberl. If you would like to support an individual member's subscription, please contact the Society Office. It is also possible to pay the postage for a ten-year's set of back issues to be sent to an institution (about \$40.00). Srodon mentions in his accompanying letter that "most of the people in the former SU are totally cut off from the international community and are too shy and too poor to try entering it without a form of invitation." If you have more information about eastern European clay scientists and institutions, please contact Dr. Jan Srodon, Institute of Geological Sciences, PAN, Senacka 1, 31002 Poland (fax: 48-12-221609; ndsrodon@cyf-kr.edu.pl). The recommendations of the EE Liaison Committee are deleted from this report, pending decisions by the Council in August.

Chairman: Jan Srodon

Members: Roger Burtner, Warren Huff, W.D. Johns, Vladimir Sucha

We set the following goals for the activity of this committee in 1994.

1. Find out who does clay science in EE countries and establish some contacts.
2. Find out whether these researchers have access to *Clays and Clay Minerals* (CCM).
3. Find out how the accessibility of CCM can be improved.

A preliminary search of the CCM subscription list has shown that former Czechoslovakia, Hungary, and Poland are relatively better integrated into the international clay community, each having subscriptions to CCM in most major cities. Also, authors from their countries appear in CCM. Our attention then was concentrated on the remaining countries.

A list of 37 addresses of clay scientists or at least geological institutions in these countries was put together by Warren Huff, Vlado Sucha, and myself, and a letter was mailed to all these addresses. The following report is based on the 14 answers which have arrived to date. The mail east of us is terribly slow, and I suspect that is why no letter from Russia has come yet.

Albania - No information.

Belarus - A group of 14 people works on clays in the Institute of Geological Sciences (Zhodinskaya 7, 220141 Minsk, Rep. of Belarus; tel: 7-172-645315; fax: 7-172-636398). They work on clays in sediments (V.I. Abramenko, J.I. Anoshko, S.D. Astanova, V.A. Vecher, T.E. Kolosova, N.N. Levych, N.D. Michailov, L. I. Murashko, S.L. Shimanovich), on water-clay interaction (L.F. Gulis, L. I. Mateeva, A.A. Machnach, V.M. Shimanovich), and on XRD+EM of clays (V.P. Samodurov). So far they have published only in Belarus and Soviet (Doklady ANSSSR) journals. The central library of BAS has a complete set of CCM since 1973 (since 1983 only on microfiche).

Bulgaria - Dr. Georgi K. Kirov (Institute of Applied Mineralogy, Moskovska 6, Sofia - 1000) is in touch with all the other mineralogists in Bulgaria.

Croatia - No information

Czech Republic - Well-organized clay community (Czech and Slovak National Clay Groups - organizer of well-known clay conferences, reports in AIPEA newsletter). Most people work in Prague, where they have at least two sets of CCM (at the University and at the Geological Survey). A small group in Ostrava with a crystallographer Zdenek Weiss (Technical University Ostrava, 70833 Ostrava-Poruba; e-mail: Zdenek.Weiss@vsb.cz) has had CCM in Ostrava since

1981. They can't afford to buy back issues, but are very interested in obtaining them. They can offer in exchange 200 kg. of Mg vermiculite from Letovice for the CMS Repository.

Estonia - Clay research in Estonia is concentrated on clay sedimentology, geochemistry, and paleoweathering of Precambrian crust. Volli Kalm (e-mail: geol@geogr.ut.ee), Juho Kirs, Jaan Aruvali, and Kalle Kirsimae (e-mail: arps@math.ut.ee), work at the Institute of Geology, University of Tartu, Vanemuise 46, EE2400 Tartu, Estonia (fax: 372-34-30853). Enn Pirrus and Toivo Kallaste work at the Institute of Geology of the Estonian Academy of Sciences. So far they have published only in local and Soviet journals. The first paper is being prepared for *Clay Minerals*. CCM is not available in Estonia. In Soviet times, they had access to Moscow and Leningrad copies by interlibrary loans. Now they are cut off. The Nordic Society of Clay Research has offered the 1993 issue of *Clay Minerals* to the Estonian Clay Centre, an unofficial coordinative body led by Prof. Enn Pirrus (Clay Centre Mining Institute of Technical University, Kopli 82, EE0004 Tallin, Estonia). The Estonians cannot currently afford a subscription to CCM. In exchange for back and/or current issues of CCM, they can offer famous unconsolidated Lower Cambrian Blue Clay from Lontova Em.

Hungary - The Hungarians are organized into the Clay Minerals Group of the Hungarian Geological Society (info on recent activities in the AIPEA newsletter). They publish internationally, and at least four institutions in three cities are subscribing to CCM.

Kazakhstan - Clay research in Kazakhstan is concentrated in the capital Almaty and concerns mostly the clay mineralogy and the XRD

techniques of clay identification.

A.P. Slusarev, L.B. Samatov, N.A. Azerbaev, and G.K. Bekenova work at the Institute of Geological Sciences of the National Academy of Sciences of the Republic of Kazakehstan. (Kabanbai Batyr 69, 480100 Almaty, Republic of Kazakehstan). E.A. Sultanbaev, T.I. Malueva, and T.A. Ulmanov work at the Soil Institute of NAS RK (Akademgorodok, 480032 Almaty, RK). So far they have published only in Kazakh and Soviet geological and soil journals. Central Science Library of NAS RK (Schevchenko 28, 480021 Almaty, RK) has had CCM until 1991. Subscription has been stopped for the lack of funds, and for the moment there is no prospect of renewing it.

Latvia - Most of the clay research in Latvia seems to be concentrated on studying sedimentary clays as raw materials for the ceramic and other industries (Institute of Silicate Materials of the Riga Technical University). Similar types of research are carried out by Dr. Austra Stinkule at the Institute of Geology, University of Latvia, Jurmalas gatve 91/1 - 33, 1029 Riga, Latvia. They publish locally. CCM is not available. In Soviet times they had access to it via interlibrary loans from Moscow and Leningrad, but not any more. They have no chance of getting a subscription. Latvia is a small country, covered with sediments, and they cannot offer any pure clay in exchange for CCM.

Lithuania - Dr. Petras Simkevicius (Institute of Geology, Sevecenkos 13, 2600 Vilnius) and his PhD. student are the sole clay scientists in Lithuania. He does clay sedimentology, studying both ancient rocks and Baltic sea sediments. CCM and other international clay journals are not available in Lithuanian libraries. Since 1991, the Nordic Society for Clay Research has paid for the personal subscription to *Clay Minerals* for Dr. Simkevicius.

Macedonia - No information.

Poland - Big clay community (more than 100 people attended 4th national clay conference last year) organized into the Clay Group of the Polish Mineralogical Society (information in the AIPEA newsletter). Both fundamental and applied research in many directions, several people have published in CCM. Main centers: Warsaw, Krakow, Lublin, and Gdansk have access to CCM. A new group, starting clay sedimentology in Poznan declares that they will start a subscription to CCM if the Society could provide the back issues free of charge. (Dr. Stanislaw Lorenc, Institute of Geology, Poznan University, Makow Polnych, 60665 Poznan, Poland, fax: 48-61-536536.

Romania - Clay community organized into Romanian Group for the Study of Clays (5th national clay conference held in 1987, more info in AIPEA newsletter 3/94). Clay research is carried out at:

1. Dept. of Mineralogy, University Babes-Bolyai, M. Kogalniceanu 1, 3400 Cluj-Napoca; fax: 40-64 111905. (Lucretia Ghergari: hydrothermal and volcano-sedimentary clays; Alexandru Hosu: sedimentary clays; Dana Pop: glauconite).

2. Dept. of Mineralogy, Univ. of Bucharest, Piata N. Balcesco 1, Bucharest (fax: 40-1-614508; Lucian Metei: clays in sediments).

3. Geological Institute of Romania, Caransebes 1, Bucharest (fax: 40-1-13128444; Silviu Radan: clays in sediments).

4. Mineralogical Laboratory, Technical University of Timisoara, Stadion 1a, Timisoara (fax: 40-56-190321; Iulio Bobos; hydrothermal clays).

5. The Research Institute for Soils Science, Marasti Bd. 61, Bucharest (Constantin Craciun and Gheorghe Gata: clays in soils).

6. Prospectiuni S.A., Caransebes 1, Bucharest (Gheorghe Neascu: clay minerals).

So far, the Romanians have pub-

lished mostly locally (until 1990, it was prohibited to publish in foreign periodicals). They do not have access to CCM at the Romanian libraries. The library of Babes-Bolyai University in Cluj-Napoca hopes to start a subscription to CCM soon and would welcome very much a gift of the back issues from the CMS. In exchange, Dr. Ghergari can offer the CMS two Romanian standard clays, Namontmorillonite from Chioarului Valley and kaolinite from Aghires, and also hisingerite from Baisoara, ferri-palygorskite and palygorskite, hydrothermal halloysite and nacrite from Baia Marc.

Russia - No answer has arrived to date. There seem to exist three main centers of clay science in Russia: Moscow (V. Drits and his group), St. Petersburg (Frank-Kamenecki and his group), and Novosibirsk. According to the subscription list, CCM is available in St. Petersburg and Novosibirsk, although it well may be that they have stopped their subscription. The Geology Department of the Library of Natural Sciences of the Russian Academy of Sciences (Staromonetny per. 35, 109017 Moscow, Russia; fax: 7-95-2302179; e-mail: chckin@igem. msk. su) has a complete set up to 1991. Then the subscription was stopped for lack of funding. The library applied to the International Science Foundation (G. Soros) but failed. They also applied to the President of the CMS (R.C. Reynolds, Jr., letter of 15 Oct. 1993). In 1993, the CMS EE Committee sent a set of back issues to Moscow.

Slovakia - Clay scientists in Slovakia are organized into the Slovak Clay Group, which holds joint Conferences on Clay Mineralogy and Petrology with the Czech Group. The clay research takes place in Bratislava (Slovak Academy of Sciences and Comenius University). The Slovaks publish in CCM and *Clay Minerals*, and started in 1992 another international clay journal, *Geologica Carpa-*

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Student Profile

Julie Sheets

Nationality: American

Place of study:

Ph. D. (in progress):
Department of Mineralogy, Ohio State University, Columbus, Ohio

Thesis Advisor:

Rod Tettenhorst

Interest in clay: I

became interested in clay minerals

through working

with Dr. Tettenhorst during my dissertation research. During my Master's research, I applied low resolution transmission electron microscopy (TEM) techniques to the study of mineral intergrowths, and the TEM experience was then applied to a feldspar-alteration problem. Dr. Tettenhorst was interested in the texture of a completely-altered (to clay) feldspar. This clay sample appeared to retain



Rod Tettenhorst and Julie Sheets.

High Iron Photos

the original microtexture of the parent feldspar, and so we decided to attempt to determine whether the original feldspar texture imparted a control on the weathering process; specifically we wanted to know if there is a preference for alteration on specific types of texture in the parent feldspar (they are very inhomogeneous on the scale of a micrometer).

even some reclaimed strip mine land (with guess what: clay pits!).

Present occupation: I am now teaching an introductory geology course at Wittenberg University in Springfield, Ohio, while finishing my degree.

Career plans: I would like to continue teaching in a small college setting.

Favorite sports:

Hiking, camping, and golf.

Other enjoyments:

Enjoying my family and travelling to our family farm near Oak Hill, Ohio (southern Ohio). We have never lived on the farm, but we derive most of our sanity from visiting it! It is mostly wooded and has a pond and

Workshop Volumes,

continued from page 1

the workshop to be presented in Saskatoon.

Chapters in *Layer Charge Characteristics of 2:1 Silicate Clay Minerals* include: Layer Charge Determination by Alkylammonium Ions, by G. Lagaly; Role of Layer Charge in Organic Contaminant Sorption by Organo-Clays, by S. A. Boyd and W. F. Jaynes; Evaluation of Structural Formulae and Alkylammonium Methods of Determining Layer Charge, by D. A. Laird; Problems Associated with Layer Charge Characterization of 2:1 Phyllosilicates, by A. R. Mermut; and The Movement of Neutral Particles in

Charged Media, by W. J. Farmer.

Chapters in *Scanning Probe Microscopy of Clay Minerals* include High Resolution Scanning Probe Microscopy: Tip-Surface Interaction, Artifacts, and Applications in Mineralogy and Geochemistry, by C. Eggleston; Atomic and Molecular Scale Imaging of Layered and Other Mineral Structures, by F. Wicks, G. Henderson, and G. Vrdoljak; Mineral-Water Interactions: Fluid Cell Applications of Scanning Force Microscopy, by P. Dove and J. Chermak; Determination of Illite/Smectite Particle Morphology Using Scanning

Force Microscopy, by A. Blum; and Application of Morphological Data Obtained Using Scanning Force Microscopy Quantification of Fibrous Illite Growth Rates, by K. Nagy.

Both books will be available at the annual meeting and can be ordered from The Clay Minerals Society, P.O. Box 4416, Boulder, CO 80306 USA.

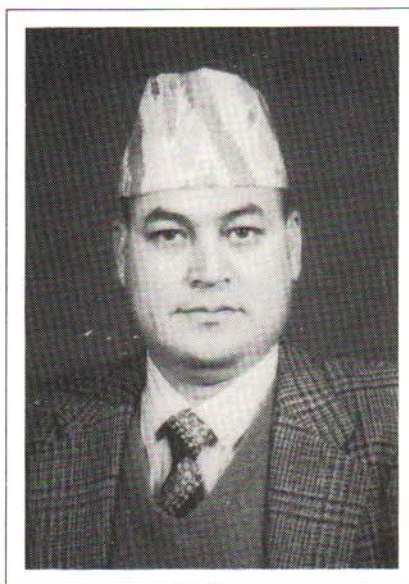
Volume 6, *Layer Charge Characteristics of 2:1 Silicate Clay Minerals*, will sell for a price of \$12.00 plus \$2.00 postage. Volume 7, *Scanning Probe Microscopy of Clay Minerals*, will sell for a price of \$18.00 plus \$2.00 postage.

Research on Clays and Clay Minerals in Nepal

Mount Everest, the highest snow peak in the world, is in Nepal. It is bounded on the north by China, and east, west, and south by India. The country is highly mountainous, and modern means are still not available for approaching the northern region of the country, which has been left untouched by all kinds of scientific exploration, except mountaineering. However, the capital, Kathmandu, now has direct air links with Paris, Moscow, Rome, Frankfurt, Osaka, Dubai, Singapur, Bangkok, Colombo, Karanchi, Dhaka, Bombay, Delhi, Tibet, (China), and is no longer a remote corner far from any point in the world.

Although relatively undeveloped, Nepal is trying to lay down a basic infrastructure to cultivate scientific culture for national development. Geological studies on mineral wealth began with the establishment of the Department of Mines and Geology in 1959. Geological reports regarding the occurrence of significant clay deposits appeared only after 1970. Chemical engineers, ceramic experts, and research chemists undertook detail studies on these deposits to establish clay-based industries in Nepal. For this purpose, they received assistance from foreign labs, such as Australian Mineral Development, Central Glass and Ceramic Research Institute (India), and Federal Institute of Geosciences and Natural Sciences (Germany). Unfortunately, nothing substantial resulted from these efforts. Manpower development, along with other facilities, were expanded to strengthen research in this direction. Agricultural chemists employed at the government labs also initiated studies on clay-soils beginning in 1970.

Institutes under Tribhuvan University, such as Science and Technology, Engineering, Forestry and Agriculture, now have the potential man-



Dr. Krishna P. Awal, Associate Professor of Chemistry, Tribhuvan University, Nepal.
Courtesy K. P. Awal

power to undertake research on clays and clay minerals. This writer is affiliated with the Central Department of Chemistry, Tribhuvan University, Kirtipur, Kathmandu, and has been engaged in research and development on the physical chemistry of clays since 1976. In this department, students work on physical chemistry of clays for both masters and doctoral dissertations. In addition, a privately-run research institute, Research Laboratory for Agricultural Biotechnology and Biochemistry, is also making a contribution to the field of soil and soil-related studies.

We have accomplished studies like identification, evaluation of physico-chemical properties, and assessment of industrial uses of clay deposits in the Daman, Panchmanne, and Simpani regions. We have identified Daman and Panchmanne clay deposits consisting mainly of kaolinite, and Simpani as consisting of chlorite. We have found Daman and Panchmanne clay suitable for use in ceramic industries. We have also explored their interactions with some organic compounds to better highlight their sur-

face characteristics. All the clay deposits mentioned here have been used as raw materials for painting by local people for a long time. Geological reports regarding other clay deposits are also available, and we have a program to explore these step by step.

Although undertaking research is a difficult job in a country like Nepal, we are making efforts to create better facilities to foster research. Our library is not yet well-equipped with leading journals and recent relevant publications. It is unfortunate that I have to report here that none of the institutes mentioned in this article have instruments like XRD, DTA, and SEM, which are basic aids for carrying out complete research in this field. Hence, I would like to appeal to international personalities, research institutes, and organisations to cooperate with us to expand research activity in this field in Nepal.

Krishna P. Awal
Kathmandu, Nepal

ICDD Crystallography Scholarship Awards

Qualifications: The applicant should be a graduate student seeking a degree with major interest in crystallography (crystal structure analysis, crystal morphology, modulated structures, correlation of atomic structure with physical properties, systematic classification of crystal structures, phase identification and materials characterization).

Deadline for 1995 awards: 31 October 1994.

For necessary information, contact: Secretary, ICDD, Newtown Square Corporate Campus, 12 Campus Boulevard, Newtown Square, PA 19073-3273 USA.

New Members

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

J. Baron
6 rue de Bourgogne
Mulhouse 68100
FRANCE

Mr. Joseph R. Beckner
Geoscience Dept.
New Mexico Institute of Mining
& Technology
Box 3248 c/s
Socorro, NM 87801

Dr. Iuliu Bobos
Technical University
Mineralogical Analysis Lab.
str. Stadion Ia, Timisoara-1900
ROMANIA

Dr. Gerd Boettcher
Geologisches Landesamt
Meklenburg
Vorpommern
Postfach 040251
19026 Schwerin
GERMANY

Tracey Carpenter
8853 10th Ave. S.
Bloomington, MN 55420

Dr. Hyem Goo Cho
Department of Geology
College of Natural Sciences
Gyeongsang National University
Gazwa-Dong 900
Chinju 660-701
KOREA

Mr. James W. Cutright
221 Rangeline Road, Apt. #A
Kohler, WI 53044

Mr. Andreas Decher
Dept. of Economic Geology
RWTH Aachen
Suesterfeldestr. 22
D-52056 Aachen
GERMANY

Mr. David A. Dixon
26 Shields St.
Winnipeg, Manitoba R2C 4E1
CANADA

Mr. Reiner Dohrmann
Dept. of Economic Geology
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Suesterfeldstr. 22
D-52056 Aachen
GERMANY

Mark Floyd
3777 Depot Rd., Suite 406
Hayward, CA 94545

Dr. Huamin Gan
960 College Station Rd.
Athens, GA 30605

Connie L. Kaplan
5701 Judith Drive
Lincoln, NE 68517

Dr. Bruce A. Manning
4500 Glenwood Dr.
Riverside, Ca 92501

Jocelyne Mische
Lab. de Materiaux Mineraux
3 rue Alfred Werner
Mulhouse 68093
FRANCE

Susan H. Miller
Atomic Energy of Canada, Ltd.
Whitshell Labs
Pinawa, Manitoba R0E 1L0
CANADA

Mr. Arthur D. Pengelly
2510 Decatur Avenue
Ft. Worth, TX 76106

Mr. Guillermo Rocha
4489 Broadway Avenue, Apt. 5F
New York, NY 10040

Mr. C. Eric Westbrook III
Kentucky-Tennessee Clay Co.
P.O. Box 6002
Mayfield, KY 42066

Mr. Richard D. Willette
Rheox Inc., Hector Mine
31763 Mountain View Road
Newberry Springs, CA 92365

Answers to Clay Names Quiz (page 17)

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

Thanks to Bette Hughes and Walter Keller for recent photographic contributions to the CMS archives. Thanks also to Carolyn Olson for other materials.

Eastern Europe, continued from page 13

thia - Clays. The library of the Slovak Academy of Sciences has all issues of CCM except 34/6 and 36/6. The library of Comenius University is lacking CCM from 1983 till 1990. If the CMS decided to give them the missing issues, they could cover the costs of shipment. Also, they could provide big samples of illite 2M1 and pyrophyllite for the CMS Repository.

Slovenia - No information.

Ukraine - More complete information has not arrived so far. It seems that some clay research is carried out at least in Lvov, Kiev, and Charkov. The libraries of Lvov University and Charkov University have never had a subscription to CCM. It seems that there is not a single issue of CCM in the whole country.

Yugoslavia (New) - A group of 14 clay scientists works at various departments of the Belgrade University.

1. Faculty of Mining and Geology, Djusina 7, 11000 Belgrade (fax: 381-11-182363 or 635217 (Z. Maksimovic: weathering and hydrothermal alterations; V. Jovic: mineralogy and geochemistry; A. Dangic: hydrothermal and bauxites; V. Poharc-Logar: IM; M. Logar and I. Krstanovic: serpentines; J. Obradovic: sedimentology; S. Djuric: XRD; D. Nicolice: applied clay mineralogy; V. Simic: clay deposits.

2. Faculty of Agriculture, Nemanjina 6, 11080 Zemun (fax: 381 11 193659; N. Kostic, J. Milicevic, and D. Jovsic: soil clay mineralogy).

3. Faculty of Forestry, Kneza Viselava 1, 11000 Belgrade (S. Rickovski: soil clay mineralogy and geochemistry).

Some Yugoslav scientists have published in CCM, but mostly they publish in domestic journals. Only one library in Yugoslavia (at the Faculty of Mining and Geology) has a set of CCM (which is incomplete). At present, due to sanctions, they have no chance for renewed subscription nor for shipping clay in exchange for the missing issues.

Jan Srodon
Krakow

Clay Doctors (from page 19)

This photograph features, in the middle, Paul Kerr, Walter Keller, and Lee Edwards. The other four, among them possibly the real Clay Doctor, remain unidentified. We would appreciate help on this, if anyone knows them. The picture was taken while the scientists were being taped on television in Houston for the 1954 CMS Meeting held at Rice Institute. Many thanks to Walter Keller for this contribution.

Clay symposium at NEGSA meeting convened by Hluchy and Walker

A special symposium on clays was held at the Northeastern Sectional Meeting of the Geological Society of America in March, 1994, in Binghamton, New York. The symposium, presided over by Michele Hluchy and Jeff Walker, was entitled "What Do Clays Tell Us? The Application of Clay Mineralogy to Geological Investigations."

Ten papers were presented in the symposium, on topics ranging from illite polytypes in K-bentonites, to clay mineral assemblages used as climatic indicators in southern Africa. The session was well attended, and Michele and Jeff would like to thank everyone who helped, either as an organizer, presenter, or attendee, particularly Bob Reynolds, who started off the session first thing in the morning, and Herm Roberson, who put the schedule together at Binghamton.

The reason that we wanted to have this session was to provide an opportunity for geologists who are not clay mineralogists to see how clays can be used in their own research projects. We hope that we achieved the desired effect. Perhaps similar symposia can

be tried at other regional meetings of the GSA or other professional societies. Those of us who study clays realize the kinds of information that our favorite minerals can provide, but our colleagues in the geological community are sometimes unaware, because we often tend to present our work only to other clay mineralogists at CMS meetings. What made us especially happy about this symposium, though, was that half of the papers at this session were presented by *students*—both undergraduate and graduate students. Hopefully that is a good sign for our society!

Michele Hluchy
Alfred, New York

Papers presented at NEGSA meeting

Illite polytypes in K-bentonites, R.C. Reynolds, Jr., and D.K. McCarty.

Regional variation in the clay mineralogy of the middle Ordovician Millbrig K-bentonite from the Appalachians to the eastern midcontinent: implications for thermal history, M.P.S. Krekeler, D.E. McVey, W.D. Huff.

The oxygen isotope geochemistry of

soil clay minerals formed in a saprolite, Piedmont Province, Virginia, W. C. Elliott, S.M. Savin, J.-P. Girard.

Clay minerals as sources and sinks of aluminum in Adirondack and New England spodosols, R.H. April, D.M. Keller.

Clay mineralogy: a tool to understanding lacustrine sediments of the Oligocene Creede Formation, Colorado, S.E. Greenberg, M.M. Hluchy, D.B. Finkelstein, R.L. Hay, S.P. Altaner.

Microfabric and petrographic analysis of the Williamson-Willowvale Shale, Silurian, New York, M.J. Woodard.

A study of sepiolite (mountain wood) from Patterson, NY, E.L. Belk, T.B. Fisher, B.E. Fisher, K.D. Fletcher, J.S. Swantz, L.B. Webster, L.S. Yin, J.R. Walker.

Evidence for hydrothermal alteration from mafic volcanic rocks of the Winterville Formation, Aroostock County, ME, L.S. Giobannini, J.R. Walker.

Vertical mineral variation in a metamorphosed, Pennsylvanian-age, underclay: implications for the recognition of precursor minerals and for paleoenvironmental analysis, S. Gill, K. Yemane.

Clay mineral assemblages as imprints of late Permian climates in an upper Permian Gondwana sequence, Southern Africa, K. Yemane, G. Kahr, K. Kelts.

Clay Names Quiz

(From the Nomenclature Committee)

Answers from: Mitchell, R. S. (1979) *Mineral Names, van Nostrand*, 229 p.

Answers on page 16

1. BERTHIERINE is named for
 - A. Bertha and Irene, daughters of the discoverer
 - B. Pierre Berthier, French geologist
 - C. Bert Hierine, Belgian naturalist
 - D. Bertha d'Blues, Louisiana natural
2. BRUCITE is named for
 - A. Archibald Bruce, American mineralogist
 - B. Bruce Velde, Euroamerican claymologist
 - C. Latin *brucosa*, for resemblance to cow's horn
 - D. A place where beer was made
3. CELADONITE is named for
 - A. Third member of the Ladonite Group
 - B. Location on River Don, Russia
 - C. Max Celado, Spanish mine owner
 - D. A French word for the color green
4. JAROSITE is named for
 - A. A ravine in Spain (mainly on the plain)
 - B. Chinese word for yellow-orange color
 - C. Archeological dig where pottery was found
 - D. Otto Jaro, Swedish seismologist and aviator

Ask the Clay Doctor

(Not a real doctor)

Dear Clay Doctor: Some clay minerals have clearly identifiable characteristics that make them easy to spot, such as the 10Å XRD reflection for illite. But I am having trouble with some others, such as distinguishing between kaolinite, nacrite, and dickite. Can you give me some helpful hints?

Perturbed in Pawtucket

Dear Perturbed: No problem. Kaolinite is easy to identify by the rather nasty-looking scar on the bottom of the octahedral sheet, the result of an unfortunate encounter with a near-sighted short-order cook who mistook it for cream cheese. Nacrite, always the first in fashion, is wearing a gold ring pierced through an inverted tetrahedron these days, and dickite has a very distinctive tattoo on its left shoulder with an inscription which reads, "For Mother, God, and Country, but not necessarily in that order." Further details on how each of these came about are stored in a file called juicy tidbits, available by anonymous tip from your nearest clay.info listserv.

Dear Clay Doctor: My X-ray diffractometer won't work. I checked the plug, and it's not that. What went wrong?

Broken in Hoboken

Dear Broken: You may have bumped your diffractometer and tilted it. If so, you will have to put in another quarter.

Dear Clay Doctor: Why do so many mineral names end in "ite?"

Wondering Denverite

Dear Wondering: Because it is hard to pronounce names such as "montmorillonite."

Dear Clay Doctor: This list appeared on my office door, but I don't understand—I've never gotten free tickets to anything. Can you help?

Seeking Freebies in Fort Wayne

Top 10 Reasons to be a Clay Mineralogist

10. Palygorskite is a cool mineral name.
9. Diffraction patterns make good abstract art.
8. No complaints when it's soft and mushy.
7. Free tickets to the world mud-wrestling championships.
6. Cute clay groupies.
5. Nobody thinks you're odd when you squish mud between your toes.
4. Known the California Grapes since they were children.
3. Receive top-dollar for facial consulting.
2. High pay and undying respect of my colleagues.
1. Children let me play with their Play-Dough.

Dear Clay Doctor: How do you identify clintonite?
B. Dole, Washington

Dear Bob: It's usually associated with good cleavage.

The Clay Minerals Society 32nd Annual Meeting, June 4-8, 1995, Baltimore, Maryland Headquarters: Omni Inner Harbor Hotel

Organized by: Departments of Agronomy and Geology, University of Maryland, College Park, with present and retired workers from the U.S.G.S., Smithsonian, U.S. Nuclear Regulatory Comm., Johns Hopkins, and others

Workshop: Saturday, June 3: Reactions of Organic Pollutants with Clays, organized by Brij L. Sawhney.

Field Trip: Clay Minerals in Soil-Geologic Columns of Maryland's Piedmont and Inner Coastal Plain, led by Martin C. Rabenhorst.

Symposium: Clays, Surfaces, and the Environment, organized by Allan Stone and Donald L. Sparks.

Celebration: 100 years of X-rays: W. C. Röntgen's Discovery, November 8, 1895.

General Chair: Delvin S. Fanning, Dept. of Agronomy, University of Maryland, College Park, MD 20742.
Tel: 301-405-1344; fax: 301-314-9041.

Technical Program Chair: Virginia Colten-Bradley, U.S. Nuclear Regulatory Commission, MS 7D13, 11545 Rockville Pike, Rockville, MD 20852. Telephone: 301-415-6616; fax: 301-415-5399.

Feats of Clay

Darsa Siantar has taken a post-doc position at Stanford, working on environmental problems.

Fred Mumpton recently returned from a trip to several cities in Russia and Ukraine, where he was discussing (surprise!) zeolites.

John Chermak has moved to Fort Collins, Colorado, to work with Shepherd Miller, Inc., an environmental consulting firm.

Simeon Tsipursky has taken a position in Chicago with American Colloid Company.

Jeff Walker was granted tenure at Vassar.



John Chermak, San Diego, 1993.

Jo Eberl



Even with balloons on his head, Haydn Murray is cool. Bette Hughes

Bob Pruett's wife **Diane** gave birth to a son, Jonathan Edward, on June 29.

Using her computers, software, and experience, **Pat Costanzo** has started a customized logging service.

Ruben Kretzschmar has taken a new position in the Soil Chemistry division of the Institute of Terrestrial Ecology in Zurich, under Prof. Dr. **Hans Sticher**.

Bull Bailey gave a series of lectures on the structure and crystal chemistry of clay minerals in April and May at the Institute for Geosciences, Universidade Federal do Rio Grande do Sul in Porto Alegre, Brazil. His host was Professor **Milton Formoso**, who previously had studied with **Ralph Grim** and **George Brindley**, then worked in geochemical exploration for the USGS in Nevada. On Bailey's return he had a chance to make a technical survey of the bareness at the lovely beaches in Rio.

A gathering to celebrate **Bob Reynolds**, **Noye Johnson**, and **Chuck Drake** was held at Dartmouth in April. Talks by former students, panel discussions, poster sessions, and talks by geology notables were given. Some clay folks on hand were **Rod Parnell**, **Jeff Moe**, **Craig Bethke**, **Jeff Walker**, **Michele Hluchy**, **Carrick Eggleston**, **Denny Eberl**, **Paul Nadeau** and **Pete Ryan**.

At the CMS Meeting in San Diego, a symposium on industrial applications of clays in honor of **Haydn H. Murray** was held. Afterwards there was a spirited dinner party for friends, former and present students, and colleagues. CMS members there were too numerous to mention. This was followed up in the Spring with a retirement party, to which many traveled. It is rumored that Haydn retired this year, but no evidence of it yet exists.



Who is the real Clay Doctor? (see page 16)

Courtesy W. D. Keller

CMS student research grant deadline will be earlier next year

Purpose: The research program is designed to provide partial financial support of masters and doctoral research for graduate students of clay science and technology.

Selection: Applications will be judged on a competitive basis. The qualifications of the applicant, the financial need of the research project, and the design of the research project shall be considered. Applicants selected will be nominated by a five-member CMS committee and approved by the CMS Council. Members and nonmembers of the CMS are eligible. Students from all countries are eligible to apply.

Application: Each applicant must complete an APPLICATION FOR RESEARCH GRANT form available from the CMS Office and must obtain confidential evaluations from two faculty members at his or her university. Use the APPLICANT APPRAISAL form provided with the application.

Use of Funds: Individual grants will not exceed \$2,500. Grant money may only be used for the costs of travel by the grantee to conduct research, room and board associated with research-related field work, or for the costs of equipment, supplies, and analyses required to complete the research, with the exception of up to \$500 for expenses incurred while presenting a paper at the CMS conference on thesis research. Recipients can apply for grants on subsequent years. Application forms and appraisals (6 copies) must be postmarked by May 1 and sent to the Society Office.

D. G. Schulze

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Meeting Calendar

August 14-19, 1994, Saskatoon, Saskatchewan, Canada: CMS Annual Meeting. Contact: A. R. Mermut, Department of Soil Science, University of Saskatchewan, Saskatoon, SK S7N 0W0 Canada. Tel: 306-966-6839; Fax: 306-966-6881.

August 29-September 2, 1994, Edinburgh, Scotland: VM Goldschmidt Conference—An International Conference for the Advancement of Geochemistry. Contact: Dr. Peter Symms, Dept. of Geology & Geophysics, The University of Edinburgh, The Grant Institute, West Mains Rd., Edinburgh EH9 3JW, Scotland.

August 29-September 2, 1994, Prague, Czech Republic: XIIIth Conference on Clay Mineralogy and Petrology. Contact: Dr. Jana Zoubkova, Czech Geological Survey, Malostranské nám. 19, 118 21 Prague 1, Czech Republic. Tel: +42 2 7980724; fax: +42 2 7980965.

September 4-9, 1994, Pisa, Italy: 16th General Meeting of the International Mineralogical Association. Contact: Organizing Committee IMA 94, Dipartimento di Scienze della Terra, Università di Pisa, Via S. Maria 53, I-56126 Pisa, Italy. Tel: +39-50-568204; fax: +39-50-40976; E-mail: ima94@vm.cnuce.cnr.it

September 12-14, 1994: Liverpool, U.K.: Controls of metamorphism. Metamorphic Studies Group of the Mineralogical Society. Contact: A. P. Boyle, c/o Mineralogical Society, 41 Queen's Gate, London SW 7 5HR, UK.

September 25-28, 1994, New Orleans, Louisiana: Society of Petroleum Engineers. Box 83386, Richardson, TX. Tel: 214-952-9393. Fax: 214-952-9435.

October 24-27, 1994, Seattle, Washington: Geological Society of America, Mineralogical Society of America. GSA, PO Box 9140, Boulder, CO 80301. Tel: 303-447-2020.

November 17-18, 1994, Reading University, UK: Clays and Isotopes. Clay Minerals Group, Mineralogical Society. Contact: A. Parker, c/o Mineralogical Society, 41 Queen's Gate, London SW 7 5HR, UK.

March 5-8, 1995, Houston, Texas: AAPG Annual Meeting. Contact AAPG Convention Dept., P.O. Box 979, Tulsa, OK 74101. Tel: 918-584-2555.

April 23-26, 1995, El Paso, Texas: 31st Forum on the Geology of Industrial Minerals. Technical sessions with both pre- and post-meeting field trips on both sides of the border. Contact: Gretchen Hoffman, Registration Chair, New Mexico Bureau of Mines and Mineral Resources, Campus Station, Socorro, NM 87801. Tel: 505-835-5640; fax: 505-835-6333; E-mail: gretchen@gis.nmt.edu.

May 24-26, 1995, University Park, Pennsylvania: Fifth Annual Goldschmidt Conference. Contact: Michael McKibben, Technical Program Chair, Department of Earth Sciences, 1456 Geology Bldg., University of California/Riverside, Riverside, CA 92521. Tel: 909-787-3444; fax: 909-787-4324; E-mail: MCKIBBEN@UCRAC1.UCR.EDU

May 29-June 2, Baltimore, Maryland: AGU Meeting. Contact: AGU, 2000 Florida Ave. N.W., Washington, D.C. 20009. Tel: 202-462-6900; fax: 202-328-0566.

June 3-8, 1995, Baltimore, MD: The Clay Minerals Society Annual Meeting. Contact: Del Fanning, Dept. of Agronomy, U. of Maryland, College Park, MD 20742. Tel: 301-405-1344.

August 19-25, 1995, Leuven, Belgium. European Clay Groups Association - Euroclay '95. Contact: Prof. P. Grobert, Secretary Euroclay '95, Centrum voor Oppervlaktechemie en Katalyse, KU Leuven, K Mercierlaan 92, B-3001 Heverlee, Belgium. Tel: (32) 16 220931; fax: (32) 16 295126.

October 1-4, 1995, Dallas, Texas: Society of Petroleum Engineers. Box 83386, Richardson, TX. Tel: 214-952-9393. Fax: 214-952-9435.

November 6-9, 1995, New Orleans, Louisiana: Geological Society of America, Mineralogical Society of America. GSA, PO Box 9140, Boulder, CO 80301. Tel: 303-447-2020.

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.

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

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.

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.

General Manager Position

The International Centre for Diffraction Data, a scientific database corporation in the Philadelphia area, is seeking a General Manager. The non-profit corporation operates from a new headquarters facility and serves a world-wide scientific community. Required qualifications include proven managerial and business experience, a degree (minimum BS) in physical or materials sciences or engineering, and experience in XRD work and electronic data handling. Duties are interesting and diversified and include supervision of 30+ employees and cooperation with about 100 international scientific volunteers.

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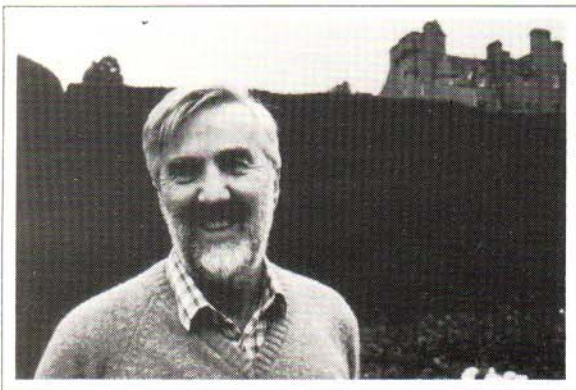
Archives



L. Gatineau, H. Pezerat, Jacques Mering, Paris 1958. Joe White



P. M. Huang and Po Ho Hsu, Denver 1985. Joe White



V. Colin Farmer, Aberdeen, Scotland, July 1986. Joe White



R. Greene-Kelly, George Brown, Paris, International Crystal Congress, 1954. Joe White



Standing, A. F. Frederickson, R. E. Grim, W. D. Keller, C. E. Marshall; Seated, Ada Swineford, Norman Plummer, CMS Meeting, Columbia, Missouri, 1953. W. D. Keller



Adrian Herbillon, Michel Robert, Georgetown, Colorado, 1985. Joe White



Drs. Persio and Helena de Souza Santos, Georgetown, Colorado, 1985. Joe White

More from San Diego



George Austin, and Bette Hughes.

Jo Eberl



Colin Harvey, Haydn Murray, and Wayne Bundy, editors of Kaolin Genesis and Utilization.

High Iron Photos



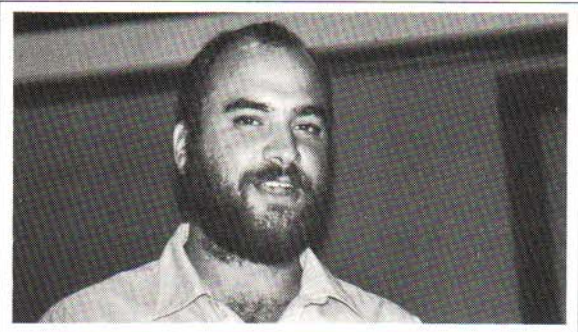
Jeff Walker and Pat Costanzo.

Jo Eberl



Paddy Hill and William Pizzolato.

Jo Eberl



Ken Esposito.

Jo Eberl



Surinder Singh and Brij Sawhney talking with Chrystie Jackson.

High Iron Photos



Marion Reed and Dick Berry.

High Iron Photos



Dougal McCarty and Georg Grathoff.

Jo Eberl

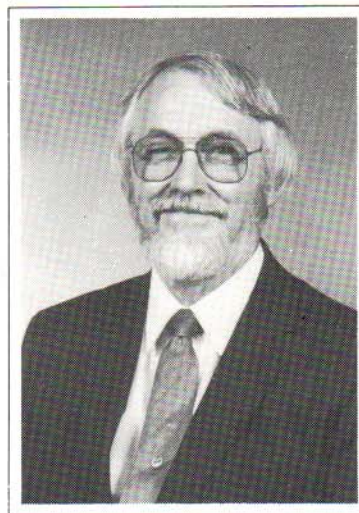
Lowell Douglas retires after 33 years at Rutgers

Lowell A. Douglas, Professor of Soil Mineralogy at Rutgers University and Editor-in-Chief of *Soil Science*, retired in July of 1993.

Dr. Douglas was born in 1926, and he grew up in Durango, Colorado. He served in the Army Air Force during World War II. After the war, he entered Mesa Junior College in Grand Junction, Colorado, to study chemistry. Working as a summer trainee for the SCS apparently inspired him to transfer to Utah State University and study soil science. He obtained a B.S. in agronomy (1952) under the guidance of Sterling Taylor and was influenced to go on to graduate school, obtaining his M.S. in soils at USU. He was hired as a soil chemist at the U.S. Salinity Laboratory in Riverside, California, and worked there for two years before aspiring to the doctoral degree. He then studied under John C. F. Tedrow at Rutgers University, doing his research in Arctic Alaska during the summers. He received his Ph.D. in 1961 and joined the Rutgers faculty as Assistant Professor of Soils. He continued study of Arctic soils with Dr. Tedrow and also began developing a research pro-

gram in soil mineralogy, emphasizing the 14 Å minerals that dominate many New Jersey soils. His graduate students affectionately referred to him as "Doc Vermiculite." Besides mineral weathering, his other research interests included land use and soil resources, soil micromorphology, and site stability relating to faulting (earthquake) probability. The latter interest also provided many consulting opportunities. Dr. Douglas was made Associate Professor in 1965 and Full Professor in 1969. He served Rutgers as Chairperson of the Department of Geosciences (1980-1981) and of the Department of Soils and Crops (1982-1989), until reorganization landed the Soils group into the Department of Environmental Sciences. He taught an undergraduate course, Soils and Water, and several graduate courses, Clay Mineralogy, Quantitative Clay Analysis, and Soil Micromorphology. He also guided many undergraduate and graduate students through their programs.

Dr. Douglas also served his profession by acting as Associate Editor (1968-1978) and Editor-in-Chief (1979-1993) of *Soil Science*. As well as being a Fellow of the SSSA, he was a member of ASA, International Society of Soil Science, The Clay Minerals Society, the International Minerals Society, the Mineralogical Society of



Lowell Douglas.

Courtesy Soil Science

America, the Mineralogical Society, the Soil and Water Conservation Society, the Council for Agricultural Science and Technology, the American Association for the Advancement of Science, Alpha Zeta, and Sigma Xi.

Dr. Douglas will continue to enjoy time with his two daughters and grandchildren during his retirement, and hopes to spend more time fishing.

MSA Lecture Program features Banfield and Heaney

The Mineralogical Society of America is continuing its Lecture Program during the 1994-1995 academic year. The arrangement is that the MSA will pay travel expenses for the lectures with the understanding that the host institution will be responsible for local expenses. The speakers will each visit about nine institutions during the academic year.

This academic year, the MSA lecturers are Jillian Banfield, Uni-

versity of Wisconsin, Madison, and Peter Heaney, Princeton University, both members of CMS committees.

Banfield will speak on: 1. From rocks to soil: chemical weathering and clay formation in the near-surface environment, and 2. Complex polytypism, regular interstratifications, defect microstructures, and layer silicate reaction mechanisms in serpentinite-chlorite.

Heaney will offer: 1. From atoms to agates: a fresh look at fine grained silica, and 2. Looking at phase transitions with

the electron microscope.

If your institution wishes to be considered as a possible venue for one of the MSA lecturers, please contact: Prof. Henry O. A. Meyer, Dept. of Earth & Atmospheric Sciences, Purdue University, West Lafayette, IN 47907-1397. Tel: 317-494-3271; fax: 317-494-0293.

Please respond no later than 18 September 1994.

Hall, Manning, Hughes, Velde, and Wilson write new clay books

DA.C. Manning and C. R. Hughes of the University of Manchester, Peter Hall of Cambridge, Bruce Velde of the Ecole Normale Supérieure in Paris, and Jeff Wilson of the Macaulay Land Use Research Institute in Aberdeen, have written new books on clays.

Manning, Hall, and Hughes' book, *Geochemistry of Clay-Pore Fluid Interactions*, includes the following contents:

1. Experimental and theoretical characterisation of mudrocks and clays (characterisation of porous solids and particle aggregates by small angle scattering techniques, Monte Carlo simulations of Mg- and Na-smectites, molecular dynamics simulation of water mobility in smectites).
2. Natural processes of diagenesis and weathering (the composition of authigenic clay minerals in recent sediment: links to the supply of unstable reactants, diagenesis in Jurassic mudrocks of the North Sea, diagenetic pore fluid evolution in the Kimmeridge Clay formation: from concretions to sandstone cements).
3. Experimental studies of diagenesis and weathering (the stability of experimentally grown clay minerals: implications for modelling the stability of neoformed diagenetic clay minerals, laboratory reproduction of morphological variation in petroleum reservoir clays, monitoring of fluid composition during illite precipitation, experimental diagenesis of mudrocks, weathering kinetics of montmorillonite, investigations in batch and mixed flow reactors).
4. Applications in civil and petroleum engineering (mechanisms of overpressuring: an overview, clays as chemical and hydraulic barriers in waste disposal: evidence from porewaters, mass transfer mechanisms in compacted clays, monitoring the evolution of the clay environment beneath a concrete vault at the Drigg

low level waste disposal site, new apparatus for pore fluid extraction from mudrocks for geochemical analysis, chemical composition of pore waters in the Italian Plio-Pleistocene clay formations, porewater-groundwater relationships in Jurassic shales and limestones of northern Switzerland.

Velde's book, *Introduction to Clay Minerals; Chemistry, Origins, Uses and Environmental Significance*, includes the following chapters:

1. The clay perspective (what are clay minerals, clay environments and the clay cycle, clays as an interface in the environmental cycles).
 2. Tools (XRD, thermo-gravimetric analysis, differential thermal analysis, infrared spectral analysis, electron microscopes, electron microscope).
 3. Clays as minerals (structures, polytypes, clay mineral structures, clay mineral groups, clay mineral identification).
 4. Origins of clays (mineral instabilities, mineral stabilities).
 5. Uses of clays (industrial uses, ceramics).
 6. Clays in the environment (situations of clays in surface environments, nuclear waste disposal, general conclusion).
- Wilson's book, *Clay Mineralogy, spectroscopic and chemical determinative methods, Vol. 1*, contains the following chapters:
1. Introduction to spectroscopy,
 2. Infrared spectroscopy.
 3. Mössbauer spectroscopy.
 4. Nuclear magnetic resonance spectroscopy.
 5. Electron spin resonance spectroscopy.
 6. X-ray fluorescence spectroscopy and microanalysis.
 7. X-ray photoelectron spectroscopy.
 8. Chemical analysis.
 9. Selective dissolution analysis.
 10. An overview of strengths and

weaknesses.

All three books are published by Chapman & Hall, 2-6 Boundary Row, London SE1 8HN, England. (In the United States: One Penn Plaza, New York, NY 10119. Tel: 212-564-1060. Fax: 212-564-1505.)

Clay Mineralogy, Vol. 1, M.J. Wilson. 1994, 367 pp. \$158.95.

Geochemistry of Clay-Pore Fluid Interactions, D.A.C. Manning, P.L. Hall, C.R. Hughes. 1993, 427 pp. \$149.95.

Introduction to Clay Minerals, B. Velde. 1992. 224 pp. \$29.95.

Saskatoon, *continued from page 1*

Scale Imaging of Minerals; SPM of Clay Minerals, Fluid Cell Application; Particle Morphology Using SFM; and Quantifying Clay Mineral Dissolution and Precipitation Rates. Speakers will include C. Eggleston, G. Henderson, F. Wicks, P. Dove, J. Chermak, A. Blum, and K. Nagy.

An overnight field trip, led by B. Schreiner, H. B. Stonehouse, H. P. W. Rostad, and W. Dubbin, will visit a potash mine shaft and soils, and Cretaceous and Tertiary sediments in southern Saskatchewan.

Activities for accompanying guests include visiting the Ukrainian Museum of Canada, Mendel Art Gallery, John G. Diefenbaker Center and Wanuskewin Archaeological Site, the historic Batoche battle site, and shopping and other sightseeing.

The meeting promises, as always, to be engaging scientifically, and to provide an opportunity for clay scientists, new and old, to meet and share ideas in a congenial atmosphere.

For more information, contact Dr. Ahmet R. Mermut, Department of Soil Science, University of Saskatchewan, Saskatoon, SK S7N 0W0, Canada. Phone: 306-966-6839, fax: 306-966-6881.

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Sustaining Member Profile

ECC International

ECC International (ECCI) is the name given to the two specialty mineral divisions of English China Clays Plc. headquartered in the U.K. One division, covering the European minerals operations, is based in Cornwall, and the other division, covering minerals operations in the Americas/Pacific area, is based in Georgia. English China Clays also has a specialty chemicals division, Calgon Corporation, which provides products for water treatment, paper making, cosmetics, surface treatments, and other industrial uses. The acquisition of Calgon in 1993 signaled ECC's new role as a supplier of specialty minerals and specialty chemicals.

The history of ECC is complex because its evolution is marked by merger and divestiture. The British china clay industry was launched in 1746 when a Quaker potter and chemist, William Cookworthy, discovered high quality kaolin in Cornwall. By 1914 there were 159 china clay companies located in southwest England. Economic hardships resulting from World War I began industry consolidation, which led to only four china clay producers remaining in southwest England today. English China Clays Ltd. was established in 1919 by the merger of the three largest kaolin producers, Martin Bros. Ltd., the West of England and Great Beam Co. Ltd., and the North Cornwall China Clay Co. Ltd.

Several small china clay producers were acquired by ECC in 1929, and the company grew more in 1932 when ECC merged with Lovering China Clays Ltd. and H.D. Pochin and Company Ltd., its two principle competitors. The 1932 merger established ECLP & Co. which became ECCI. The company continued to grow after World War II through

capital expansion and through acquisition of other minerals companies like Southern Clay Products. Southern Clay Products and International Drilling Fluids (IDF) were divested by ECC Group in 1991. This year ECC Group separated from its building materials divisions, which now form a separate company named CAMAS.

The American kaolin operations of ECCI began with the purchase of Cleveland-Oconee Lumber Co. in 1942, which owned some kaolin properties in middle Georgia. Then in 1956, the Anglo-American Clays Corp. was established with ECC's purchase of the Georgia Pigment Company, a small air-float water washed kaolin filler plant in Sandersville, Georgia. This plant has since expanded to a size that produces over one million tons of kaolin per year.

In 1990, ECCI's Georgia operations doubled when a major part of the Georgia Kaolin Company (GK) was purchased from Asea Brown Boveri (ABB). GK formed in 1901, and in 1908 it became the first U.S. plant to employ wet processing of kaolin. In 1927, Edward J. Grassman purchased GK, located near Dry Branch, Georgia, and American Standard Clay Co., located near Deepstep, Georgia. The name of American Standard Clay was changed to American Industrial Clays, Inc. (AIC), and construction started in 1956 on the AIC water washed clay plant located between Deepstep and Sandersville. When Grassman died in 1973, GK was inherited by the Engel family and operated by Grassman's nephew, Edward Engel. In 1980, the Engels sold Georgia Kaolin to Combustion Engineering, which was acquired by ABB in 1990.

Today, ECCI is the largest kaolin

producer in the world, and is an important producer of ground calcium carbonate (GCC) and precipitated calcium carbonate (PCC) products. ECCI mines and processes millions of tons of kaolin each year from kaolinized granites located in Cornwall and Devon, and from sedimentary kaolin deposits located in Georgia. They mine some kaolin deposits in Brazil and Australia, and some ball clay deposits in Devon, England. Some kaolin is dry processed, but most is water washed.

Wet processed kaolins are first made down into a clay water suspension with the aid of dispersant chemicals. Sand and some coarse particles are removed by gravity settling, and the kaolin is classified into approximate particle sizes by centrifugation. Kaolin is brightened and whitened using processes such as ozone to remove organics, reduced acid leaching to remove iron, magnetic separation to remove titania, and flotation to remove titania. Kaolinite books or stacks are delaminated into thin platelets by a process called attrition grinding. For value added applications, some kaolins are modified by calcination or by chemical additives to yield specific functions. Most of ECCI's kaolins are shipped in dry or slurry form to paper companies that use clay to coat paper for improved opacity, brightness, gloss, smoothness, and printability. ECC exports ceramic clays from Cornwall for use in premium whitewares. Some other important markets for ECCI's kaolins include plastics, rubber, and paint.

Calcium carbonates compete directly with kaolin in some segments of the paper pigment market. ECCI is the only white pigment company that produces kaolin, GCC, and PCC. GCC in the United States is made by grinding a very pure marble into the

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ECCI, *continued*

clay size range. Flo-tation can be used to improve its product brightness. ECCI's sources of calcium carbonate in Europe range from chalk to the Carrare marble located in Italy. PCC is usually manufactured at a plant located adjacent to the customer's paper mill. It is made by slaking lime and reacting the resultant $\text{Ca}(\text{OH})_2$ with $\text{CO}_2(\text{g})$ to precipitate calcite with a specified uniform particle geometry.

ECCI has research facilities that study minerals and their applications, and it has a pilot coater in Lixhe, Belgium, that can evaluate pigments in paper coatings. The Central R & D and European support labs employ a staff of approximately 200 and are located at Par-Moor, near St. Austell in Cornwall. In North America, ECCI has a technology center located at Sandersville, Georgia, that employs about 100 people. These labs have scientists with a broad range of skills and backgrounds, including geology, chemistry, physics, materials science, engineering, and paper science. Research topics are diverse, and they include mineralogy of kaolin deposits, crystal chemistry, surface chemistry of mineral particles, developing advanced process technologies, new product development, and developing new applications for kaolin and calcium carbonate.

A specific example of clay research is the series of studies on a suite of Georgia and English kaolins having different degrees of crystal order. Collection and study of this "crystallinity suite" was initiated in 1965



CMS members left to right: Dan Panfil, Wayne Bundy (visiting from Bloomington, Indiana), Barry Jennings (visiting from Cornwall), Bob Pruett, and John Adams (visiting from Cornwall). ECCI Sandersville CMS members not shown: Michael Ginn, Phil Jones, and Jun "Gene" Yuan.

Courtesy ECCI

by Wayne M. Bundy at GK to illustrate how fundamental differences in kaolins influence physical properties such as brightness and viscosity of clay-water suspensions. Studies on the "crystallinity suite," including the work by Brindley *et al* published in a 1986 issue of *Clays and Clay Minerals*, have improved our fundamental knowledge of kaolin mineralogy and kaolin genesis. Scientists at ECCI continue to study the "crystallinity suite" using advanced analytical techniques to better understand associations between kaolin mineralogy and the end-use properties of kaolin products.

The Georgia kaolin industry is challenged by competitive threats and by political issues like a proposed severance tax on Georgia mineral resources. Competitive threats include the emergence of new low-cost kaolin producers like those in the Amazon basin of Brazil. Some Brazilian kaolin producers have high quality crudes that do not require as much processing as most Georgia kaolin crudes. Another threat is represented by the ongoing displacement of kao-

lin from the paper market by calcium carbonate. The increased use of calcium carbonate by the paper industry is driven largely by conversions to neutral/alkaline paper making. Unlike the standard acid paper making process requiring acid tolerant minerals such as kaolinite, the higher pH systems accommodate the use of calcium carbonates. The kaolin industry can negate these competitive threats, much as it has done with past threats, by innovative responses

developed through research.

ECCI supports research societies that are close to its core technologies to build its business and to find answers to competitive issues. Scientists from ECCI actively participate in the CMS, SME, and TAPPI. Quality research and diverse backgrounds of CMS members lead to interactions of great importance to creative science and technological innovation. ECCI's interaction with CMS members is an excellent external drive for innovation, for acquiring skills, and for developing knowledge networks.

The future of clay minerals research will depend to a large extent on how well the CMS members sell their science to the needs of technological innovation. Core skills found in clay mineralogy can be easily lost by companies if a connection cannot be found with application. Fortunately, the CMS appears bound for success, based on the many presentations in San Diego that showed how clay science is important for understanding earth processes and for developing new technologies.

Bob Pruett
Sandersville, Georgia

Commentary

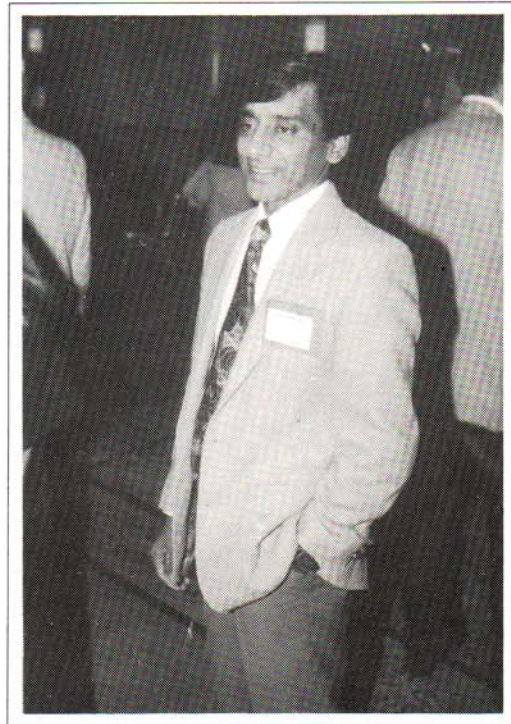
Designer Materials from Clays

Naturally occurring clays have been used as precursors for some of the earliest man-made materials such as bricks, tiles, and so on. With the thorough understanding of the clay mineral structures and their properties, it is now possible to design and synthesize new phases or modify existing structures to use them as new materials with tailored properties. In the following, I will describe two novel single phases and two nanocomposites of clays which have been designed for special applications.

A cesium-selective ion sieve has been made¹ from phlogopite mica by a soft chemical route, i.e., by complete leaching of K^+ ions from the interlayers and replacing them with Na^+ ions and water molecules at room temperature. Thus a hydrated, sodium phlogopite mica (as defined by charge) with a c-axis spacing [$d(001)$] of 1.22 nm has been obtained from an existing structure. Selective cesium ion exchange experiments showed that this fully K-depleted 1.22 nm phase is extremely selective for cesium ions, as expected, based on previous studies with partially K-depleted micas. For an example, the cesium distribution coefficient, K_d (ml/g) of this new phase is 949,000 compared to a clinoptilolite zeolite from California which has a K_d of 4,400 when equilibrated in a solution of 0.04 M $NaNO_3$ containing 0.0002 M $CsCl$. The above high selectivity of the new sodium phlogopite mica is attributed to the interlayer spacing of ≈ 0.29 nm which is ideal for the diffusion of less hydrated ions such as cesium but not of the hydrated ions. When about half of the exchange sites are occupied by cesium, this hydrated phase collapses because of the high charge density of the layers, and any further exchange is prevented. Thus, the cesium ions are trapped inside the

structure, forming a cesium mica-like phase. The ideal interlayer spacing and the high-charge density of this newly-discovered cesium ion sieve are responsible for not only selective separation of cesium but also its immobilization at room temperature through chemical bonding. This new cesium ion sieve is expected to find applications in cesium decontamination of nuclear wastes and of the environment after accidental releases.

We have recently reported² that "Na-4-mica," a highly charged sodium fluorophlogopite mica (ideally of $Na_4Mg_6Al_4Si_4O_{20}F_4$ composition) can be used for the selective removal of strontium ions from solution as well as their immobilization at room temperature. This particular phase is analogous to brittle micas and has double the charge of regular micas. It is, however, a unique mica because of its ability to readily undergo a hydration reaction which makes the interlayers accessible for cation exchange. The anhydrous phase has a 'c' dimension of 0.98 nm while the hydrated phase has a 'c' dimension of ≈ 1.22 nm. The easy hydration of interlayer cations is possible because of the presence of unusually large number of Na cations (four per cell unit), unlike brittle micas where two divalent cations are locked in the ditrigonal holes. Selective cation exchange experiments with monovalent and divalent ions have shown that some of the less hydrated ions of the latter group can be exchanged selectively, but none of the former group of cations. For example, this phase shows K_d s (ml/g) of 218,000 for Cu^{2+} , 4720 for Sr^{2+} and 1



Sridhar Komarneni, San Diego, September 1993.

High Iron Photos

for Ca^{2+} when equilibrated in a solution of 0.5 N $NaCl$ containing 0.0001 N M^{2+} ($M = Cu, Sr$ or Ca). The high selectivity for less hydrated divalent cations such as Cu and Sr can be explained by the structural factors of the clay as well as the hydration energy and other properties of the cations. Less hydrated divalent cations can diffuse into the interlayers, easily replacing two Na^+ ions for each divalent ion whereas very hydrated ions such as Ca^{2+} and Mg^{2+} cannot shed their hydration shells to enter the restricted space in the interlayers. This is the first report of a clay which exhibits selectivity for Sr^{2+} exchange but not for Ca^{2+} . This fact is extremely important in the Sr^{2+} decontamination of the environment because Ca^{2+} is ubiquitous in natural waters. As in the case of the cesium ion sieve, this hydrated phase also collapses when about half of the ex-

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change sites are filled with Sr^{2+} ions. This collapse effectively traps the Sr^{2+} ions in the ditrigonal holes, forming a kinoshitalite-like brittle mica structure. Thus the synthetic, ultrafine Na-4-mica is not only useful for Sr^{2+} separation, but also for its immobilization at room temperature.

We have recently developed two types of nanocomposite clays: (1) oxide intercalated clays and (2) metal intercalated clays for special applications. The term "nanocomposites" was first coined by Roy, Komarneni, and colleagues some time during the period 1982-1983 and refers to composites of more than one Gibb'sian solid phase where at least one dimension is in the nanometer range and in general all solid phases are in the 1-20 nm range. The solid phases can be amorphous, semi-crystalline or crystalline, or combinations thereof. They may be organic, inorganic, or both and of any chemical composition. Pillared clays are a perfect example of a nanocomposite because metal oxides are intercalated in the interlayers of bidimensional clays where each layer is about 1 nm, and oxide pillar is also about 1 nm.

We have recently prepared³ an alumina pillared clay nanocomposite with tailored hydrophilic properties, and this can be used as a desiccant. The alumina and other oxide pillared montmorillonites are in general hydrophobic, apparently because of the migration upon calcination of charge balancing protons from the interlayers to the octahedral sheets in which negative charge sites are located. The protons are brought back to the interlayers by treatment with NH_3 to form NH_4^+ in the interlayers. The exchange of NH_4^+ with Ca^{2+} gives hydrophilic property to the alumina pillared clay nanocomposite, which can be used as a desiccant in the gas-fired cooling and dehumidification equipment.

The metal intercalated clays have recently been prepared for us⁴ for the first time by *in situ* reduction of Cu^{2+}

and Ni^{2+} ions in montmorillonite expanded with ethylene glycol. All previous attempts by others have failed to produce intercalated zero-valent transition-metal particles in layer silicates by hydrogen reduction because the metals migrated to the external surfaces and the layers collapsed.

The metal-cluster intercalates of about ≈ 0.6 nm prop the silicate layers apart, just as ceramic oxides do in pillared clays, leading to microporous materials. Although the metal intercalated clay nanocomposites are not as stable as pillared clays, intercalated metal clusters of these dimensions are expected to behave very differently from the bulk metal and may prove to be versatile catalysts. The novel metal intercalated clays have been characterized by powder X-ray diffraction and transmission electron microscopy. The micropore structure of the metal intercalated clay nanocomposites were probed by measuring water adsorption isotherms at 25 degrees C and nitrogen surface area by BET. The surface areas estimated from BET monolayer capacity of water and nitrogen are $187 \text{ m}^2\text{g}^{-1}$ and $165 \text{ m}^2\text{g}^{-1}$, respectively, for the Ni metal intercalated clay. Although these surface areas are smaller than those of pillared clays ($200\text{-}400 \text{ m}^2\text{g}^{-1}$), further optimization in processing may lead to higher surface areas. These novel microporous metal intercalated clays are expected to find unique applications in catalysis, adsorption, molecular selectivity, etc.

The readers can find more details from the following references:

¹S. Komarneni and R. Roy, "A Cesium-Selective Ion Sieve Made by Topotactic Leaching of Phlogopite Mica," *Science* 239: 1286-1288 (1988).

²W. J. Paulus, S. Komarneni and R. Roy, "Bulk Synthesis and Selective Exchange of Strontium Ions in $\text{Na}_4\text{Mg}_6\text{Al}_4\text{Si}_4\text{O}_{20}\text{F}_4$ Mica," *Nature* 357:571-573 (1992).

³P.B. Malla and S. Komarneni, "Synthesis of Highly Microporous and Hydrophilic Alumina-Pillared Montmorillonite: Water-sorption Properties," *Clays & Clay*

Minerals 38:363-372 (1990).

⁴P.B. Malla, P. Ravindranathan, S. Komarneni and R. Roy, "Intercalation of Copper Metal Clusters in Montmorillonite," *Nature* 351:555-557 (1991).

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By-laws Changes

Article IX. By-laws and Amendments
Section 1. By-laws. The By-laws of the Society may be amended as follows.

(a) By a majority of the voting members present in person or represented by proxy at a meeting duly called for the purpose, at which there is a quorum, provided that a copy of the proposed amendment and notice of the meeting shall have been mailed to such voting members not less than twenty (20) nor more than eighty (80) days before the meeting at which the action is to be taken; or

(b) By a vote of two-thirds (2/3) of the entire Council at a meeting duly called for the purpose; or by mail ballot upon a vote of three-fourths (3/4) of the entire Council. All amendments approved by the Council, either at meetings thereof or by mail ballot, shall be voted on by the membership at the next Annual or Special Meeting of the Society.

Section 2. Proposals of Amendments. Any twenty-five (25) voting members may, by letters addressed to the Secretary, recommend to the Council the amendment of a By-law. Amendments and changes also may be submitted directly to the Council by the Policy and Administration Committee. If the Council shall approve the amendment, the Council may adopt it, subject to later vote by the membership at a duly called meeting. If the Council shall disapprove the amendment, it shall so inform the proposers and refer it to the membership for a vote at a duly called meeting, if the proposers so request.

Section 3. Suspension of By-laws. The Executive committee may suspend the operation of any rule or By-law only until the next regular meeting of the Council.

