CMS News

A Publication of The Clay Minerals Society

February 1992

Ray E. Ferrell, Jr. takes on editorship

Ray E. Ferrell, Jr. has been selected the new Editor of *Clays and Clay Minerals*. A Professor in the Department of Geology and Geophysics at Louisiana State University, Ferrell follows in the valiant footsteps of Kenneth M. Towe, the Interim Editor for the past year, and Frederick A. Mumpton, the editor for the twelve previous years.

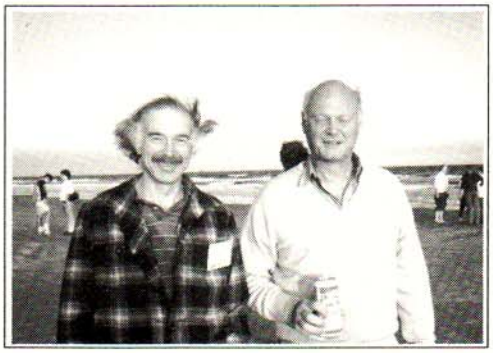
The search for a new Editor was the highest priority of last year's President, Thomas J. Pinnavaia. Concerning Ferrell's appointment, he says, "I couldn't be more delighted. In a Society so full of dedicated and talented people, we have found one of the best to carry on the high standards of our journal."

See page 24 for Ferrell's report.

Incoming Editor of Clays and Clay Minerals, *Ray E. Ferrell, Jr., gets advice (in stereo) from former editors Fred Mumpton and Ken Towe in Houston.* *High Iron Photos*

Cajun flavors, friends, and good papers spice up Houston meeting

"Send help! We're trapped in a hotel just outside of Houston." That was the message from the 289 people attending the 28th Clay Minerals Conference. That is not to say everyone wasn't comfortable. The weather was pleasant, probably as surprising to Houstonians as to the "Clay People," as the hotel staff referred to us. We were on Clear Lake, an extension of Galveston Bay, and the accommodations were plush. No one in Houston, at least those who make decisions about roads and sidewalks, believes in walking; thus our isolation. We're sure Walter Keller had another birthday (his 91st), but he didn't come to this meeting, so we couldn't help him celebrate. Bull Bailey and Bill Johns were also conspicuous by their absence. They were missed, and all are counting on seeing them next year in Minneapolis.



Gray Thompson and Bruce Velde on Galveston Beach. *Dave Pevear*

The meeting was hosted by NASA's Johnson Space Center and the Lunar and Planetary Institute (LPI). In addition to the financial support provided by the host institution, Alpha Earth Inc., ARCO Oil and Gas

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Inside ...

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.

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This newsletter printed on recycled paper.

Announcements

Eastern European liaison committee formed

At the Council Meeting in Houston, it was decided to investigate ways in which the CMS could cooperate with clay scientists in central and eastern Europe during this difficult transition time.

Several people have already stepped forward to sponsor eastern European colleagues as members of the CMS. Other ideas include finding grant money to support sabbaticals and equipment purchases, as well as sending journals to university libraries.

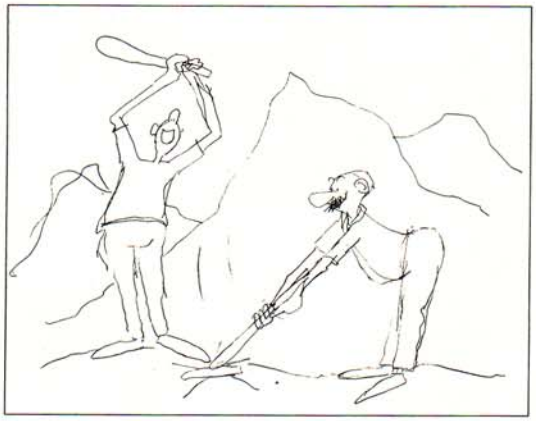
The new committee, chaired by Dennis Eberl, includes Roger Burtner, Rick Lahann, Dewey Moore, Jan Srodon, Joe White, and Bill Johns. Anyone interested in this project or having suggestions, please feel welcome to contact the committee. Roger Burtner will be the interim chair until June while Dennis Eberl is in Strasbourg.

Address change

Because of changes beyond our control (the closure of a post office), the Society Office has had to change its address. The new address is P.O. Box 4416, Boulder, CO 80306. We apologize for the inconvenience.

Where's the gavel?

Does anyone know where the Presidential gavel is? Please contact the Society Office if you have a clue.



Two geologists having fun beating illite/smectite to death.
Drawing by Peg Buschman

Dues to be raised in '93

In trying to find ways to support the increased costs of the editorial office, outreach programs, and the newsletter, the Council has reluctantly decided to raise dues by $5.00, starting in 1993. Subscribing member dues will become $40.00, and nonsubscribing memberships will be raised to $15.00. Student dues will not be affected.

It has been a long time since the last increase, and although the Council regrets the change, it feels that our dues still remain low compared to the benefits of Society membership.

Announcements,
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Thanks...

To the following people who contributed to this issue:

Dave Bish
Peg Buschman
Victor Drits
Dennis Eberl
Jessica Elzea
Ray Ferrell
Warren Huff
George Kacandes
W. D. Keller
Dewey Moore
M. J. Nash
Sam Patterson
Dave Pevear
Tom Pinnavaia
Rich Pollastro
Jim Post
Bob Reynolds
Don Scafe
Jan Srodon
Ken Towe
Gene Whitney

John W. Hosterman Memorial

John Hosterman, a Research Geologist who retired from the U. S. Geological Survey in May 1991, died of pancreatic cancer November 13, 1991, in Vienna Virginia.

John was born in East Lansing, Michigan in 1923, and reared in Washington, D. C. He served in the Navy in the Pacific during World War II. He attended George Washington University, and he received Bachelor's and Masters degrees in geology and mineralogy from Pennsylvania State University. While at Penn State, he was introduced to clay mineralogy by Prof. Thomas Bates.

John began work with the U. S. Geological Survey in 1949. One of his early assignments was the compilation of data and writing reports on several high-alumina clay deposits in Idaho and Washington that had been investigated by others during World War II. Later he mapped the geology of refractory clay in Kentucky, Pennsylvania, and elsewhere in Appalachia, and studied their mineralogy and physical properties. He also worked on ceramic clay in Washington, and kaolin and bloating clay in Maryland, and studied the mineralogy of Devonian black shale in the Appalachian Basin. He was an invited speaker on X-ray diffraction techniques at several workshops sponsored by universities, and served as an expert witness in lawsuits involving the federal government.

During 1973 and 1974, he was assigned to the Lunar Programs Office of NASA as a technical monitor for research grants. In this work he reviewed and evaluated proposals, negotiated proposed budgets, wrote funding actions, and made visits to evaluate research progress. He also served on a peer review panel evaluating proposals for a lunar data analysis and synthesis program.

In the decade preceding his retirement, John became an expert and an exceptional teacher for those wanting to learn about X-ray diffraction techniques for the study of minerals and the use of computers in analyzing mineralogical data. During this time, he also completed significant reports on bentonite in the Gulf Coastal Plain, another on bentonite and Fuller's earth in the entire United States, and another on non-bauxite aluminum resources of the world.

John was active in The Clay Minerals Society, serving as a leader of field trips and contributing papers at annual meetings. He lectured on a computerized system for semiquantitative mineral analysis by X-ray diffraction at the CMS First Annual Workshop, Denver, Colorado, 1985. He served on the Finance and Budget Committee, 1985-1991.

John will be missed by his family, friends, and colleagues. He leaves Margaret, his wife of 48 years, three daughters, a son, and a sister. After retirement, he returned to work part time on a volunteer basis, primarily to train USGS geologists in methods of investigation of minerals by X-ray diffraction methods and the use of computers in interpretation of the results of such studies. Those geologists who counted on him have lost a friend and a helpful colleague. He will also be missed by people who seek information on the economic geology of clays because it was well known that he had considerable knowledge of this subject.

Sam Patterson
Reston, Virginia

News from the Ad Hoc Committee on Regulatory Issues

On 13 November 1991, the Chemical Manufacturers Association held a workshop to review analytical methods for the detection and quantification of crystalline silica minerals (quartz, tridymite and cristobalite). The Clay Minerals Society was well represented at this workshop. Jessica Elzea, who attended as a representative of the CMS, participated as a panelist, as did other Society members, including Haydn Murray, Jack Burst, and Sarkis Ampian. Cliff Johnston was a reviewer and gave a presentation on the use of FTIR in crystalline silica analysis. Other members of the Regulatory Issues Committee in attendance were Jean Hemzacek, Bill Miles, and Ed Odom.

One of the duties of the Regulatory Issues Committee is to inform Society members about regulations that impact the use of clay and clay-related materials in research and industry. For anyone interested in the regulation of crystalline silica minerals, many of which are associated with clays, an article entitled "U.S. Crystalline Silica Regulation" by Bill Miles and Peter Harben will appear in the December issue of *Industrial Minerals*. Reprints are available.

Interviews with the clay scientists

Victor A. Drits

For the past 19 years, Professor Victor Drits has been head of the Laboratory of Physical Methods for Investigating Rock Forming Minerals in the Geological Institute of the USSR Academy of Sciences in Moscow. Two years ago he was elected its Vice Director. Professor Drits was interviewed by J. Srodon in September 1991, while both were visiting Centre de Géochimie de la Surface, CNRS, *in Strasbourg, France.*

Drawing by M. J. Nash

CMS: You are a physicist by training. How did you happen to become interested in crystallography and in clay minerals? Did you have a teacher who pushed you in this direction?

DRITS: Not really. It was rather a string of accidents which brought me into the clay field, and this is a long story. Between 1950 and 1955, I studied mathematics and physics at the Irkutsk University in Siberia. For the Master Thesis, I was asked to work out a quantitative X-ray technique for mixtures of kaolinite and illmenite. I never learned what they needed it for. I was endlesly preparing different mixtures, X-raying them in a Debye-Scherrer camera, but the results were so scattered that I felt I was doing it wrong. I may say that up to that time I was not a very motivated student, but this challenge changed my attitude. I abandoned my experiments and started digging into the theory of X-ray diffraction. Luckily, I got into my hands the book of James, *Optical Principles of X-ray Diffraction* (1950), just translated into Russian. I swallowed it, worked out theoretical formulae for quantitative X-ray diffraction analysis of mixtures, and proposed several new techniques based on photographic registration of intensity. I presented these results as my Master Thesis and got a very good degree for it, despite badly antagonising my advisor, whose several works in this field become invalidated.

I was offered an assistantship at Irkutsk University and accepted it as a better choice than school or industry. It paid 120 roubles per month and obligated me to 1200 hours of teaching per year. The salary was not sufficient to survive, so I had to give private lessons to high school students to supplement our income. I lived with my wife and a small son in one room 9 m^2. For me, this was a very motivating situation. I knew that to improve my life I had to get my Ph.D. as soon as possible and to make it as good as possible.

At this critical moment, another lucky accident pushed me towards clays. I was asked by Prof. Larina from the Institute of Coal Chemistry to study properties of clay catalizers, which they were trying to use to improve the efficiency of gasoline production from oil.

All kinds of Siberian clays were tried, but the first sample I was given to X-ray happened to contain ordered mixed-layer minerals. At that time, I was experimenting with small-angle scattering using a home-made primitive camera, and I found on my films this bizzare non-integral series of reflections. At the newstand in the university library, I found Brindley's book, just translated into Russian (1955). After reading it, I understood what I had. I saturated my sample with glycerol, and the peaks shifted as they should. Soon I did quite precise identification of my sample, just in time for the National Clay Conference in Lvov in 1957, where I was taken by Prof. Larina.

The event that dominated the conference was a big discussion on mixed-layer clays, whether they existed or not. People had learned about them from the literature, but hardly anybody had a personal experience with these minerals. In this situation, a young boy from Siberia who presented experimental data that unambiguously indicated the presence of interstratification effects must have impressed many people.

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Drits, *continued*

I was pleased to spend the field trip in the company of the rector of Lvov University, Prof. Lazarenko. V. A. Frank-Kamenetskij and B. B. Zvyagin invited me to visit their labs in Leningrad. B. B. Zvyagin, who soon became my close friend, promised me to share his sample containing single crystals of kaolinite, in exchange for a bottle of mineral water for which I was queuing during the field trip.

On the way back to Irkutsk, I visited Leningrad and Moscow. In Leningrad I met Prof. Porai-Koshitz, the well-known specialist in low angle X-ray scattering, who gave me a Kratky camera for my studies. In Moscow I met the famous Prof. Kitaigorodtski, who told me that my knowledge of crystallography was at a nineteenth century level. His advice was to read a lot, first books, then articles, and then to try to do something new. I followed this advice. In retrospect, I think that this trip to Lvov, which, by the way, was my first travel outside Siberia, was the single most decisive event for my future clay involvement, and for all of my career.

CMS: So this is how you got involved with clays, but you still lived in Irkutsk, hardly a paradise for a scientist at that time. How did you get out of Siberia and find a job in Moscow? As far as I know, the mobility of Soviet scientists is limited, mostly because of the notorious shortage of housing all over the Soviet Union.

DRITS: Well, it is again a long story. This shortage of housing was also an important factor in my life. I tried hard, but I couldn't get a place in Irkutsk to live, so I decided to finish my Ph.D. as soon as possible and try to find a university or research institute which would offer me a job and a place to live. At that time, a Soviet citizen with his Soviet salary could not dream of buying or renting an apartment, not to speak of a house.

I worked for the next two years like crazy. I studied a lot and tried a lot of things. I did some work on particle size analysis and strain in chlorite and lizardite using Warren's approach. I continued applying MacEwan's technique to mixed-layer clays, and also quantitative X-ray analysis and experiments with small-angle X-ray scattering. When I got the promised kaolinite samples from B. B. Zvyagin, I did my first structure analysis in cooperation with my friend A. Kashaiev, who was an excellent experimentator, and managed to collect the data for the single crystal. Our structure was published just after Zvyagin published his oblique-texture analysis. During this study, I first thought about dislocations as a possible source of defects leading, in particular, to stacking faults in phyllosilicate structures. I tried to generate dislocations mechanically in kaolinite and chlorite. Inspired by the first work of Smith and Yoder, A. Kashayev and I studied mica single crystals and found twinning and intergrowth of different polytypes. These results were never published because of the strong opposition of my former advisor, who was editing the journal.

I put all these results in my thesis, which was ready by 1960. When writing the thesis, I got sick from swimming too much in the cold Baïkal water and ended up for three months in a hospital, which gave me a chance to memorize enough Marxist philosophy to pass an examination required as part of the Ph.D.

According to the regulations in our country, the thesis has to be defended in a university other than the one where it was made. There was no other university in Irkutsk. I decided to defend in Moscow, but the rector refused to pay for my trip, arguing that I might fail there. I borrowed money from friends, went to Moscow, and asked Academician Belov, of the Institute of Crystallography of ASUSSR, to accept my thesis for the defense in his institute. Prof. Vainshtein, our famous crystallographer, read it and agreed to be the official opponent. I got my Ph.D. and pretty soon received six job offers from different cities. In those days, a Soviet citizen could change a job only if his employer agreed. The rector told me to ask the Dean and the Dean refused, arguing that he needed young researchers. In principle, I was not against staying in Irkutsk if I could get a decent apartment there. Together with the university trade-union leader, we visited the Communist party boss of Irkutsk, who could solve all kinds of problems. He told me that a room in a student hostel was all he could offer and that I could leave Irkutsk if that didn't suit me. Among the job offers there was one from Prof. Lazarenko from Lvov, which included an apartment. I decided to take this job, so soon I was in a plane on the way to Lvov.

I may say that up to that time I was not a very motivated student, but this challenge changed my attitude.

There was no direct flight to Lvov, so I had to stop in Moscow. I went to see Prof. Kossovskaya at the Geological Institute of AN USSR , with whom I had already started cooperation on clay diagenesis. Three days later I was an employee of their institute. It just happened that exactly on that very day, when I arrived in Moscow, the Academy created 21 new job positions, one for each institute, to invite scientists from outside Moscow. Each position came with a flat and permission to live in Moscow,

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Drits, *continued*

which was a closed city at that time. The Academy got that opportunity from the very top, from a deputy of N. S. Kruschev. Prof. Chukhrov used such a position to invite B. B. Zvyagin from Leningrad, and A. G. Kossovskaya convinced Prof. P. P. Timofeev, at that time vice-director of the institute, to invite me. Of course, I did not hesitate, and stayed in Moscow, for the first half a year completely illegally, because it took about that long to give me the required residence permit *(propiska)*. After one year, I got my dream flat, consisting of two rooms, 16 + 8 m^2, where we lived for the next 25 years, and which is serving now the family of my son.

In the institute they made me the head of the Laboratory of Physical Methods for Investigation of Rock-forming Minerals. I still hold this position, only the lab has evolved over these years.

CMS: Judging from the output written in English, you have the best clay lab in the Soviet Union. How did you manage to gather around you such good people?

DRITS: First of all, I quickly got rid of nine out of the eleven people that came with the lab. From the old scientific staff, only Y. Alexandrova stayed on the job. Then I started searching actively for new staff. These were mostly young people whom I hired as assistants and who did their Ph.D. with me. Only A. Bookin came with a Ph.D. to the lab. All of them worked hard. As a boss, I am rather autocratic. I like to suggest research ideas, and I quickly find errors. I am a poor experimentator, but I think I can do a good job interpreting data. So I was providing ideas, they were doing the experimental part, and then together we were processing and interpreting the data. It still works that way, and I am quite content with the output.

Drits and others at the 1985 International Clay Conference barbeque, Georgetown, Colorado.

Right now, there are 14 people in the lab: six scientists, including myself, and eight technicians and engineers. Alexander Bookin works in all the fields. Boris Sakharov is specialized in XRD and, in particular, in modelling XRD patterns from structures including stacking defects, mixed-layering, etc. Lydia Danyak works with interpreting Mössbauer and IR spectra, and Bella Smoliar-Zviagina does structural modelling based on the parameters and chemical composition of the unit cell. Alfred Salyn is our specialist in XRD experiments, modifications of equipment, and creating data-processing programs. Alla Sokolova is responsible for all the routine XRD analyses which our lab is providing to the rest of the institute. Last year, we lost our EM specialist, Semeon Tsipursky, who emigrated to the US and now works with Peter Buseck. Earlier, our two women retired: Vera Alexandrova, who specialized in single-crystal analysis, and Maya Slonimskaja, who worked with IR, gas chromatography, and thermal analysis. By education, most of the scientists in my lab are physicists.

B. B. Zyvagin, who soon became my close friend, promised me to share his sample containing single crystals of kaolinite, in exchange for a bottle of mineral water for which I was queuing during the field trip.

CMS: You have authored and co-authored so many papers that I've had difficulty tracing the evolution of your personal research interests. How did they develop over these years? I understand that in the Academy of Sciences you were free to choose your research goals, and never did any research oriented towards practical applications, e.g. to generate money for the lab. Am I right?

DRITS: Basically you are right, although being a part of the Geological Institute, we were always collaborating with geologists. Personally, my major interests were confined to two directions. The first is developing methodological approaches to interpreting diffraction and spectroscopy data obtained from fine-disperse minerals. The second is solving crystal structures, the more exotic and complicated the more challenging, both clay and non-clay. Along with working inside the lab, I am cooperating with lots of people from various scientific centers—in Moscow, St. Petersbourg, Novosibirsk, Irkutsk, Kiev, Kazan, Kishinev, and so forth. Hence the great diversity of the topics I am dealing with.

In the sixties, we concentrated on three major research topics: structure refinements by single crystal methods,

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Drits, *continued*

developing methods for analysis of mixed-layer minerals, and application of our results in cooperation with geologists.

All the structural studies were made in the same way: considering all theoretically possible structural modifications, comparing calculated and experimental X-ray intensities, determining the idealized models, and then refining the structures. I did my first study of this kind (structure of kaolinite) by hand, but from about 1965 on we could use computers.

Together with V. Alexandrova, we used this approach to determine the structures of a one-layer dioctahedral chlorite and two-layer dioctahedral and di-trioctahedral ones. Dr. Tepikin and I refined an iron-rich biotite, and together with B. B. Zvyagin we described gumbellite, a $2M_2$ dioctahedral mica.

Together with Dr. G. V. Sokolova, we determined and refined the crystal structures of Ca silicate fedorite and Ca and Na Li-rich micas. She also worked on palygorskite and confirmed Bradley's model of this mineral. In collaboration with my Irkutsk friend A. Kashajev, we described the possible polytypes of pyrosmalite structures and found the models for shellerite and fridelite. XRD patterns of kimrite, a Ba layer silicate, seemed at first quite mysterious because of the presence of satellite reflections. So I was very pleased to have guessed the actual nature of structure modulations leading to these effects.

In 1972, I was as much delighted to have discovered, using SAED, a triple-chain silicate that somehow closed the gap between amphiboles and phyllosilicates. Later, such minerals were found in nature by Professors Veblen and Burnham.

In the seventies, we started widely using other methods in addition to XRD. We bought transmission (JEM 70) and scanning (Stereoscan 600) electron microscopes, an electron diffractometer (EMR 102), an X-ray microprobe Camebax analyser, an IR spectrometer, equipment for thermal analysis, and so on. I've been paying special attention to structure studies of minerals using electron diffraction. At that time, the dominating opinion was that selected-area electron diffraction (SAED) could not be used for direct structure analysis because of the strong influence of dynamic effects. However, we showed that under certain conditions this method is effective in solving new structures. This is very important because a lot of natural

Victor Drits, Karuna Eberl, Dennis Eberl, Jan Srodon, Bessie, Benny Theng, Howard May, and Prof. Stoch, leaving on a field trip, Evergreen, Colorado, 1985. *JoEberl*

and synthetic minerals are extremely poorly crystallized, and SAED turns out to be the only tool for studying their structures. The first demonstrations of the advantages of SAED were our works with Natalia Organova, who did her Ph.D. on exotic CuFe-sulfide/brucite mixed-layer minerals with commensurable and incommensurable layers. We discovered new minerals, tochilinite I and tochilinite II, one-layer valeriite, and a lot of tochilinite- and valeriite-related varieties.

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Later, together with Professors Chukhrov and Gorshkov, we used SAED and EDS to discover a whole new world of mineral varieties among phyllomanganates, including regular mixed-layer Ni-asbolane, Co, Ni-asbolane, Co-asbolane with incommensurable layers, various random mixed-layer asbolane-buserite phases, different channel-structure minerals, etc.

Dr. Tsipursky improved intensity registration for oblique-texture electron diffraction (OTED), and this allowed us to refine, for the first time, the structures of celadonite and illite $2M_1$ and 1M with the same precision as provided by single-crystal XRD. OTED study of dioctahedral smectites saturated by K and subjected to wetting-and-drying cycles identified diverse distribution patterns of octahedral cations over cis- and trans-sites. I described these and other results in my book, *Electron Diffraction and High-Resolution Electron Microscopy of Mineral Structures,* which was translated into English and updated in 1987. I don't know whether this book is acknowledged by Western readers, but the review published by Professor Güven in *American Scientist* was quite a gift for me be-

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Drits, *continued*

cause he stressed just those aspects that were most important for myself. Our results on manganese minerals were published in 1990 in the book *Hypergene Manganese Oxides*, in Russian. The mixed-layer clay minerals became the specialty of Boris Sakharov, who came to the lab in 1966. Inspired by Kakinoki and Komura matrix formulation, we developed an original mathematical formalism for simulating XRD patterns from mixed-layer structures. We studied many different clays, and the results of these studies were sumarized in our book published in 1976, unfortunately only in Russian. It is frequently cited, but I am afraid that not many people have read it. It's a pity because there are, I suppose, some ideas and results that still retain significance.

V. A. Drits, collecting illite near Red Mountain Pass in the San Juan Mountains, Colorado,1985.
Dennis Eberl

In the seventies, A. S. Bookin, L. G. Dainyak, and M. V. Slonimskaya joined the lab and started applying non-diffraction methods to the study of phyllosilicates. With the arrival of each new person who started a new method, I had to penetrate into a new field. This proved a very fruitful process for each of us.

A. S. Bookin worked out a set of computer programs for estimating the Madelung energy in the point-charge approximation. These programs were used for comparing O-H vector orientations obtained from diffraction data and from electrostatic-energy calculations. The result of this work allowed us to get a deeper insight into the conditions under which, for certain phyllosilicates, one can predict O-H vector orientations, to clarify the cohesion energy of 1:1 layers in kaolin minerals, to show that the IR O-H stretching frequencies are largely affected by the crystal field and that hydrogen bonds are not the main reason for shifting the frequencies, and so forth. I'd like to draw attention to the work of A. S. Bookin, where he showed that there is a linear relationship between the observed frequencies for kaolin minerals, muscovite, margarite and phlogopite and the electric-field gradients (EFG) along each of the O-H bonds.

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L. G. Dainyak came to join us at the lab, having an idea that the conventional model for the interpretation of Mossbauer spectra of phyllosilicates, biotites in particular, is invalid. In those days, one used to decompose such spectra into two doublets related to Fe cations occupying cis- and trans-octahedra, respectively. The supposition of L. G. Dainyak, however, was based on indirect implications and intuition. Her ideas were directly confirmed when OTED showed that trans-octahedra are vacant in Fe^{3+} - rich micas, such as celadonites and glauconites. Together with L. G. Dainyak and A. S. Bookin, we have elaborated a new model for interpreting Mössbauer spectra of Fe^{3+} -rich micas. This model is based on EFG calculations depending on the shape of the Fe^{3+} -octahedron which is determined by the type of the nearest-neighbor cations. We have used a combination of this technique with a new approach to interpreting IR spectroscopy data in computer simulation of two-dimensional cation distribution in octahedral sheets of micaceous minerals.

CMS: You've mentioned your cooperation with the geologists at your institute. In which directions did this cooperation develop?

DRITS: For the thirty years that I've been working at the Institute, I've been constantly participating in studying diverse geological objects and processes. The main problems in our cooperation were associated with revealing interrelationships between fine structural peculiarities, composition, and formation conditions of minerals in various geological environments; in elucidating mechanisms for structural transformations of minerals; in searching for regularities in the distribution of clay minerals in continents, transition continental-marine zones, in marine sediments and basalts, and so on.

I worked together with Vsevolod Shutov, who was a brilliant scientist and my close friend. We described, in terms of the solid-phase transformation, illitization and development of ordered mixed-layer illite/smectite in the course of diagenesis from bentonites of Karaganda basin. Using the density-gradient technique, we could quantitatively evaluate the degree of heterogeneity in glauconites

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Drits, *continued*

differing in age and rock type in order to solve the problem of their formation conditions.

In the early sixties, Prof. Kossovskaya and I studied the transformation history of biotite and muscovite at different decomposition stages and in different geological environments. We believed that the information on the existence of these main micas of the crystal rocks in the sedimentary cycle would clarify the genesis of the sedimentary clay minerals. We showed, in particular, that in the case of humid-type diagenesis-epigenesis, illitization of detrital flakes of biotites accompanies chloritization. A study of muscovite flakes differing in density, found in weathering crusts, indicated that kaolinization proceeds without any appreciable intermediate phases, through dissolution-precipitation. Studying the crystal-chemical features of clay minerals formed under different facies and climatic conditions, we concluded that both under low pH typical for coal-bearing complexes and under high pH and high mineralization of solutions typical for evaporite basins, authigenic clay formation often proceeds through synthesis and is hardly affected by the initial composition of the detrital mud. Some of these results were summarized in English in the special volume of *Sedimentology* published in 1970.

When we got samples from the first two expeditions of Glomar Challenger, we, together with Prof. Kossovskaya and Shutov, studied smectites from the Atlantic sediments

We found trioctahedral smectite samples, quite unusual in containing anomalously high amounts of Fe^{3+}, with a deficiency of OH groups. The formation conditions of such samples are still a mystery.

and found them to be relatively Fe-rich in composition and lath-shaped. We concluded that they were authigenic products of basalt alteration. Comparing dioctahedral smectites derived from basalts and ultrabasic rocks of continental vs. marine origin, we found a pronounced, though still puzzling, difference in the exchange cations: Ca = Na on land and K in the sea. Remarkably, the paragenesis of authigenic smectite was found to be characteristic only of pelagic clays.

Together with Dr. G. Butuzova, we studied authigenic phyllosilicates from metalliferous sediments of the Red Sea and found a transformation series: gel - di, tri - smectite - nontronite - mixed-layer nontronite/celadonite - celadonite, which we interpreted as evidence for a dissolution-crystallization mechanism.

Later we studied products of secondary alteration of marine and continental basalts and determined the geological environments for which associations that included saponite, celadonite, corrensite and hydrated talc are typical. Among these products, we, together with Dr. I. Simanovich, found trioctahedral smectite samples, quite unusual in containing anomalously high amounts of Fe^{3+}, with a deficiency of OH groups. The formation conditions of such samples are still a mystery.

Jo Eberl, Karuna Eberl, and Victor Drits, Evergreen, Colorado, 1985.
Dennis Eberl

Prof. Kossovskaya and I analyzed geological environments for which the rock-forming minerals are dioctahedral and trioctahedral smectites, micaceous minerals, and so on. This approach has allowed us to determine indicator characteristics of each of these minerals and factors that determine their formation, that is physico-chemical conditions, compositions of the initial material, the degree of secondary transformation, and so on. For example, we found that chlorites of sedimentary complexes differ from those of magmatic and ultra-basic rocks in the total amount of Al in the unit cell. This parameter, along with parageneses of the accompanying minerals, may serve as a criterion for identification of highly metamorphosed para- and orthorocks. This is just an oversimplified sketch of our results.

Some of these are summarized in two books, which I've written with Prof. Kossovskaya. One has been published last year, and the second will appear this year. They are in Russian, but I am looking for a publisher of an English version.

CMS: It reminds me of the question I wanted to ask when you mentioned the 1970 special "Russian" volume of *Sedimentology*. How did it happen that this volume appeared? Was this your first publication in English? Why have you started publishing in international journals so late? Did you see any advantage to such isolation, and

continued on next page

Drits, *continued*

how did your international contacts develop?

DRITS: The "Russian" volume of *Sedimentology* was arranged by Prof. Kossovskaya, who served at that time as an associate editor of this journal. It contained indeed one of my first papers published in English. Earlier, I co-authored papers published in proceedings of the Stockholm and Tokyo Clay Conferences, although I did not have a chance to attend them. You see, in the early years, I did not have much incentive to publish in English. First of all, I did not expect much chance to travel abroad and meet my potential non-Russian readers. And in the country, the publications abroad did not count more than the papers in renowned Soviet journals like *Kristallographia, Doklady, Izvestija,*

Victor Drits, a Polish farmer, Jan Srodon, and Keith Goulding, on a farm between Warsaw and Krakow, 1989. *Dennis Eberl*

It didn't happen to me, but happened to my colleagues, that their papers were rejected because of poor English. This was also discouraging.

or *Litologija i Poleznyje Iskokajemyje*. For the same reasons, I did not pay much attention to learning foreign languages. As a result, it was very difficult for me to write a paper in decent English. And the editors were sometimes not very cooperative. It didn't happen to me, but happened to my colleagues, that their papers were rejected because of poor English. This was also discouraging. The situation changed gradually when the first contacts with the external world began.

My first travel abroad was to East Germany in 1963. I visited several institutes, including the most interesting for me, which was the Institute of Crystallography in Berlin, headed at the time by K. Dornberger-Schiff. She explained to me her order-disorder (OD) theory of solids, and during next two years I attended summer schools in Berlin and Bratislava, which were devoted to this subject. I met there a great team of Slovak crystallographers: Durovic, Kupczik, and Makovicky. The latter two emigrated to the West after the end of Prague Spring (1968,) but Durovic continued work on the OD approach and published several papers on its application to clays.

In 1966, during the International Congress of Crystallography in Moscow, I met Jacques Mering and spent a lot of time talking with him. He was a son of émigrées from Russia and spoke fluent Russian. We saw each other again in 1970 in Paris when I was on the way home from the electron microscopy conference in Grenoble, and we spent all night talking about crystal structures, Russia, literature, and all possible subjects. My Russian colleagues were very nervous when I showed up only early in the morning.

Also in Grenoble I met Cyril Tchoubar, and we soon became friends. We also realized that we were thinking along similar lines and moving in the same direction. Cyril is a son of Russian émigrées and he spoke good Russian, which helped in this contact. Later, he visited Moscow in 1979, and I went for two months to Orléans in 1980. We arranged the signing of a formal cooperation agreement between CNRS and ANUSSR involving our labs, and for several years we've been working together very intensively on real, i.e., involving defects, crystal structures of clay minerals, using a range of techniques, mostly XRD, IR, and Mössbauer. Some of these results were published in our book, *X-ray Diffraction by Disordered Lamellar Structures.*

Unfortunately, it turned out very quickly, that the travel worked essentially only one way: the French were coming to Moscow every year, but except for me—the boss—only Bookin made it to Orléans in the first year of the project.

Our institutions were given freedom in experimenting with their internal organization. The directors are now elected by the scientists, and we have also organized a competition for the heads of all laboratories.

CMS: Why was it so? Did your authorities keep younger people at home, afraid that they might stay abroad? Or was this a privilege of older scientists to get funds for travel?

I have made an observation over the last 15 years, that

continued on next page

Drits, *continued*

the only person whom you may have expected to show up at any international clay meeting was Prof. Chukhrov, accompanied by a younger scientist. There was even a protest proposed by the French and voted in 1978 in Oxford against such lack of freedom to travel by the Soviet colleagues. I remember that Prof. Chukhrov was the only person to vote clearly against it. His companion kept his hand up as low as he dared. I remember also all the adventures related to bringing you to Denver in 1985. Tell us, please, how travel out of the Soviet Union worked over the years and how it is now?

The field trip is over: Drits, Eberl, Stoch, Srodon.

To do research, we have to compete for money, presenting research projects to a government funding institution. I am afraid it may reorient us towards more applied research.

DRITS: No, I do not think there has ever been a conscious policy of restricting travel for young people. It may have looked like this from the outside, but the real reason was always the very limited resources available for travel, and at the same time, tremendous competition because a lot of people were anxious to go abroad. Naturally, this competition would be won by those who had higher scientific positions. On the other hand, the Academy would send one or two people to an international conference as its official delegation and pay for their expenses. That is why you saw Prof. Chukhrov so often. He was an academician, the director of one of the biggest geological institutes and the president of the Soviet clay group, so he was always the number one candidate to go if he wanted to. The academicians have their privileges, and this is an old tradition, going back to the time of Catherine the Great. Other people, in order to attend a conference, usually had to pay from their own pockets, which was always very expensive for us, and had to do it through the state tourist agency, which typically restricted the group to 10-15 people because of the non-equivalence of the rouble and hard currency. As a result, you could see the Russian groups only at those conferences whose organizers understood our situation and waived the registration fees, and you did not see them in Oxford, Denver, and Strasbourg. In more recent years, you could see also some exceptions: people like me, travelling individually, thanks to the financial support of foreign scientific institutions. So such was the typical situation, but I also knew cases of individual people not allowed for years to travel abroad for unknown reasons. Such was, for example, the situation of my colleague Boris Sakharov, whom I have tried unsuccessfully to send abroad since 1977.

Today the situation is completely different. We are free to travel individually, so funding remains the sole limitation of our travel possibilities.

CMS: History seems to be taking a major turn in your country. How do you experience it from the perspective of your lab and your Institute? What are the major changes so far, and what do you anticipate?

DRITS: Well, after these three months in Strasbourg, I am going back to a new country. The Soviet Union has almost disappeared, and we have been the institute of the Soviet Academy of Sciences. The future is then quite unclear. I expect that the Soviet Academy will become the Russian Academy. It is sort of natural, because all the republics have their own academies, but Russia does not, and essentially all the institutes of AN USSR are located in Russia, mostly in Moscow, Leningrad, Novosibirsk, Irkutsk, Chabarovsk, and Vladivostok. But I would imagine that the Academy has to change. It gets a lot of criticism from the inside and the outside for its conservatism and complete separation from universities, who could benefit from our scientific potential.

A lot has changed over the last few years. Our institutes were given freedom in experimenting with their internal organization. The directors are now elected by the scientists, and we have also organized a competition for the heads of all laboratories.

For the moment, our quiet life devoted to fundamental research is not so quiet any more. The Academy pays only our salaries and maintenance of the buildings. To do research, we have to compete for money by presenting research projects to a government funding institution. I am afraid it may reorient us towards more applied research. Right now, money is very tight and salaries are very low, so the scientific career is becoming less and less attractive. I have a very hard time finding young talented and motivated people.

Annual Meeting,

continued from page 1

Co., Chevron Oil Field Research Co., CONOCO Inc., Exxon Production Research Co., Siemens X-Ray Analytical Instruments Inc., and UNOCAL Science and Technology contributed toward various aspects of the meeting.

Dave Pevear was General Chair and Joe Dixon was Program Chair for the local committee. Much of the field trip was handled ably by Doug Ming, and the paper work by the staff of the Lunar and Planetary Institute. Cathy Fischer and Becky Simmons, from the Departments of Publications and Program Services of LPI, served with extraordinary diligence. The technical program was

Doug Ming, NASA Representative to the meeting and one of the field trip organizers, and Dave Pevear, General Chairman of the meeting, on the field trip.

Jo Eberl

divided into five categories: a General Session that met four times; sessions on Surface Chemistry, convened by Jose Fripiat, and one titled *The Extraterrestrial Connection*, convened by Jim Gooding and V. L. (Buck) Sharpton, that each met twice; and sessions on Soils and Clays in Environmental Research, convened by Paul Bertsch and Brij Sawhney, and Geothermometers and Geochronometers, convened by Eric Eslinger and Reed Glasmann, that each met three times.

The meeting began with a short-course on Mössbauer spectroscopy, a technique in which gamma rays are used as probes of nuclear energy levels, usually of iron. It was sponsored by The Continuing Education Committee of the CMS, the Lunar and Planetary Institute, and NASA-Johnson Space Center, and led by Richard Morris and D. C. Golden, both from the NASA-Johnson Space Center. The 58 participants heard from Lawrence Bowen from North Carolina State University, David Agresti from the University of Alabama at Birmingham, David Lindstrom from NASA-Johnson Space Center, Denis Rancourt from the University of Ottawa, Roger Burns from MIT, Enver Murad from the Technische Universität München, and Richard Morris from NASA-Johnson Space Center. Three important points from this session for the clay mineral community to keep in mind are that: (1) Mössbauer spectroscopy can distinguish between Fe^{2+} and Fe^{3+}; (2) it can identify the structural site and coordination state of iron; and (3) it can identify magnetic ordering states at liquid-N_2, liquid-He, and lower temperatures.

1990-1991 President and Brindley Lecturer Tom Pinnavaia receives the Presidential Plate from 1991-1992 President Bob Reynolds, as Lyn Pinnavaia looks on. The plate has been donated in the past by Georgia Kaolin. Now that ECC International has bought Georgia Kaolin, they have willingly agreed to continue donating the plate.

High Iron Photos

Heroes Jerry Bigham, Co-chair of the 1992 CMS Annual Meeting and Darrell Schulze, 1992 Program Chair, talk to Larry Bowen. Bigham and Schulze, along with Wayne Hudnall, also Co-chair, have taken on the task of organizing the first joint meeting of the CMS with the SSSA, to be held next year in Minneapolis.

High Iron Photos

The technical program began with a plenary session, first featuring the CMS Distinguished Member address. Doug Ming introduced his former

Dr. and Mrs. M. L. Jackson, funders of the Marion L. and Chrystie M. Jackson Award for Mid-Career Clay Scientists, at the barbeque. *High Iron Photos*

professor and newest Distinguished Member Joe Dixon, Texas A&M University, who spoke on Clay Science in Soil Environments: Recent Findings. Then Jose Fripiat introduced the George W. Brindley Lecture given by Tom Pinnavaia, Michigan State University. His topic was Recent Advances in Intercalated Clay Catalysts. Dave Pevear introduced the last speaker of the morning, the Pioneer in Clay Science lecturer,

Doug Ming, Fred Mumpton, Hameed Malik, and Rolly Jones. Fred Mumpton was the recipient of a special award to honor the twelve dedicated years he spent as Editor of Clays and Clay Minerals. *High Iron Photos*

Charles Weaver, Georgia Tech, whose talk was titled, "Once a Pioneer, Always a Pioneer."

I'm sure it's understood by everyone that I can't see or hear about all presentations, but I do think it's important to try, even if from my distorted viewpoint, to give the highlights of the technical sessions. So, here's a summary with input from several people, proceeding session by session.

In the General Session posters: Thornley and Primmer showed a believable quantitative whole rock determination of clay minerals in sandstones using loss on ignition to complement XRD. Hillier and Clayton showed a nifty Cs-exchange technique for spotting the clay minerals with high-exchange capacity. Webb and Sprague showed that, on the basis of trace fossils preserved in fine detail, some central and eastern Georgia kaolinites had to have been formed before being transported. Uwins and Mackinnon (and Uwins, Mackinnon, and Thompson in a paper) argued that the tendency for kaolinites to intercalate is related to particle size—the smaller the size, the less likely to intercalate—and they also showed an interesting bimodal distribution of particle size. And Pevear, Klimentidis, and Robinson argued for the origin of vermicular kaolinite by nucleation on the 001 surfaces of muscovite, and that, based on improved modeling of the 001 peak, illite crystallites may have kaolinite-like surfaces. In General Session papers: Murad argued persuasively that Fe is present in kaolinite in the 3+ state and does not necessarily affect its brightness. Reynolds crisply demonstrated two points (1) sample preparation introduces no artifacts in the study of the clay-sized fraction of sedimentary rocks, and (2) the degree of modulation of the 20:13 band correlates well with respect to the percent expandability indicating that turbostratic displacements occur at, and are limited to, the expandable interlayers of illite/smectite. Hay and Liu, and a poster by Harper, Longstaffe, and Wadleigh in a Geothermometers and Geochronometers Session, showed evidence that kaolinite was the precursor for K-feldspar in several episodes of K-metasomatism widespread in the mid-contintent.

Part of the upcoming generation of bright clay lights: George Kacandes and Kenan Cetin. *JoEberl*

In recognition of a critical focal point of research on clay-sized materials, we had oral and poster sessions on Surface Chemistry.

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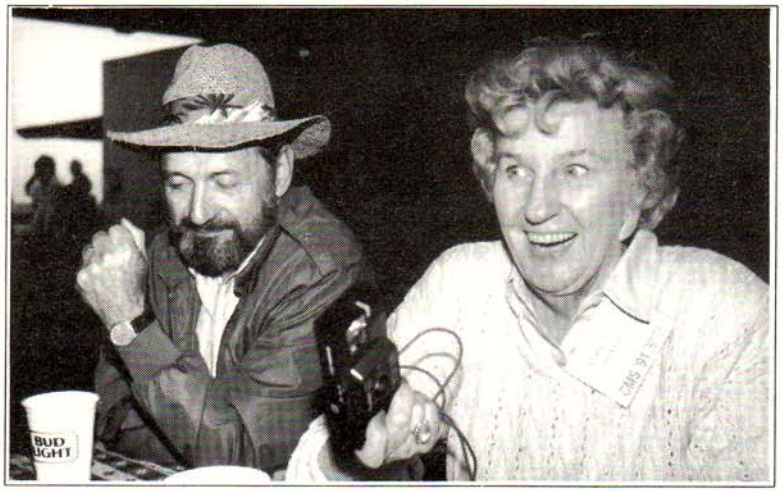

Pioneer in Clay Science Lecturer Charles Weaver and his wife Jan. *High Iron Photos*

Let me highlight some of the noteworthy papers. The three papers, one by Eberl and Blum, one by Johnsson, Blum, and Hochella, and one by Nagey, Hochella, Blum, and Lasaga, showed the power and potential of the atomic force microscope (AFM). Muller argued that Mn^{2+} in kaolinite indicates a residual kaolinite whereas VO^{2+} indicates deposition in a reducing environment and, therefore, a sedimentary origin. Li, Giese, Eberl, and van Oss, on surface thermodynamics of illite surfaces, complemented a poster by Pevear, Klimentidis, and Robinson on the relation of the illite to the kaolinite surface, with Pevear *et al.* showing that illite modeled mixed with 3 to 5% kaolinite (as end surfaces?) produce improved calculated diffraction tracings.

In The Extraterrestrial Connection sessions, the interests of our host institutions were reflected. There were papers on the problem of whether or not there are clay minerals on the surface of Mars. Their presence would indicate that weathering had taken place. There were papers on the use of Mössbauer, related to the workshop, because a miniaturized Mössbauer instrument will be sent to Mars to determine the oxidation state of Fe on the Martian surface. And there were papers on the mineralogy of material at the K/T boundary, much of which was shown by Pollastro and Bohor to be halloysite or kaolinite when deposited in swamps.

In the Soils and Clays in Environmental Research sessions, posters by Salter and Riley and by Elzea, Sprague, and Odom, combined with a paper by Odom and Elzea, stimulated spirited discussion about respirable SiO_2. This discussion, and the one at a panel discussion on the asbestos problem held at the annual meeting of the Geological Society of America in Denver in 1988, clearly show the lack of agreement or communication, or even the antagonism at times, between scientists and regulators. On other topics, there were papers by Lee and by Chermak on clay minerals and storage of radioactive wastes, and papers by Boyd, by Zhang and Sparks, and by Farmer, Aochi, and Sawhney on sorption of contaminants on organically treated clay mineral surfaces.

Several generalizations appeared in the Geothermometers and Geochronometers sessions. Clauer and Velde, in separate papers,

Marion Reed, Jean-Pierre Muller, Elise Duwicquet-Muller, and Michelle Hluchy at the barbeque. *Jo Eberl*

Randy and Betty Hughes. *Jo Eberl*

Martin Kralik from Vienna and Alain Manceau from Paris, discussing clay at the pre-banquet reception. *High Iron Photos*

argued that the thermal history of basins is more clearly analyzed by using a variety of tools in addition to the diagenetic trends of clay minerals. It was also emphasized in these and other presentations that I/S in sandstones is different from that in shales. Several presentations, among them Whitney and Velde's, Velde's, Vali, Hess, and Srodon's, and Schroeder's, pointed out that there is often more than one variety of I/S or illite plus I/S in a sample. Bish used modern analogues from geothermal areas to explain paleogeotherms in the Yucca Flats, Nevada, area that abruptly change slope. A paper by Walker and a poster by deCaritat, Hutcheon, and Walshe discussed chlorite as a geothermometer. Wampler and Hassanipak described a method for collecting a potassium-argon "age spectra" by the degree of chemical decomposition rather than degree of thermal decomposition. Both Wampler and Hassanipak and Thomas, Dahl, Hall, and York had suggestions for compensating for 39Ar recoil aberrations. And finally, Pevear and Elliot, in a nifty study, devised a plot of age vs % illite in I/S that can be extrapolated in one direction to the age of diagenesis, and in the other direction to the age of the source rock.

Continuing Education Chair Jeff Walker and AIPEA Liaison Steve Guggenheim. *Jo Eberl*

On the overall quality of the meeting, spontaneous, unsolicited comments in the halls and over food and drink were that this was the best meeting ever attended, but everyone had a "however . . .." The howevers had to do with the quality of a few of the presentations with illegible slides or with sessions that didn't stay on schedule, thereby preventing coordination with other sessions. In addition, we still have some abstracts promising the reader that they will describe or will discuss rather than straightforwardly stating what they have found. Some promise unique insights rather than tell us what those insights are. We do not need abstracts that conclude that these investigations suggest fruitful areas for future investigation without specifying, even vaguely, what those areas might be.

Marion Reed, Charles Roth, and Joe Dixon, Program Chair of the meeting. Professor Dixon was honored as this this year's CMS Distinguished Member. A modest man, he neglected to tell his wife he had received the honor. *High Iron Photos*

On Wednesday, a beautiful day, especially for Houston, about 140 participants took a field trip led by Doug Ming, Theron Garcia of the University of Houston-Clear Lake, and Lisa Tuck of Sterling Chemical, Inc. The trip consisted of four legs: 1) Expansive Soils in Harris County; 2) Johnson Space Center; 3) Subsidence and Surface Faulting; and 4) the Gulf Coast Waste Disposal Authority Campbell Bayou Facility. The expansive soils cause problems when building foundations, roads, bridges, and other heavy structures. The pumping of ground water and of oil has caused subsidence and surface faulting. And the engineer running the waste disposal facility said he didn't know anything about clays, he just builds the facilities. Lisa Tuck may have adequately summed up the opinion of the participants after they

Regulatory Issues Chair Jessica Elzea and Membership Chair Jean Hemzacek. *High Iron Photos*

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Annual Meeting,

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had viewed these highlights of the Houston area when she said that it might have been better if Galveston hadn't raised its dockage fees, causing Houston to have been founded.

Field trippers were joined by non-field trippers at the end of the day for a beach party at the northeastern end of the barrier island on which Galveston sits. Steak, shrimp, corn, boiled potatoes, and beer were enjoyed by all, and then those who had not been immobilized by the meal played volleyball to settle their dinner.

The Program Advisory Committee had a bit of trouble deciding which were the best oral and the best poster presentations by students so they added some honorable mentions. The best paper was *Chromium (III) Induced Solid Phase Transformation of* MnO_2, by Scott Fendorf from the University

Councilor Fred Longstaffe and Publications Chairman Reed Glasmann on the field trip. Dave Pevear

of Delaware, with co-author Donald Sparks. The runner-up paper was *Mineralogy and Mineral Equilibria of an Alfisol/Vertisol Complex in the Australian Tropics*, by Janis Boettinger from the University of California at Davis, along with R. A. Dohlgren and R. J. Southard. Two honorable mentions were also given: *Rietveld Refinement of a IIb-2 Clinochlore*, by John Rakovan from SUNY at Stony Brook, along with Steve Guggenheim, and *Oxidation of Phenol in Acidic Aqueous Suspensions of Manganese Oxides*, by Ljerka Ukrainczyk from Cornell University, with co-author M. B. McBride. The best poster was *Synthesis of Fluorinated 2:1 Layer Silicates and their Characterization by 29Si, 27Al, and 19F Magic Angle Spinning (MAS) Nuclear Magnetic Resonance (NMR) Spectroscopy*, by L. Huve from l'École Normale Supérieure de Chimié de Mulhouse, with co-authors Saehr, Martin, Baron, and Le Dred. The runner-up poster was *Illite/Smectite Geothermometry of the Oronto Group, Southern Lake Superior Basin, Michigan*, by Kirsten Price from Michigan Tech, with her co-author Doug McDowell. An honorable mention was given to *Halloysite: Product of Calcium-rich Plagioclase Alteration, Riverside County, California*, by Matthew Taylor from San Diego State University, with his co-author Dick Berry. Congratulations to these people for their quality work and quality presentations. Sometimes these "kids" are so bright they're a bit scary.

Georgie Scafe and Deborah Dane (Post) at the wine and cheese reception. High Iron Photos

In the Council meeting, the biggest news from President Tom Pinnavaia was that Ray Ferrell will be the new editor for our journal. The *ad hoc* search committee chaired by Warren Huff said that from several excellent candidates, the final selection was made partly on the basis of the amount of support the candidate's institution could offer. There was a large sigh of relief from Ken Towe's corner of the room. Ken served this last year as both treasurer and editor for the Society. As treasurer, he reported that the Society remains in good economic health. This is especially pleasing against a background of a number of other scientific societies experiencing financial difficulties. Dues will be raised five dollars, however, to cover the cost of the newsletter, and everyone agreed that we are getting more than our money's worth from the newsletter. The Teller's

The French Connection: Jean-Pierre Muller, Bertrand Fritz, Bob Klimentidis, and Claudine Durand. Jo Eberl

Committee reported that Dennis Eberl was elected Vice President-elect. New council members are Richard Hay from the Department of Geology, University of Illinois-Ur-

bana, Carolyn Olson of the USDA in Lincoln, Nebraska, Darrell Schulze from the Agronomy Department, Purdue University, and Gene Whitney of the USGS in Denver. Philip Low from the Agronomy Department, Purdue University, will be next year's Distinguished Member. J. P. Quirk from the Waite Agricultural Institute, Adelaide, Australia, will be the Brindley lecturer. Joe Stucki will be the first recipient of the Marion L. and Chrystie M. Jackson Award for Mid-Career Clay Scientists. At the close of the business meeting on Thursday, leadership of the Society passed from Tom Pinnavaia to Bob Reynolds.

Next year's meeting will be held November 1 to 6 in Minneapolis, Minnesota. The general co-chairs for the meeting are Jerry Bigham (614-292-2001) and Wayne Hudnall (504-388-1344). Darrell Schulze is the program chair (317-494-8062).

In 1993, the meeting will be hosted by San Diego State University. The chair is Dick Berry (714-265-5586).

Steve Altaner, Randy Hughes, David Pevear, and Shelley Roberts helped collect, sort, evaluate, and edit information for this report.

Dewey Moore
Urbana. Illinois

New Members

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

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Ask the Clay Doctor

(Not a real doctor)

Dear Clay Doctor: I hear that Dr. Srodon is in jail again. What happened?

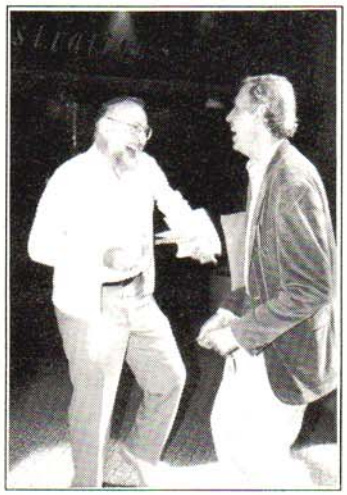
Polish Joke, Boulder

Dear Joke: Polish geologist Jan Srodon was arrested recently because Professor Weaver caught him trying to beat illite/smectite to death.

Dear Clay Doctor: Is it true that all geologic phenomena can be explained by meteorite impact or Ostwald ripening?

Cratered, Denver

Dear Cratered: It is now believed that all of geology and much of economics can be satisfactorily explained using only meteorite impact ("bullide" as it's known by the experts) and Ostwald ripening. In fact, it now appears that every phenomenon known to man can be displayed and understood using reduced-parameter plots. According to our sources, only two exceptions remain: a complete understanding of impressionism apparently requires the use of fractals, and the meaning of life is found in the DOE QA/QC manuals.



Blair Jones and Ross Giese dancing to the joyful strains of clay layer collapse during dehydration. *George Kacandes*

Dear Clay Doctor: I have often wondered about the physical phenomenon of clay layer collapse during dehydration. Does it make any noise?

Mystified in Missouri

Dear Mystified: Yes, there is sound produced when clay layers come together. In fact, it is quite a musical effect, as was demonstrated very convincingly by the experiments of Horatio P. Kildare, founder of the HPK School of Applied Clay Musicology in Phoenix. During the late 1920's, in what was then considered a remarkable technological feat, he amplified the sound of various clay mineral platelets being stacked normal to the ab plane. As it turns out, kaolinite emits a tone between E^{d} and $C^{\#}$, depending upon the crystallinity. Smectite tones are mainly in minor keys, and vermiculite sounds rather like an accordion. Towards the end of his career, he managed to produce a duet from illite/smectite and was working feverishly on several trios and quartets when he met with a most untimely end. As he was writing the allegro movement for his illite sonata, a careless lab assistant accidentally dropped 40 pounds of palygorskite next to his amplifier, and the resulting symphonic blast, which was mistaken for a tornado alert in Tucson, sent him headlong through the ceiling of the administration building and into oblivion. His dramatic exit received a standing ovation from his staff and rave reviews in the Sunday paper.

Dear Clay Doctor: I don't have much trouble with the clays, but I do have a hard time pronouncing the names of some of the zeolites. Can you help?

Zeophonocist, Boise

Dear Zeophonocist: The most commonly mispronounced zeolite name is clinoptilolite. This name should be pronounced, "clinoptilolite." On the other hand, chabazite should be pronounced, "chabazite." Please write again if you need additional help.

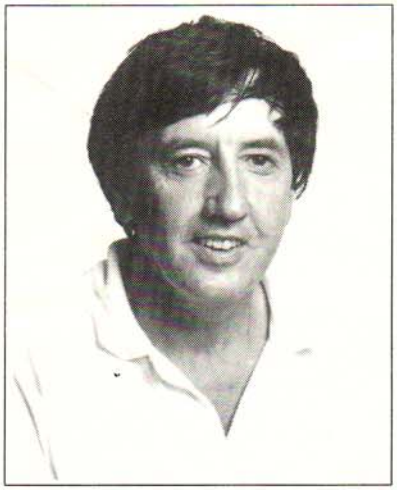
Dear Clay Doctor: Are pillared clays a new discovery, or have they been around awhile?

Captivated in Carthage

Dear Captivated: Pillared clays were actually invented by the ancient Greeks, but fell into disuse during the Dark Ages, only to be rediscovered recently in the American Midwest. Early Greek versions had simple Doric columns randomly distributed in the interlayer space of smectite. However, these early efforts were widely ridiculed, and soon abandoned in favor of the more decorative ionic forms. Though long the favorite of deposed emperors, ionic clays were eventually rivaled by the flamboyant, outrageous, and thermally stable Corinthian pillared clays. Widely heralded as signalling the new age of Greek clay mineralogy, these highly ordered forms were used, among other things, to construct the Parthenon, which stands today as a monument to the ingenuity of early clay scientists.

The Clay Doctor is available for consultation. Please send contributions to the Society Office.

Feats of Clay



Colin Harvey

Marion Reed has been named Distinguished Lecturer of the Society of Petroleum Engineers. In this capacity he will spend nine months traveling extensively around the world giving lectures.

Jan Srodon has been elected Vice-Président Étranger of the Société Française de Minéralogie et de Cristallographie.

Steve Guggenheim has been elected Secretary of the Mineralogical Society of America.

Vernon Hurst has retired from the Geology Department at the University of Georgia.

Paul Schroeder was awarded his Ph.D. from Yale and has taken a position as Assistant Professor at the University of Georgia Geology Department.

Colin Harvey has relocated from the Geothermal Institute in Auckland to Indiana University, where he has joined **Haydn Murray**, who was his Ph.D. advisor in the late 70's, as a research associate in clay mineralogy.

Cliff Johnston spent six months at Los Alamos with **Dave Bish** and is now spending another six months in Leuven with **Robert Schoonheydt.**

Bernard Kübler recently completed a trip to Auckland for the meeting, "Low Temperature Metamorphic Processes in Contrasting Geodynamic Settings." Then he traveled to Bali and New Caledonia, stopping in Boulder and Champaign on his way back to Neuchatel. In New Caledonia, he was looking for El Niño and concerned with the possible effects of global warming on corals.

Student awards at the annual meeting in Houston were as follows: Best Paper: **S. E. Fendorf,** student of **D. L. Sparks;** Runner-up Best Paper: **J. L. Boettinger;** Honorable Mention: **J. Rakovan,** student of **S. Guggenheim;** Honorable Mention: **L. Ukrainczyk,** student of **M. B. McBride;** Best Poster: **L. Huve;** Runner-up Best Paper: **K. L. Price,** student of **S. D. McDowell;** Honorable Mention: **M.C. Taylor,** student of **R. W. Berry.**

CMS Student Research Grants were made as follows: **Clifford Ambers**, student of **H. H. Murray**, for kaolinite genesis in coal cleat and comparison with other very well-crystallized kaolinites; **Steven B Feldman,** student of **L. W. Zelazny**, for soil mineral transformations, elemental distribution, mass flux and paleopedological reconstruction along a Piedmont soil climosequence; **Ronald Hill**, student of **I. R. Kaplan**, for influence of organic matter on the extent of illitization of smectite during diagenesis; **George Kacandes**, student of **L. R. Kump & H. L Barnes**, for open-system rates for the reaction of smectite to illite in metered input fluids; **Ruben Kretzschmar**, student of **W. Robarge & S. Weed,** for mobility of colloidal clay particles in soils and saprolite and their potential role in pollutant transport; **Julia Sheets**, student of **R T. Tettenhorst,** for the influence of crystal-structure defects on feldspar weathering; **William N. Pizzolato,** student of **René Dehon,** for sedimentation rates and clay mineral distribution of Lower Wham Brake sediments; and **JoAnne Russell**, student of **G. R. Thompson,** for clay diagenesis and mineralogy of the Williston Basin.

Results of the 1991 CMS elections were as follows: Vice President Elect—**Dennis D. Eberl;** Council Members—**Richard L. Hay, Carolyn G. Olson, Darrell G. Schulze,** and **Gene Whitney.**

The following is the inscription on the plaque presented to **Fred Mumpton** at the Houston conference: "Presented in deep appreciation to Frederick A. Mumpton for 12 dedicated years of excellence as Editor-in-Chief of *Clays and Clay Minerals* (1979-1990). Under your stewardship our journal became recognized world-wide as the leading publication in its field. Thank you for generously sharing your editorial scholarship with us."

Pumo Indian Acorn-Kaolinite Bread

Gene Whitney contemplating a bite of acorn-kaolinite bread. *High Iron Photos*

(This recipe has not been tested or fully researched by the CMS. We do not recommend trying it without consulting a qualified nutritionist.)

Ingredients: Dried acorns (valley oak or white oak acorns preferred, e.g. *Quercus lobata* Née); red clay (mostly kaolinite, with a little smectite and other clays), dried and sifted; water.

Recipe: Grind dried acorns into a meal. Mix clay thoroughly with sifted acorn meal in a ratio of approximately 1:20 by volume (11 g clay per 100 g meal), and add 75 ml water to form a dough. Bake at ≥100°C for several hours to yield a sweet black bread.

Comments: Both baking and the addition of clay serve to decrease the amount of tannic acid in the bread, thereby making it palatable. Unbaked bread contained 47.3 mg/g tannic acid, compared with 18.2 for bread baked without clay, and 7.8 for bread baked with clay. See: Johns, T. and M. Duquette, 1991, Traditional detoxification of acorn bread with clay. *Ecology of Food and Nutrition*, v.25, 221-228; and Johns, T. and M. Duquette, 1991, Detoxification and mineral supplementation as functions of geophagy. *Am J Clin Nutr*, v.53, 448-456.

Keller's comment: Tell this cook he is no chef—the acorns are O.K., but the clay should be mixed-layer, as in sandwiches, pizza, and layer cake.

Clay Names Quiz

(From the Nomenclature Committee)
Answers from: Mitchell, R. S. (1979) *Mineral Names, van Nostrand, 229 p.*
Answers on page 27

1. BAUXITE is named for
   1. "Tourist trap" town in S. France
   2. Thibault d'Baux, French soil scientist
   3. Occurrence in **ba**dly **ox**idized soils
   4. Characteristic boxwork texture

2. AMOSITE is named for
   1. Amos N. Handie, Scottish chemist
   2. **A**sbestos **M**ines of **S**outh **A**frica
   3. **Am**phibolitic silicate
   4. A place where gunpowder was stored

3. HALLOYSITE is named for
   1. Baron Omalius d'Halloy
   2. Location of Roman shrine in S. England
   3. Characteristic hallo-tube morphology
   4. Composition of **h**ydrogen, **al**uminum, **o**xygen, and **si**licon

4. DICKITE is named for
   1. Dick somebody
   2. Somebody Dick
   3. German reference to "thick" stacks of hexagonal plates
   4. Laughs

Pinnavaia's pillared clays

The September 13, 1991 issue of *Science* magazine singled out Tom Pinnavaia's work with pillared clays (out of around 4200 papers presented at the Fourth Chemical Congress of N. A.). The objective of the work is to achieve microporous materials with pore structures substantially larger than normal pillared clay. In a supergallery clay, the gallery height can be several times larger than the clay layer thickness, whereas in a conventional clay, the gallery height is comparable to the layer thickness. If lateral separation of the pillars can be optimized in a supergallery derivative, then a large fraction of the total volume should be empty space available for adsorption and catalysis.

CMS Council News

Several actions of interest to members were achieved at the 28th Annual Meeting of the Society in Houston, TX. After an extensive search for a new editor of *Clays and Clay Minerals*, two candidates submitted proposals, and Ray Ferrell, Jr., of Louisiana State University was accepted as the new editor.

The Policy and Administration Committee will be revising the bylaws to make the language gender neutral and to incorporate the Sustaining Member categories passed last year. Also, on the recommendation of the committee, liability insurance for directors and officers of the Society will be obtained from Agricultural Excess and Surplus Lines Insurance Company.

The Society is seriously considering moving part of our investments in the Endowment Fund to another investment group because of the failure of the managers at the Fidelity Group to maintain the annual 7% increase in capital investment desired by the Society. Members interested in advising the Society on our investments are encouraged to contact Treasurer Ken Towe or the chairperson of the Finance and Budget Committee (Brij Sawhney).

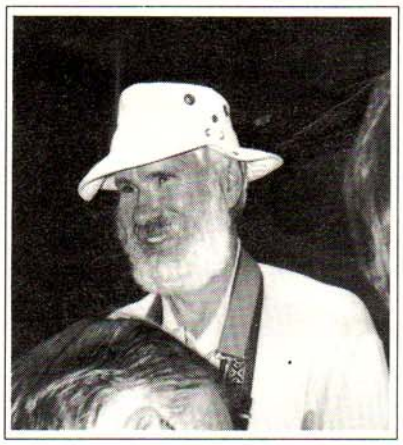
In order to cover some of the increased costs associated with the editor, new outreach programs, the CMS newsletter, and other budget items, without raiding the capital invested in our Endowment Funds, a membership dues increase of $5.00 for all membership categories, except student membership, was approved.

Papers from the Keller Kaolin Symposium at the 1990 meeting in Missouri are to be published as a monograph by the Society.

Graduate students, of any nationality, in any country, pursuing study of clays now are eligible to apply to the Society for research funding (pending confirmation that it will not affect our tax exempt status). A travel subsidy to the 1993 International Clay Conference in Australia of $500 for each of five students will be available. A Student Education Fund box will be added to the next membership renewal invoice for members who wish to contribute to grants for undergraduate students studying clays.

The Regulatory Issues Committee has designed data sheets that characterize the CMS Source Clays as much as possible, and these sheets are to be included with all orders of clays shipped. Society members are encouraged to send any data they obtain on the CMS Source Clays to Jessica Elzea for inclusion in the data sheets.

Don Scafe
CMS Secretary
Edmonton, Alberta



Don Scafe in this universe. *(See page 27).*
David Pevear

Problems with Beidellite Analyses

The only complete chemical analysis of Black Jack beidellite done, until recently, was presented by Shannon (1923). The material, at the Smithsonian Institution, was labelled as leverrierite gouge and was nearly pure except for some small zones of quartz. The analysis was done on the basis of air-dry weight of the naturally occurring material, giving H_2O+110°C of 8.16 and H_2O-110°C of 14.48 percent of total weight. When Nagelschmidt (1938) copied these data, the numbers were accidentally reversed. Then, Weir and Greene-Kelly (1962) secured part of the beidellite sample for more complete analyses. They found the total weight loss from 105°C to 950° C was 6.3 percent, which was not comparable to previous data.

A specimen of beidellite from the Crown Point mine, adjacent to the Black Jack mine, comparable to the original beidellite, was dehydrated in stages to 1050°C. The H_2O^+ value for Black Jack beidellite is calculated as 9.54 percent, and the Crown Point measured as 9.60 percent by weight, basis of 100°C. Whence, adsorbed water 110°C to 300°C for the Black Jack beidellite is 3.95 percent, and the structural water is 5.59 percent. The measured structural water, basis 300°C, is thus 5.81 percent, which value is required for chemical analysis by XRF. The ideal calculated structural water is only 4.82 percent, to add to the confusion. I hope you've enjoyed this little romp through history.

Jim Post
Sacramento, California

Shannon, E. V. (1923) Notes on the mineralogy of three gouge clays from precious metal veins: Proc. U.S. National Museum, 62, 1-4.
Nagelschmidt, G. (1938) On the atomic arrangement and variability of the members of the montmorillonite group: Mineralogical Magazine, 25, 140-155.
Weir, A. H., and Greene-Kelly, R. (1962) Beidellite: Amer. Mineralogist, 47, 137-146.

Announcements,

continued from page 2

Undergraduates to be funded by donations

Next year, you will see a new box on your dues envelope. The Council decided to include a new category that will allow members to donate any amount, large or small, to support undergraduate scholarships and travel. It is hoped that if funds are raised in this voluntary fashion, the Society can begin to design ways in which serious undergraduates can be helped in their study of clays.

Individuals can be sustaining members

Our Sustaining Contributors are an essential support to the Society and its programs. Although most Sustaining Members are corporations, individuals can also be contributors. If an individual would prefer not to have his or her name on the back cover of the journal, that wish can be accommodated. Or, if someone wishes to contribute to a particular project, such as the undergraduate scholarship fund, the Eastern European liaison committee, or the Jackson fund, that can be arranged as well. Check with Jo Eberl, Society Office Manager (303-444-6405), or Jack Burst, Chair of the Sustaining Contributors Committee (314-364-1864).

Archives

The Society Office would like to thank people who have sent in archival material, including journals, photographs, and papers: Jack Burst, George Kacandes, Walt Keller, Bob Martin, Dave Pevear, Jim Post, and Brij Sawhney. Thanks to Steve Altaner and Richard Hay for their involvement in Mrs. Grim's donation of Dr. Grim's memoirs. Thanks also to all those who contribute commentaries, interviews, and material for retrospectives for the newsletter.

Smectite symposium

There will be a symposium on the origin, properties, and composition of smectites at the CMS meeting in Minneapolis in 1992. Interested participants should contact R. C. Reynolds, Jr., Dept. of Earth Sciences, Dartmouth College, Hanover, NH 03755 (telephone 603-646-2370), or David Laird, National Soil Tilth Laboratory, 2150 Pammel Drive, Ames, IA 50011 (telephone 515-294-1581).

Journal issues needed

In the Office's quest for a complete set of *Clays and Clay Minerals*, we are indebted to Brij Sawhney, who sent most of the earliest volumes, and to Jim Post, who donated a copy of the very first volume. We are still missing quite a few, however, and wonder if anyone out there has some extras they would like to donate. We are missing the Proceedings from the Tenth and Eleventh National Conferences and all of the Pergamon Press issues. Of the Allen Press issues, we are missing Vol. 35, # 1 and Vol. 34, #3.

Are you famous or something?

Last year there was a suggestion in the CMS News that educators might like to have slide sets of clay scientist portraits for teaching purposes. The sets could be produced and sold by the Publications Committee of the Society. Interested educators were asked to submit names of colleagues who should be included. The response was underwhelming. We are not sure whether the response is due to apathy or whether the idea was lousy! One educator submitted the following list: S. W. Bailey, W. F. Bradley, G. W. Brindley, J. W. Burst, D. de Seyonzac, V. A. Drits, D. D. Eberl, J. J. Fripiat, R. E. Grim, J. Hower, M. L. Jackson, W. D. Johns, G. Millot, F. A. Mumpton, E. Perry, D. R. Pevear, R. C. Reynolds, Jr., C. S. Ross, R. A. Rowland, A. M. Swineford, H. van Olphen, B. Velde. Portraits of 15 of the 22 names on this list are in the collection of High Iron Photos. This is the second, and final, call for a show of interest and a list of names. Contact either Jo Eberl at the Society Office or Don Scafe at Alberta Geological Survey, Box 8330 Station F, Edmonton, Alberta T6H 5X2, Canada. Phone: 403-438-7633, fax: 403-438-3364.

Don Scafe

Grim's memoirs

The Society is delighted to have received a copy of the *Memoirs of Ralph Early Grim* as a gift from Mrs. Grim. It is a large volume, almost 700 pages, and details many of Dr. Grim's experiences traveling and teaching. Shirley Langenheim was instrumental in producing and publishing the volume. Mrs. Grim has graciously given us permission to publish excerpts from the *Memoirs* from time to time.

Government ethics follow-up

The U. S. Office of Government Ethics received 980 sets of comments on the proposed changes to the Standards of Ethical Conduct for Employees of the Executive Branch. (See September 1991 *CMS News.)* These changes would have severely limited the amount of time government employees could spend involved in professional societies. In response to the comments, the government will issue a new set of proposed regulations which can be commented on at a future date.

Say cheese

The Society Office and CMS Secretary are developing a photo file of all our members, for archival purposes and just to have on hand for the newsletter. Please put your modesty aside and send in photographs of yourself and other clay people, labeling the backs with names, dates, and places. Thanks for helping out.

Message from the new Editor

The New Year means many things to many people. This year it means that I begin a new task as editor of our journal. It's a job that I look forward to with excitement and, ...well! What have I gotten myself into this time? One thing is clear, I've inherited things in good shape from Fred Mumpton and Ken Towe. I've already handled about two dozen manuscripts, and not one of them had illustrations with tick marks on the outside of the drawing. In this brief period of transition, I've also learned that "red ink" looks different from this side of the desk.

I would like to share some thoughts about the operation of the editor's office that might give you some idea of my approach as Editor. The penultimate objective of any editor is to assess the scientific value of contributed papers, and this is where the majority of my effort will be directed. I want to establish a panel of Associate Editors from diverse backgrounds, whose expertise will guarantee that each paper gets an unbiased peer review. I believe this system is working well for the Society, and I plan to expand the disciplines and geographic areas represented. Objectivity will be the watchword for my discharge of this editorial function. I will use the "3 R's" of reviewing (reasonable, rigorous, and rapid) as my guide.

I plan to operate the editorial office as efficiently as possible and to maintain the excellent rapport with Allen Press. I'd like to see what I can do to shorten the time between manuscript submission and the editorial decision to accept or reject a paper. I will explore the possibilities of electronic manuscript submission as another way to speed up the publication process. I plan to devote some time to promotional activities in order to maintain a high rate of submission of quality manuscripts. I personally believe that the breadth of topics published could be expanded. I will work closely with the CMS Publications Committee to increase the variety of Society publications. I will do my best to maintain and to improve the reputation and stature of our international, interdisciplinary journal.

The CMS has provided support for an editorial assistant, and Louisiana State University has assisted in several ways. I have hired Elaine Rowland, and we are ready to serve the Society and its members. Now, all I need is your help. Please fell free to offer any suggestions for improvement at any time. I'd especially welcome your comments during this initial phase of my tenure as Editor. I am particularly interested in hearing your suggestions and nominations regarding persons who might serve as Associate Editors. I invite all of you to become more directly involved in the editorial activities. Most importantly, continue to submit your high quality research results to *Clays and Clay Minerals*. Urge your non-member colleagues to consider publishing their studies in our journal.

I look forward to this New Year! I hope yours is as rewarding and challenging as mine promises to be!

Ray Ferrell
Baton Rouge, Louisiana

Faculty of Natural Science Comenius University
Institute of Inorganic Chemistry Slovak Academy of Sciences
Geological Institute Slovak Academy of Sciences

12th Conference on Clay Mineralogy and Petrology

Bratislava
August 31-September 4, 1992
Geological, mineralogical, and chemical aspects of clay and zeolite research and its application
Exclusive excursion to Hungary

Contact:
Vladimir Sucha
Geological Insitute Slovak Academy of Sciences
Dúbravská cesta 9
842 26 Bratislava, CSFR
Czechoslovakia

USGS
8th Annual McKelvey Forum on Energy and Mineral Resources
February 18-20, 1992
Houston, Texas

Short Course—Warren B. Hamilton: Recent Advances in Plate Tectonics and Continental Crustal Evolution
Michael Lewan: Role of Water in Petroleum Formation
Christopher C. Barton: Fractal Nature of Hydrocarbon Accumulations—Size & Spatial Distribution & Implications for Exploration an & Devel. Strategies
Contact:
Christine Turner
(303) 236-1561

The Clay Minerals Society
Organization and Committee Personnel 1991-1992

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Society Office Advisor
R. M. Pollastro

Membership
J. M. Hemzacek

* *Ex officio*

Meetings

A Day at the SSSA Meeting

This year's Soil Science Society of America Annual Meeting, held in conjunction with the Crop Science Society of America and the American Society of Agronomy, was held in Denver, so close to home that I decided to attend for one day. This meeting, unlike that of The Clay Minerals Society, is huge, attracting close to 5000 scientists who are interested in all manner of research that pertains to agriculture. I got there late, driving to the Colorado Convention Center through bumper-to-bumper traffic in a snowstorm. I am not a member of the SSSA and was not giving a paper. With no responsibilities, I decided to attend whatever sessions struck my fancy.

First I went to the exhibit hall, where manufacturers exhibited tractors, bean counters, books, analytical machines, labeled nitrogen, and other products, and where scientists displayed poster papers. At the poster session I met P. A. Mosher, who had synthesized high-charge zeolites out of flyash by using basic solutions containing NaOH. KOH does not work, and neither does NH_4OH. Then I attended a session on developing a viable sustainable agriculture in Sub-Saharan Africa. Many questions were raised, but few were answered. What is sustainable agriculture, and can it be applied to feed Africa's growing population? What is Africa? Can one generalize about the needs of a very large continent having over 40 countries, even more cultures, and diverse climates and soils? One author pointed out that Africa is a net exporter of nutrients: nutrients are exported to the West as cash crops, but much smaller amounts of nutrients are imported as fertilizer. There has been a general degradation of crop lands throughout the continent. Is the solution to bring more land into production, or to cultivate more intensively land that already is farmed? If the former is pursued, then there could be large scale environmental degradation related to farming marginal lands. If the latter is pursued, then more fertilizer will be needed, and it would be best economically to develop local fertilizer resources.

At lunch I was joined by Max Mortland, who was to give a talk at a session entitled "The Philosophical Aspects of Soil Chemistry" that afternoon. We talked about whether the research done by members of this society had contributed in a practical way to agriculture. Science certainly has contributed in the area of genetic research and the green revolution, but what about soil minerals research? Can we justify our existence practically as well as scientifically? Perhaps Pasteur was the ideal scientist, making many basic scientific discoveries that also were of immediate practical importance. We discussed how much we liked the recent CMS meeting in Houston. Max emphasized the need to keep surface chemistry alive in the CMS, and to have more sessions similar to the one organized by Fripiat. We also talked about Max's patents, which include a method to make benzene radicals in Cu-montmorillonite; it turns the clay bright red. Max had to leave to look over his talk, and I went to hear a session on the "Role of Mineralogy in Agriculture," chaired by Lucien Zelazny.

While waiting for the session to begin, I met Duncan Scott, who had retired from Iowa State University last December. We discussed his puzzling observation, made years before, that K is held more strongly by finer grained micas than by coarser grained micas. If the interlayer region of illite were not so stable, then much of the K in soils would long ago have been washed away. Another puzzling observation is that K is weathered out of alternate interlayers in illite, and that Ca and Na may segregate from a mixed solution into alternate layers in smectite.

The first talk, by G. Stotzky on the "Importance of Clay Minerals in the Release of Genetically Modified Microbes and Plants to Soil," offered evidence that smectite can sequester DNA released from bacteria and plants in a soil, protect it, and then perhaps make it available later for reintroduction into other living organisms. He also showed electron micrographs of viruses attached to the edge sites of clay minerals. The next paper seemed to be taken from Star Trek. Doug Ming presented the results of experiments related to NASA's plans to manufacture soil for space colonies. The present idea is to use a soil that is composed entirely of a mixture of K and NH_4-exchanged zeolite and phosphate rock (zeoponics). The idea is to have a soil system that is so simple that one only needs to add water; the proper ratios of nutrients then would be released by the exchange process (exchange fertilizer). The next talk was by N. Vidic, who described the use of zeolites, in what was formerly Yugoslavia, to treat pig manure slurries to keep them from smelling. The treated zeolite then was used as fertilizer. Yields from this system were higher than those using standard NPK treatments.

Between papers I talked with Suk Lee, who is working on the problem of soil pollution at the Fernald nuclear waste site in Ohio. Then I left the mineralogy session to go to the old philosophers session to hear Max's talk.

There was a sea of white hair at the

head table in the philosophy session. The scientists chosen to philosophize by the SSSA probably would be the same ones that the CMS would choose. Unfortunately, I missed the talks by Philip Low ("Health and Status of Basic Research in Soil Chemistry"), and by Joe White ("Soil Chemistry from an Analytical Perspective: Past, Present, and Future"), but walked in in the middle of Mortland's talk ("Developments in Chemistry as Applied to Soil Research"). Max said that he has been criticized because he works with pure materials rather than with soils. But he said that processes are much easier to identify in simple systems; by working with a soil often you will learn only about that particular soil. The results from soil studies are difficult to generalize because soils are so complex. However, he did raise the philosophical question of whether the properties of a soil can ever be discovered by summing the behavior of its individual parts.

Betty Scott and Duncan Scott talking to Joe Stucki, who will be the first Jackson Lecturer. *High Iron Photos*

After an interesting talk by P. F. Pratt ("Comments on Soil Chemistry Careers"), George Bailey gave a talk on "Soil Chemistry: A New Profession?" One slide showed a tetrahedron meant to represent the responsibilities in a scientist's life. In the center of the tetrahedron was a ball labeled "Me." The apex of the tetrahedron was labeled "Religion," and the basal corners were labeled "Family," "Community," and "Science." Next to the corner labeled "Science" was the question, "How much is enough?"

There was some discussion among the panelists that soil chemistry may be looked upon as an inferior science, that most of the fundamental advances in the science have been made by true chemists and physicists. For example, Pauling, a chemist, discovered the structure of clay minerals, a chief component of soil. It seems, however, that such rapid advances have been made by chemists and physicists because their systems are relatively simple. An in-depth understanding of soils will require not only the discoveries of chemistry, physics, and biology, but also an understanding of higher level, synergistic interactions. Therefore, soil chemistry can be classified as one of the "higher" sciences.

At the end of the session, I went looking for Don Johnson, a geomorphologist and former colleague and neighbor from the University of Illinois. Among other things, Don studies processes that occur in his backyard, such as the movement of soil by worms, ants, and frost heaving. I couldn't find him, but did locate Ed Weeks from the USGS. I told him how much fun I had had wandering around the meeting. He said that his day had been proscribed because he was a member of a panel in a soil physics session. Weeks has found cracks on tops of mesas in the Nevada desert that blow warm air during the winter, and that suck air during the summer; cracks in the mesa have a chimney effect with the surrounding valleys. He will be flying infrared sensors this winter to try to locate more of these cracks, an important avenue of research for nuclear waste disposal in the desert.

By this time, the traffic had cleared enough to begin my drive home through the deepening snowstorm. It had been an interesting day, well worth a drive through snow to see the diversity of soil science. I am looking forward to the next SSSA meeting, in Minneapolis, where there will be a joint meeting between the SSSA and The Clay Minerals Society.

D. D. Eberl
Boulder, Colorado

Answers to the Clay Names Quiz
(page 20)

1. 1. Baux de Provence
2. 2.
3. 1.
4. 2. Allen B. Dick, 1833-1926, Scottish chemist

Don Scafe in a parallel universe.

Photo submitted by Dave Bish

How to order Weaver's *Clays, Muds, and Shales*

In response to the number of people who have called the Society Office wondering how to order Charles E. Weaver's book, *Clays, Muds, and Shales*: Elsevier Science Publishers, 655 Avenue of the Americas, New York, NY 10010. Phone: 212-989-5800.

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