CMS News

A Publication of The Clay Minerals Society

December 1989

Sun, wine, and clay in Sacramento

One hundred ninety-five people convened for six sunny days for the 26th Annual Meeting of The Clay Minerals Society, September 23 through 28. The meeting was hosted by California State University, Sacramento. J.L. Post was general chair for the local committee, and the technical program was handled by Roger Burton and Marion Reed. Twenty-four industries, businesses, and foundations gave financial support that helped the Society with this meeting. In general, although there were fewer presentations than in recent years, most of the participants agreed that the quality of the papers was better. Having fewer presentations left people with a bit more mental resiliency, and as a consequence, there were more and better discussions within and outside of the sessions.

The meeting began with a short-course titled *Rheology of Clay/Water Systems*, which was chaired by Necip Güven of Texas Tech. The 91 participants heard from, in addition to Necip, Philip Low of Purdue University, James Mitchell of the University of California, Berkeley, George Savins of JGS and Associates, Dallas, Texas, Garrison Sposito of the University of California, Berkeley, Thomas Thompson of Albion Kaolin Company, Hephziabah, Georgia, and Hendrick van Olphen, retired. Participants heard the theoretical and the practical side of the chemical and physical circumstances of clay mineral particles in contact with fluids in both dilute and concentrated states; they heard variations on the double layer theory, on creep, rupture, and swelling, and explanations and equations for viscosity and flow. The twin highlights of the short-course were the presence of van Olphen, who is the father of rheological studies of clay/water systems, and Garrison Sposito's Polaroid© photo of a smectite flake in which individual

continued on page 12

W. D. Johns delivers the George W. Brindley lecture at the Monday plenary session in Sacramento. *High Iron Photos*

AIPEA meets in Strasbourg

Held every four years and sponsored through the Association Internationale pour l'Etude des Argiles (AIPEA), the International Clay Conference provides a unique opportunity for scientists to participate in a world congress on clay science that includes outstanding technical, field-trip, workshop, and social programs. The International Clay Conference was last held in August of 1985, in Denver, Colorado. In the later part of this summer, I was fortunate to attend the Ninth International Clay Conference in Strasbourg, France, from August 27 to September 2, 1989.

Located along the eastern border of France, and in the province of Alsace, Strasbourg is a small, beautiful city; it offers much of

continued on page 14

Inside ...

The Clay Minerals Society
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Sue Wintsch retires from the CMS

Sue Wintsch, who has been the Society Office Manager for the past several years, announced in July that she wished to resign this position after the annual meeting in Sacramento. This position of manager of the central office is a half-time position, and Sue's other job is working as a science writer, which is her major interest. Over the years as her excellent writing became recognized, she received more contract writing opportunities. This past year her writing contracts consumed much more time, and because writing is her main interest, she felt that she could no longer handle both the CMS position and do her contract writing.

Sue graduated from the University of Rochester with a dual major in Geology and English. She received a master's degree in Geology at the University of Illinois, and after her husband, Dr. Robert Wintsch, was hired as a faculty member in Geology at Indiana University, Sue attended Indiana University where she received a master's degree in Journalism.

At present she is under contract to write for the National Science Foundation magazine *MOSAIC.* Her present assignment is to write an article about the cognition of dolphins and other cetaceans, and their amazing ability to learn. This involved travel to Hawaii and to Woods Hole in Massachusetts. She also has worked as a contract writer and editor for several other federal agencies, including UNESCO and the Office of Technology Assessment. We wish Sue all the best in her future writing endeavors and thank her very much for her excellent work in managing the Clay Minerals Society Central Office these past several years.

We welcome Jo Eberl as the new manager of the Society Office. The address of the Society Office is now P.O. Box 880, Evergreen, Colorado 80439.

Haydn H. Murray

Please send names of publications where the CMS annual meeting should be announced to: Dewey Moore, 1306 S. Race St., Urbana, Illinois 61801, or (217) 244-0080.

"Someday, my boy, all this will be clay."
Cartoon by Peggy L. Buschman

Thanks...

To the following people who contributed to this issue:

Peggy L. Buschman
Steve J. Chipera
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Richard M. Pollastro
Robert C. Reynolds, Jr.
Don Scafe
Susan J. Wintsch

Memorial to Ralph Early Grim 1902-1989

Dr. Ralph E. Grim, Professor Emeritus of Geology at the University of Illinois, died unexpectedly in Urbana, Illinois, on August 19, 1989. Dr. Grim was a world-renowned clay mineralogist who was considered by many as the "father of clay mineralogy." He began his career as an Assistant Professor at the University of Mississippi and as an Assistant State Geologist of Mississippi in 1926. He became interested in clays as a result of his study of bentonites in Mississippi, which resulted in a preliminary report on bentonite in Mississippi.

In 1931 Dr. Grim began his illustrious career at the Illinois Geological Survey where he and Dr. William F. Bradley, an eminent X-ray crystallographer, collaborated on many outstanding publications. At the Illinois Survey, Dr. Grim published many articles, including studies on diagenesis, soil mechanics, differential thermal analyses, dehydration and rehydration of clay minerals, effect of heat on the clay minerals, clay-water properties, the bonding action of clays in foundry molding sands, clay mineral composition of recent sediments, clay minerals in soils and their significance, reactions of clay minerals with organic cations, petrology of underclays, ceramic properties of clays and shales, ion exchange in relation to some properties of soil-water systems, the amenability of various types of clay minerals to aluminum extraction, a detailed study of the clay mineral micas which resulted in the name "illite," and a classic paper on the relation of composition to the properties of clays.

He was truly a pioneer in the field of clay mineralogy, and in addition to being an outstanding scientist, was a compassionate and caring person.

In 1948, Dr. Grim left the Illinois Geological Survey to join the faculty of the University of Illinois Department of Geology. This move enabled Dr. Grim to share his vast knowledge of the clay minerals and their applications with many graduate students as he supervised forty Ph.D. students until he retired in 1967. He had no children of his own, so his graduate students became his children. His books *Clay Mineralogy*, *Applied Clay Mineralogy*, and *Bentonites*, the latter co-authored with Dr. Necip Güven, were all extremely successful books.

Dr. Grim received many honors and awards during his long and outstanding career. He was the first Distinguished Member of the Clay Minerals Society; an honorary member of the Mineralogical Society of Great Britain; and chairman of AIPEA from 1948 to 1960. In 1974 Dr. Grim received the Roebling Medal from the Mineralogical Society of America, and in 1984 he received an honorary doctor of science degree from the University of Illinois in honor of his contribution to the field of geology, to the Department of Geology, and to the University of Illinois. In 1976 he established the Ralph E. Grim Professorship in Geology, an endowed chair that is now occupied by Professor Richard L. Hay.

Professor Ralph E. Grim was a practical man who understood the relationship between the structure and composition of clays and other industrial minerals. His wife, Francis, and he loved to travel and both enjoyed the game of golf. Fran resides at their home in Urbana, Illinois. I am sure that Dr. Grim personally visited more clay deposits around the world than any other clay mineralogist. He will be missed very much by his former students and associates. He was truly a pioneer in the field of clay mineralogy, and in addition to being an outstanding scientist, was a compassionate and caring person. His outstanding reputation in the field of clay mineralogy will continue to live for many, many years in the future. I owe my start in clay mineralogy to Dr. Grim. He was an outstanding teacher and advisor throughout my career at Indiana University and at Georgia Kaolin Company, and I know there are at least 39 others who were his graduate students who can say the same thing.

Haydn H. Murray
Bloomington, Indiana

Dr. Ralph Grim presents the Brindley Lecture at the CMS meeting in Jackson, Mississippi, October 13, 1986.
High Iron Photos

Interviews with the clay scientists

Robert C. Reynolds, Jr.

Dr. Robert C. Reynolds, Jr., the 1989 Distinguished Member of The Clay Minerals Society, has taught at Dartmouth College since 1960. The interview was conducted during the Sacramento meeting.

Distinguished Member R. C. Reynolds, Jr., gives his paper at the Monday plenary session in Sacramento. *High Iron Photos*

CMS: What is your favorite clay?

Reynolds: Illite!

CMS: As a geologist, where do you see clay mineralogy going?

Reynolds: As a geologist. That's a tough question. I think that we are going to learn more and more about the details of the structure of clays as we get more and more powerful computers. The Rietveld method is an example. The kind of things that used to be done as a whole research project now will be done routinely. I think the day will come when people just zap 'em with NMR, and look for montmorillonitic occupancy, instead of making it a whole Ph.D thesis. So we'll learn more and more about the structure.

Learning more and more about the geology of the clays is a slower process, though, because it only comes after you know everything else. You have to know everything about the clay's character before you can begin to correlate it with the geologic story. So I don't really see any big breakthroughs in that end of it in the very near future.

But let me say that if you try to predict anything in any field, it's very risky, because what finally happens depends on accidents that haven't happened yet. Whenever you try to make a prediction, you try to extrapolate instinctively from what you know now, when, in fact, progress comes in step functions that completely invalidate everything you think you know. After the war, the Secretary of War under Truman said that he was against bringing the German scientists into the country to build rockets. He said that nobody's ever going to hit anything with those things. OK? Well, now they land within a couple hundred meters with a 6000-mile range. Somebody else looked at big computers like the Illiac and said that the day is going to come when they will fit in a small room. That's the trouble with making predictions.

CMS: Someday computers will have only 15,000 vacuum tubes instead of 20,000.

Reynolds: Exactly! But I think something else is happening, too, that helps us: there is a renaissance in materials science, driven by the economics of metal films, amorphous metals, semiconductors, commercial products that have strange electrical and physical properties. These advances feed back into technology, equipment, and techniques that we can apply to our field. We can help those guys, too. You know, superconductors are intercalated compounds. I think that there is a swell of interest in the details of non-perfect crystals. I think that perfect crystals are dull. You've seen one quartz crystal, you've seen them all.

CMS: In Strasbourg, Pons was talking about his program for calculating mixed-layer clay structures, which is similar to yours. He is using it to study superconductors, because they are layered structures. Some clay mineralogists know how to do it.

Reynolds: I visited Pinnavaia's place at Michigan State, and gave a seminar for graduate students on mixed-layer clays. There were maybe 50 students there, and there wasn't a geologist. They were all chemists and physicists. So there may be more students interested in mixed-layer clays outside of geology than inside, because of what they can learn from mixed-layer clays for their own research.

CMS: You are one of the few geologists in the country who teaches clay mineralogy. Do you think the field is growing or dying out?

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Reynolds, *continued*

Reynolds: I hope it's not dying out. I think that the oil business is a bellwether for us. When oil prices are low and jobs are scarce, everybody in the clay field feels it. If you look down the pike, the oil industry has to come back. We haven't solved the world's energy problems. You need thirty-dollar-a-barrel oil; then we'll all be in great shape. And as discussed earlier, there ought to be a place and a need for our skills in the bigger picture of material science.

CMS: Dartmouth has a clay mineralogist, and Illinois has a clay mineralogist, but Harvard doesn't, Stanford doesn't. Why don't the "best" schools have clay scientists?

Reynolds: Many of the elite schools seem to be giving up on geology. They are interested in atmospheric circulation, big global cycles, tropospheric dust as a means of transporting nutrients. As we know geology, they are almost getting out of the business.

CMS: Atmospheric circulation is where the money is?

Reynolds: That's the action, the excitement, you see? So we thought about this at Dartmouth, but I talked to Gray Thompson about it, and he is just right. He said that this trend means that there is a place now for the geo-geological schools, because all the big boys are getting out. The competition is going to diminish for places like Dartmouth and Montana, and there will be a place for those who really want to study geology.

CMS: How did you get into clay mineralogy?

Reynolds: I did my Ph.D. at Washington University in igneous and metamorphic petrology. I studied the progressive metamorphism of the olivine hyperites from Norway:

There may be more students interested in mixed-layer clays outside of geology than inside...

a real neat study, because these are olivine gabbros that had been retrogressively metamorphosed. The reaction stopped halfway through. You could still see pseudomorphous olivine shapes that are now pyroxene. So you could write the stoichometric reaction (it was all volume to volume), for what went in and what went out. But then I went to work for AMOCO, and there wasn't much market for that in an oil company.

Hower did his Ph.D. in clays, and he and I shared a lab. I learned it from him. He never had a course in it either, because they didn't teach it at the school. He and I worked together, and we sort of grew together. I was working on boron in illite, so I learned something about illite. That is how I got into clay mineralogy.

When I went to Dartmouth, I was still a fairly conventional low-temperature geochemist. For me, clays were just one kind of low temperature geochemical system. I was just as interested in carbonates and everything else.

I think that there is a swell of interest in the details of non-perfect crystals...perfect crystals are dull.

What really got me into clays was my mixed-layer clay program, because I really didn't know anything about them when I started to write it. Then I got into it and got fascinated by them.

I remember Willy Weeks gave me a sheet of paper that showed how you calculate the structure factor for illite for the first three orders. He got it from a friend of his at Chicago. I remember looking at it and thinking, "There's nothing to that! It's not black magic." You know? So I thought that it would be easy to calculate all these things. Then, when I saw that it wasn't very easy, I got fascinated by it.

CMS: Geologists have been pretty unsophisticated until now, just using empirical measures like the Kubler index, Weaver's index, and the Hinkley index. We have to move on to the next stage.

Reynolds: Yes. You hate to say this, but with the kind of computing power that is around, there is really no excuse for not doing things right. But it was different years ago. No one can blame MacEwan for not putting in those structure factors. I mean, to do that long hand would have been just masochistic. Then you could still do decent work with a pencil and paper.

CMS: Who do you consider to be the more important influences in your scientific life?

Reynolds: Well, John Hower, certainly. First and foremost.

CMS: What did you learn from John?

Reynolds: Well, we were just good friends, and I think we picked up each others' styles, to a certain extent.

In addition, there are some little vignettes that stand out in my life. When I was working on trying to put the struc-

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Reynolds, *continued*

ture factors into the MacEwan transform, there was a really smart guy at the U.S. Cold Regions Research and Engineering Laboratory in Hanover. He was a graduate student in geophysics at MIT, named Christopher Goetz.

You don't know if you can ever find out the origin of the Alps. You can hammer on rocks forever, and you may not ever figure it out.

They hired him summers as a mathematician. He didn't know anything about mineralogy. He certainly knew nothing about X-rays. But I didn't understand the math. I didn't know what an imaginary number was. I was just fumbling through it. So they pointed me at him.

Chris said, "Well, tell me what you're doing." So I started to write a few equations, like the Bragg law. He said, "OK, OK." He knew it, right? So he said, "Give me MacEwan's work." He disappeared with it. Two days later he came back and he said, "Well, this isn't going to work; that's not going to work; that's not going to work." He said, "I can't tell you how to do it, but it won't work if you pursue those lines."

He certainly influenced my life: He was sort of my mathematical tutor. I went in to see him one day about working through these equations. I was really angry, because I was getting negative intensities, which is impossible. It means you did something wrong. And I was so sure I didn't make a mistake, that I thought God was out to get me. You know how you get? "It can't be me!" I remember he looked at me with those pale blue eyes, and he said, "Professor Reynolds, if you do the problem correctly, you'll get the right answer." I had never thought of that.

I had never thought of that because geology doesn't work very well. In geology you get a bunch of points; you plot them up; you get an R^2 of 0.5; and you are happy. I thought: there are really problems in this world which will yield a solution with which no reasonable person can disagree, if you do them correctly. That is what has fascinated me about this structure field. It is not argumentative arm waving. In many cases it is just either right or wrong, nothing in between.

Now the application of it to nature may not be right, because you may put in the wrong original assumptions. If you tell the computer that illite is full of chromium, you'll get a chromium illite calculation, and it may not be a chromium illite, right? But it will be the correct pattern for chromium illite. So it fascinated me that you could actually get answers. The beauty of mathematics. The beauty of simple, classical physics.

That had a big effect on my life. It gave me confidence. If I handed you a Chinese puzzle, you'd look at it and say it can't be done. But if you knew somebody else did it, you would know that there is a solution, right? Well

I learned from him that if I have to do it, I can. I can spend the time, and I can crack it.

you can look at a set of equations, and even though you don't know how to do them, you know they can be done. You don't know if you can ever find out the origin of the Alps. You can hammer on rocks forever, and you may not ever figure it out. You know that you can do this, and I like that. It has restricted me as a geologist, because I get less and less interested in the big projects, more and more interested in the little ones.

Sampling dike—Pierre Shale contacts near Walsenburg, Colorado
Drawing by Marti Nash

CMS: What do you think of European clay science?

Reynolds: My opinion of European science may be due to the language difference, which shows up even if the papers are written in English. I think it is much more uneven than ours. I think their best work is as good as our best or better: consider

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Reynolds, *continued*

the work of Dritz. It will stand for years. It's a centerpiece of superb research. But I think their worst stuff is worse than ours. Maybe their editors are a lot less picky in accepting manuscripts.

CMS: What was your training like at Washington University?

Reynolds: My thesis advisor was A. F. Fredrickson. He had come from MIT, which in those days, the early fifties, late forties, really was a pioneer in making geologists scientists. They made their geologists take calculus courses, and physics, and think about quantum mechanics, and even relativity physics. Other geologists weren't doing that.

When he came to Washington U, and he taught his courses, he dragged us through that same thing. He'd have a stack of reading there on DeBroglie wave functions, which was just utterly unbelievable for geology at that time. But what we learned from it is that we could do it! You see what I mean? I think a lot of geologists come through their major, and when they see a partial differential equation, they choke up. I can't do partial differential equations any more, but I learned from him that if I have to do it, I can. I can spend the time, and I can crack it. He made us go through so much that we learned that we could learn.

I remember we had Gunier's old X-ray book. The whole book was cast in vector notations. We bought it, and I went in to see him, and I said, "Dr. Fredrickson, this whole book is in vector notation." He said, "Yeah." I said, "Well, I don't think anyone in the class has had a course in vectors." He said, "Well, you better learn it then!"

John Hower, who had been a physics major as an undergraduate, understood vectors very well. Hower held night classes for the graduate students in Fredrickson's course, so we could learn enough about the subject to read the textbook.

So Fredrickson was a new kind of geologist. I think John Hower would turn over in his grave if he knew I was lauding Fredrickson; but if John could have laid aside the manner of their parting, I think that he would have agreed that Fredrickson was a major influence on his life, too.

Among Dr. Reynolds' graduate students have been the following: Roderick J. Allan, James A. Colburn, Benjamin I. Collins, William S. Condit, Charles B. Douthitt, Michelle M. Hluchy, Arthur H. Johnson, Mark Johnsson, Kenneth W. Kilmer, Eleazar Kneidel, Michael S. Kramer, Ian Lange, Peter Lessing, F. Leo Lynch, Lawrence M. Mayer, Robert M. McGirr, Paul H. Nadeau, Wayne L. Newell, Frederick W. Page, Roderic A. Parnell, Jr., Anthony M. Pytte, Stanley Riggs, Ronald L. Schrock, James Steidtmann, Edward J. Sterne, Donna M. Summer, Kathleen Tellier, Graham R. Thompson, Hendrick G. Van Oss, and Jeffrey R. Walker. Undergraduates who took his course and later went on to study clay include Craig Bethke, Dennis Eberl, John Jeffers, Wayne Jepson, Edward Perry, and Peter Ryan. (Apologies to anyone who has been left out.)

A number of people studied first with Reynolds and then with John Hower, or vice versa. Reynolds mentioned one interesting connection, which brought the relationships full circle, starting with Ed Perry, who studied with both Reynolds and Hower. Perry later became Richard April's advisor at the University of Massachusetts at Amherst. Later, at Colgate University, April became advisor to Michelle Hluchy, who went on to study with Reynolds, and to Stephen Altaner, who went on to study with Hower. Reynolds commented that working so closely with his students and then watching them graduate was akin to seeing a child leave home. Many of Bob Reynolds' students have felt that same closeness with him, and years later, still consider him a mentor and a friend.

New Books

X-Ray Diffraction and the Identification and Analysis of Clay Minerals. Duane M. Moore and Robert C. Reynolds. Softcover, 288 pages, 1989. $24.00 (including postage) from The Clay Minerals Society, PO Box 880, Evergreen, Colorado 80439 USA.

Minerals in Soil Environments, 2nd Edition. J. B. Dixon and S. B. Weed, editors. Hardcover, 1264 pages, 1989. $90.00 plus postage. SSSA Headquarters Office, 677 South Segoe Road, Madison, Wisconson 53711 USA.

Lunar Base Agriculture: Soils for Plant Growth. D.W. Ming and D. L. Henninger, editors. Published by the American Society of Agronomy, Crop Science Society of America, and Soil Science Society of America. Hardcover, 255 pages, 1989. $24.00. 677 South Segoe Road, Madison, Wisconsin 53711.

Fragipans: Their Occurrence, Classification, and Genesis. N.E. Smeck and E.J. Ciolkosz, editors. Published by the Soil Science Society of America. Softcover, 153 pages, 1989. $24.00. 677 South Segoe Road, Madison, Wisconsin 53711.

Dilatometerkurvenatlas der Tonmineralrohstoffe. Joachim Schomburg, Manfred Störr. Softcover, 88 pages, 1984. Akademie-Verlag, Schriftenr. geol. Wiss., Berlin 21, West Germany.

Editor's Report — 1989

Clays and Clay Minerals

All signs indicate that *Clays and Clay Minerals*, the Journal of The Clay Minerals Society, is holding its own as one of the leading international journals in the field of clay science. The significant increase in the number of submitted and accepted papers in the last few years testifies to the reputation that the Journal holds among clay scientists everywhere. The lion's share of the credit for this belongs to the hundreds of technical referees and the several Associate Editors, all of whom by their careful reviewing maintain the high quality of the published papers.

Between September 4, 1988, and September 9, 1989, 123 manuscripts from about two dozen countries were submitted for publication in the Journal. This year, about 60% of the submitted manuscripts originated in non-North American countries, a substantial increase from last year. As a rule, each submitted manuscript is critically reviewed by an associate editor and at least one other expert in the field. During the last year, 132 referees from 19 countries assisted in the reviewing process, ensuring that accepted papers were of the highest scientific quality.

During the last 12 months, 204 manuscripts were processed by the Editorial Office of the Society, 89 of which were outstanding as of September 4, 1988. Of these outstanding manuscripts, 56 have now been published; 15 are in press, awaiting publication in Issue 6 of Volume 37 or in Issue 1 or 2 of Volume 38 (1990); 5 are in the revision stage; 6 have been rejected; and 7 have been withdrawn or combined with another manuscript. Of the 123 manuscripts received between September 4, 1988, and September 9, 1989, 11 have been published; 32 are in press; 23 are in the revision stage; 39 are being reviewed; and 18 have been rejected. This last year about 75% of the rejected manuscripts originated in non-North American countries, chiefly due to poor quality science rather than inadequate grasp of the English expression.

To cope with the backlog of accepted manuscripts that had developed in the last year, the size of Volume 37 (1989) was increased to 608 pages. A small backlog of unpublished manuscripts still exists, and it is likely that Volume 38 (1990) will be about the same size as or slightly larger than Volume 37. A total of 77 articles and notes have been published or are scheduled for publication in Volume 37 of the Journal (vs. 78 for Volume 36, 58 for Volume 35, and 90 for Volume 34), along with 4 book reviews and meeting announcements. Between January 1 and September 9, 1989, 84 new manuscripts were received in the Editorial Office, 4 less than the all-time high for this same period (1984) and 10 more than were received last year at this time.

The trend in manuscripts in recent years is shown in Table 1. The geographic distribution of articles published in the Journal is shown in Tables 2 and 3. A report of the status and disposition of each manuscript received is on file with the Secretary of the Society.

Other Publications

In January 1989, the pressure of other activities caused J. W. Stucki to give up editorship of the Society's Workshop Lecture series, with the exception of Volume 3 on thermal methods, for which he retains full responsibility. Responsibility for Volumes 1 (quantitative XRD methods) and 2 (electron-optical methods) has returned to this office. These volumes are now nearing completion, with Volume 1 being in the "page-proof" stage. This volume will be sent to the printer before the end of the year. I. D. R. MacKinnon, co-editor of the electron-optical volume, has made a valiant effort to move Volume 2 forward, and it is only the reluctance of a couple of authors to revise their papers that has held up this volume.

Other Activities

Other highlights of the year include:

(1) A 29-page Comprehensive Subject, Author, Title Index to Volume 36 (1988) was prepared by the undersigned and published as part of number 6, Volume 36 (December 1988). A similar comprehensive index to Volume 37 by the undersigned will be published in issue number 6, December 1989.

(2) For the first time, a list of papers presented at the Society's annual meeting was published in the Journal (see Volume 36, Number 6, pp. 58-583, 1988).

(3) As the Society's Editor-in-Chief, the undersigned attended the 1989 International Clay Conference in Strasbourg, France, August 27 to September 2, 1989. During the conference, numerous opportunities arose to discuss manuscripts with authors and potential authors, to consider Journal policy with several Associate Editors, and to consider the state of the science and scientific publications with editors of sister journals.

Respectfully submitted,

Frederick A. Mumpton,
Editor
The Clay Minerals Society
September 18, 1989

continued on next page

Editor's Report, *continued*

Table 1. Trend in manuscripts received by *Clays and Clay Minerals.*

Period	Manuscripts received	Manuscripts rejected	Volume size
8/14/77 — 10/6/78	98 (85/yr)	9 (8/yr)	26:452 pp[1]
10/7/78 — 8/25/79	96 (108/yr)	23 (26/yr)	27:472 pp
8/26/79 — 9/30/80	116 (104/yr)	22 (20/yr)	28:480 pp
10/1/80 — 9/30/81	122 (122/yr)	24 (24/yr)	29:480 pp
10/1/81 — 7/15/82	68 (86/yr)	12 (15/yr)	30:480 pp
7/16/82 — 8/31/83	102 (91/yr)	14 (13/yr)	31:483 pp
9/1/83 — 8/31/84	124 (124/yr)	24 (24/yr)	32:520 pp
9/1/84 — 7/15/85	97 (111/yr)	12 (14/yr)	33:576 pp
7/16/85 — 9/27/86	105 (90/yr)	15 (13/yr)	34:732 pp
9/28/86 — 10/3/87	104 (104/yr)	22 (22/yr)	35:512 pp
10/4/87 — 9/03/88	112 (122/yr)	20 (22/yr)	36:576 pp
9/04/88 — 9/09/89	123 (123/yr)	18 (18/yr)	37:608 pp[2]

[1]Excluding index.
[2]Anticipated.

Table 2. Geographic distribution of articles published in *Clays and Clays Minerals* (%).

Volume	Articles	U.S.A	U.S.A. & Canada	Europe & Israel	Africa & Asia[1]	Latin America
27 (1979)	64	(44)	48	36	13	3
28 (1980)	66	(38)	44	35	18	3
29 (1981)	63	(49)	54	30	14	2
30 (1982)	66	(45)	49	38	11	1
31 (1983)	66	(49)	52	26	19	3
32 (1984)	67	(50)	53	20	26	2
33 (1985)	74	(55)	58	23	18	1
34 (1986)	90	(54)	62[2]	28	8	2
35 (1987)	58	(38)	41	32	27	0
36 (1988)	78	(33)	38	41	18	3
37 (1989)	77	(43)	48	29	21	3
27-37	769	(47)	50	30	18	2

[1]Includes Fiji, Australia, New Zealand.
[2]Reflects two, essentially "American," special issues.

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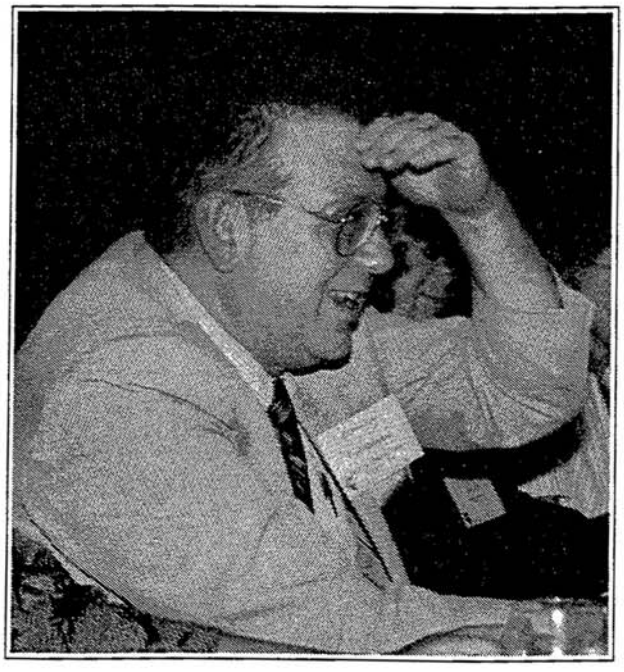
Editor's Report, *continued*

Table 3. Source of manuscripts published in *Clays and Clay Minerals*, Volumes 27-37 (1979-1989).

Country	Manuscripts	Country	Manuscripts
Argentina	10	Israel	33
Australia	51	Italy	19
Austria	2	Japan	49
Bangladesh	2	Republic of Korea	1
Belgium	16	Netherlands	3
Brazil	3	New Zealand	23
Canada	27	Poland	8
Chile	1	South Africa	2
Czechoslavakia	6	Soviet Union	7
Denmark	3	Spain	14
Fiji	1	Sweden	3
France	39	Switzerland	7
Germany (FRG)	17	Turkey	2
Germany (DDR)	1	United Kingdom	35
Greece	1	United States	359
Hungary	1	Venezuela	1
India	6	Yugoslavia	4
Ireland	6		



Clays and Clay Minerals editor Fred Mumpton searches for manuscripts from the head table at the CMS banquet at Grand Rapids, MI, September 20, 1988.

High Iron Photos

J.D. Hanawalt Powder Diffraction Award

The JCPDS-International Centre for Diffraction Data is seeking candidates for the J.D. Hanawalt Powder Diffraction Award. The award is presented every three years for an important, recent contribution to the field of powder diffraction. The award consists of a certificate and $1,000. The awardee is expected to submit an abstract and present a paper on the work being recognized at a forthcoming Powder Diffraction/Crystallographic Meeting. Recipient's travel expenses to the meeting will be provided. Work eligible for consideration must have been published between August 1984 and August 1989. The selection committee welcomes suggestions, nominations, and documentation of accomplishments for possible recipients through 10 January 1990. Contact: Benjamin Post, 108 Church Street, W. Roxbury, MA 02132.

Feats of Clay

S. W. "Bull" Bailey, CMS 1975 Distinguished Member, will receive the MSA Roebling Award next year.

At the Geological Society of America annual meeting this fall, it was announced that **S.W. Bailey** will receive next year's MSA Roebling Medal. The award will be presented to Dr. Bailey at the MSA luncheon at next year's GSA annual meeting.

CMS Research Grants have been awarded to the following students:
Jeffrey Moe, University of Montana (student of Graham R. Thompson)
Janice Norris, SUNY at Buffalo (student of Rossman F. Giese)
Eric J. Daniels, University of Illinois (student of Stephen P. Altaner)
Kenan Cetin, University of Cincinnati (student of Warren D. Huff)

The following students received awards at the CMS annual meeting in Sacramento:
Kenan Cetin, University of Cincinnati (student of Warren D. Huff) — Best Paper
H.U. Malik, University of Hawaii (student of Rollin C. Jones)— Best Paper Runner-up
Diane Keller, Colgate University (student of Richard H. April)) — Best Poster
James Wood, California State University at Los Angeles (student of J. Reed Glasmann) — Best Poster Runner-Up

Please help us recognize our members' acheivements by sending in announcements of awards, grants, promotions, new positions, as well as marriages, births, retirements, and other relevant passages.

New Members

We welcome the following new members who have joined The Clay Minerals Society since the conference in Sacramento.

Mr. Richard A. Brittain
Arizona State University
Tempe, Arizona

Ms. Claudine Durand
Institut Français du Petrole
Malmaison, France

Dr. Omer Isik Ece
Istanbul Technical University
Istanbul, Turkey

Mr. Naguib J. Halaka
H & W Minerals Co.
Jackson, California

Dr. Thomas A. Hueckel
Duke University
Durham, North Carolina

Mr. Malcolm S. Jones
CORE Labs
Irving, Texas

Mr. George H. Kacandes
Penn State University
University Park, Pennsylvania

Mr. Mitsuji Kondo
Nichitsu Ind. Co. Ltd.
Kuroiso-city, Tochigi Pref.
Japan

Mr. Daniel Larson
University of New Mexico
Albuquerque, New Mexico

Joseph A. Mason
University of Minnesota
St. Paul, Minnesota

Graham F. McCann
University of Cambridge
Cambridge, England

Dr. Sagrariv Mendioroz
Instituto de Catalisis y Petroleoquimica
Madrid, Spain

Mr. Karel L. Mesuere
Oregon Graduate Institute of Science and Technology
Beaverton, Oregon

Dr. Daniel Njopwouo
Université de Yaoundé
Yaoundé, Cameroun

Mr. H. Sonny Robb
Alternative Ways, Inc.
Coatesville, Pennsylvania

Dr. Rattan L. Sharma
Potash Research Institute of India
Haryana, India

Sacramento, *continued from page 1*

atoms showed as clearly as billiard balls in a rack; it had a defect that was visible from the back of the room. This photo had been taken with an atomic force microscope.

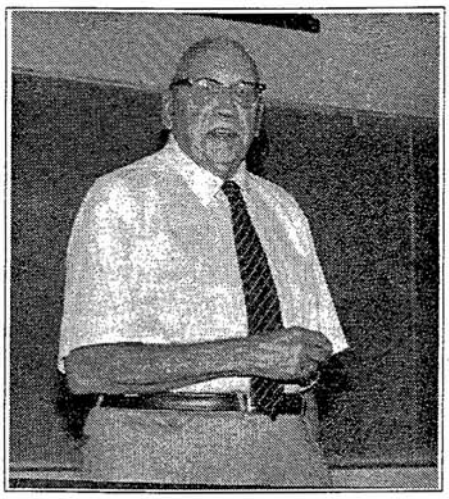
President W. F. Moll, Jr., openedthe meeting program by introducing Prof. W. D. Johns of the University of Missouri, who gave the George W. Brindley Lecture. President Moll then introduced Dr. Hendrick van Olphen for the Early

President Bill Moll delivers the President's Address at the CMS banquet in Sacramento. *High Iron Photos*

Pioneer in Clay Science Lecture, Colloid and Surface Chemistry of Clays, reinforcing and emphasizing the importance of the topic of the workshop. The last lecture of the session was The Clay Minerals Society Distinguished Member Lecture, given by Robert C. Reynolds, Jr., of Dartmouth College. Dennis Eberl, in his introduction of our newest Distinguished Member, suggested that Reynolds' rational, composed exterior covered a "wild man," one ready to take, even inviting risks. Johns' lecture, *Heterogeneities in Illite/Smectite Mixed-Layer Clays*, and Reynolds', *Old and New Concepts of Illite/Smectite*, reinforced one another in such a way that one could almost believe they had prepared them as chapter one and chapter two. An excellent start for things to come.

On Monday afternoon there were two sessions, one on *Clays as Containment Barriers* and one on *Regional Mineralogy*. Both sessions had vigorous discussion on the topics presented. At three o'clock, everyone's attention turned to the poster presentations and the refreshments accompanying them. This combination of refreshments and posters, as it did last year, stimulated a great deal of discussion and exchange of information. On Wednesday there was a session on *Soils and Materials Applications* and a symposium on *Clays as Fundamental and Mixed-Layer Particles*. The final scientific session on Thursday morning was *Fundamental Physics, Chemistry, and Crystal Structure*. Two themes that came from several directions were: 1) we need to consider larger samples whether in theoretical work or experimental work: count more spacings in HRTEM photos, take multiple samples from single locations; and 2) the notion that

With a drink in one hand and balloons in the other, conference chairman Jim "party animal" Post celebrated his "39th?" birthday party. *High Iron Photos*



H. van Olphen lectures at the Saturday workshop on the rheology of clays. *High Iron Photos*

each of the configurations R0, R1, (R2), and R3 have some kind of distinct stability. Kaolinite also got its share of attention. Even though there was not a session devoted to kaolinite, there were enough papers on this mineral to have had one.

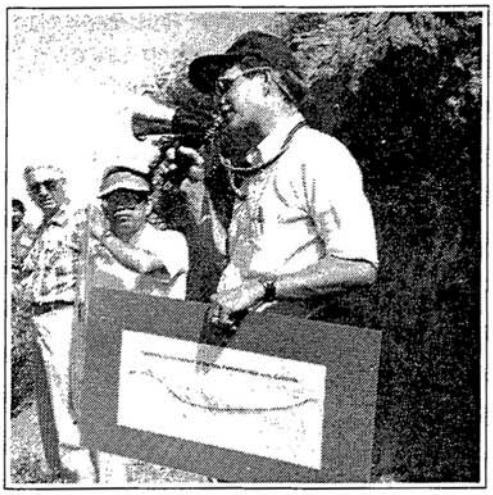
The best oral and the best poster presentations by students were recognized with prizes. Kenan Cetin from the University of Cincinnati was judged, by a very small margin, to have had the best oral presentation for *Evidence for Two Different Layer Charge Components in Interstratified Illite/Smectite from Ordovician and Silurian K-Bentonites*. Runner-up was H.U. Malik of the University of Hawaii with *Shrink/Swell Characteristics of Kaolinitic Vertisols of Hawaii*. Dianne Keller of Colgate University had the best poster, *Biotite Weathering in Forest Soils from the Eastern United States*. James Wood of California State University at Los Angeles was the runner-up in the poster category with *Morphology of Kaolinite in the Eocene Ione Depositional System, Sierra Foothills, California*. Congratulations to these people for their quality work and presentations.

There were two field trips: a half-day one on Sunday, after the council meeting, to collect several varieties of chlorite, and one on Tuesday to exam-

continued on next page

Sacramento, *continued*

ine the clays of the Eocene Ione Formation. They were well attended: 65 on Sunday and 103 on Tuesday. Both were in Eldorado and Amador Counties, the gold district of the '49ers, along the winding trace of Route 49. Exploitation of the Ione Formation has a long history. Silica, clay (chiefly kaolinite), lignite, and laterite have been taken from it. We visited three active pits courtesy of North American Refractories Company, and visited the brick-making plant and abandoned beehive kilns of the Muddox Company. The last two stops on Tuesday were the D'Agostini and the Shenandoah Wineries for tasting and purchases. At the latter, they had just harvested the sauvignon blanc grapes, so we could try the wine and then the grapes.



Thursday field trip leader Reed Glasmann covers the salient points at Stop 3. *High Iron Photos*

Next year's meeting will be special because it will coincide with Walter Keller's 90th birthday. Make plans now to come to Columbia, Missouri, to help Prof. Keller celebrate this anniversary. Perhaps we can make partial repayment for all he has done for his students, for clay mineralogy, and for the Society. Two symposia are planned: one on kaolinites in honor of Prof. Keller and one on clay minerals in sandstones. The short-course will be on neutron scattering technology, and the field trip will visit refractory clay deposits and associated soils in central and southern Missouri. The dates are October 6-11; the place is the University of Missouri-Columbia; and the person to contact for more information is Jack Burst, 1605 Lincoln Lane, Rolla, MO, 65401, ph. 314/364-0379. The 1991 meeting will be in Houston, Texas, and the contact person is David Pevear, ph. 713/965-4452. In the works for 1992 is a joint meeting with the Soil Science Society of America to be held in Minneapolis. The contact person is Wayne Hudnall, ph. 504/388-1344.

Dewey Moore
Urbana, Illinois

AIPEA, *continued from page 1*

typical France with its beautiful old buildings and majestic ornate cathedrals, sidewalk cafés, excellent restaurants, and a scenic and strategic canal system built through and around the city. Within minutes outside of Strasbourg are quaint villages, farms, and vineyards. As for transportation, everyone was pretty much on their own. Although the local bus system was efficient and inexpensive, walking about in Strasbourg was certainly the thing to do. Most participants engaged in plenty of exercise as they walked around the town with a map to guide them to conference activities, sight-seeing stops, shops, and restaurants. It was indeed a pleasant and healthy experience.

The Ninth International Conference was organized by several groups that included le Group Français des Argiles, l'Université Louis Pasteur, le Centre National de la Recherche Scientifique, l'Institut de Recherche Scientifique pour le Developpement en Cooperation, and l'Institut de la Recherche Agronomique. Primary individuals of the organizing committee included Dr. Yves Tardy (General Chairman), Dr. Helene Paquet (secretary General), Dr. Liliane Prevot (Treasurer), and Dr. Norbert Clauer (Poster Sessions). It was headquartered in the buildings of the Université Louis Pasteur on the University campus of Esplanade. The conference was extremely successful, as it was attended by over 700 participants, including about 120 students and 150 accompanying guests.

Preconference activities included a soils field trip to the Black Forest and Upper Rhine Graben, Southwest Germany, formal council meetings, registration, and a traditional welcoming buffet reception on the evening of Sunday, August 27th. The Conference was officially opened during the Inaugural Ceremony on Monday morning, August 28th, with an introduction by General Chairman, Professor Yves Tardy; as one might imagine, it was filled with much of Tardy's unique humor. Inaugural addresses were given by Professor Georges Millot, Mr. Michel Levallois, the Deputy Mayor of Strasbourg City, Michel Scmitt, and Professor Jiri Konta, President of AIPEA. The Inaugural Plenary Lecture was given by Professor Harold Helgeson of Berkeley and entitled "A chemical and thermodynamic model of clay minerals in diagenetic processes." Dr. Helgeson's lecture and model stimulated extensive discussion and debate throughout the Conference.

Dr. Patricia Costanzo and Dr. Ross Giese in Strasbourg *Photo by Robert B. Hall*

Study in White: Dr. and Mrs. Joe White and Dr. and Mrs. Arthur White enjoying Strasbourg
Photo by Robert B. Hall

The technical program included 462 abstracts; all papers were presented as posters except for the two or three Plenary Lectures introducing each of the 14 various sessions. Exhibits were limited to book and society displays. Four days of technical sessions were scheduled through the week with a "vacation day" on Thursday. The formal sessions included subjects on weathering and soil mineralogy, crystal chemistry and structure, geochemistry/isotopes, inter-

continued on next page

AIPEA, *continued*

stratification and intercalation, clays in sediments, diagenesis/hydrothermal alterations, colloidal/surface properties and catalysis, thermodynamics and clay-water interactions, clay/organic interactions and the origin of life, clays and nuclear waste disposal, industrial applications and ceramics, analytical techniques, and teaching clay mineralogy. Numerous posters were displayed in conjunction with each session. In a few cases, there were more posters than space allowed, or two posters were assigned the same display area. Informal Round Table discussions were held after each of the Sessions to address any of the presented papers, new concepts, and general state of the subject. The Round Tables were stimulating and brought about considerable discussion and debate.

The social program included a vacation day on Thursday, August 30th, consisting of a morning tour to the European Parliament and an afternoon bus trip to a pottery factory in the village of Soufflenheim and the shops of handcrafted, traditional stoneware potters in Betschdorf. Each of the Alsatian villages are noted for their unique pottery. The characteristics and properties of the pottery from both villages are unique as they are related to the composition of the local clays; Soufflenheim potteries date back to the 12th century. The peak social event was a bazaar celebration on Friday evening when all participants were bussed to the village of Kirrwiller for a banquet, folk show, and dance.

La belle dame de Strasbourg: Yves Tardy's rendition of Dr. Paquet, his co-organizer of the AIPEA conference.

Dr. and Mrs. I. E. Odom in Strasbourg
Photo by Robert B. Hall

The Conference ended on Saturday, September 2, with Closing Ceremonies that included an address of the new AIPEA president, Dr. J. M. Serratosa.awards for best posters, farewell addresses, and a farewell lunch. Four post-conference field trips began on Saturday, including one to the famous clay deposits of montmorillonite in Montmorillon and the nontronite of Nontron. Although participants claim they found neither clay in its type locality, they ate well and had an enjoyable trip. To summarize, the Ninth International Clay Conference was a unique and unforgettable scientific and social experience. The next International Clay Conference will be held in 1993 in Melborne, Australia. Start planning now for that one; you won't regret it.

Richard M. Pollastro
Denver, Colorado

CMS News is looking for advertisers. If you have suggestions or if your organization would like to advertise, please contact the Society Office. Thank you.

State University of New York at Buffalo

The Department of Geology invites nominations and applications for the position of Chairman of the Department and Professor (with tenure). Salary will be highly competitive. We seek applicants with excellent research accomplishments and the interest and administrative ability to provide academic leadership for a research-oriented department.

Applicants should submit a curriculum vitae, brief statement of research/teaching interests, and names of four references to:

Dr. Lewis A. Coburn
Search Committee Chairman
c/o Department of Geology
SUNY Buffalo
4240 Ridge Lea Campus
Buffalo, New York 14260

The deadline for applications is December 1, 1989. Later applications will be considered until the position is filled.

SUNY/Buffalo is an Equal Opportunity/Affirmative Action Employer. We are interested in identifying prospective minority and women candidates. No person, in whatever relationship with the State University of New York at Buffalo, shall be subject to discrimination on the basis of age, creed, color, handicap, national origin, race, religion, sex, marital, or veteran status.

Ask the Clay Doctor

(Not a real doctor)

Dear Clay Doctor: I have just read Cairns-Smith and Hartman's book *(Clay Minerals and the Origin of Life)* in which clays are considered to be inorganic precursors to organic life forms, and I was wondering: do clays have a sex life?

Really interested, Missoula

Dear Really: Clay mineralogists have long been trying to discover what goes on between the sheets. The problem has been to determine whether a particular clay is male or female. For some clays, such as dickite, the answer is clear enough; but for others the answer demands years of study. In one experiment, I put a sample of halloysite next to a particularly voluptuous piece of montmorillonite, and detected panting.

Dear Clay Doctor: I am so confused. What is the difference between an angstrom and a nanometer?

Fill me in, Binghamton

Dear Fill: The conversion from nanometers (nm) into angstroms (Å) is quite simple: use the formula nm = 5/9 (Å-32); or, even more simply, move the decimal point one place to the left. Moving the decimal point in the opposite direction (i.e., one place to the right), converts angstroms into ninnymeters which, unfortunately, have the same abbreviation as nanometers (nm). Ninnymeters were discovered by Alfred J. Ninny, who found that illite has a 100 nm X-ray peak. The rest is history.

Dear Clay Doctor: I like clay minerals, and I also like professional football. If Joe Montana, quarterback for the San Francisco 49ers, were a clay mineralogist, what clay would he study?

Clay fan, Houston

Dear Clay: Nontronite.

The clay doctor is available for consultation. Send written contributions to The Clay Doctor, c/o CMS News.

Computer information needed by Continuing Education Committeee

The Continuing Education Committee of The Clay Minerals Society is compiling a list of computer software that would be of interest to members and others involved in the study of clay and zeolite minerals.

If you are interested in sharing a computer program with your fellow researchers or in informing them of one, send the following information:

Name of program or package
Short paragraph describing what it does
Any hardware or software requirements
Where and how to obtain it
Any applicable fees

to: Steve Chipera, Los Alamos National Laboratory, Mail Stop D469, Los Alamos, NM 87545.

There are several companies and organizations that deal in geoscience software that may be of potential interest to our members:

RockWare, Inc.
4251 Kipling St., Suite 595
Wheat Ridge, Colorado 80033
(303) 423-5645

(Geologic programs which include well logging, plotting, graphing, hydrogeologic, geophysical, etc., programs for a fee.)

GEOTECH Computer Systems
7338 S. Alton Way, Ste. 16F
Englewood, Colorado 80112
(303) 740-9432
(Hardware, software, consulting, and training.)

Computer Oriented Geological Society (COGS)
P.O. Box 1317
Denver, Colorado 80201-1317
(Public Domain Geologic software for a nominal fee.)

COGS also offers the following publication for $18.50:
Geology Programs for Microcomputers,
A Catalog of Known Geological Software, 6th Edition
(Contains more than 600 listings of geological programs, grouped according to area of application and type of computer. Lists both commercial and public domain software. Gives name of program, brief description, and name, phone number, and address of publisher.)

Meetings

The Australian Institute of Mining and Metallurgy
Pacific Rim 90 Congress
May 6-12, 1990
Contact: The AusIMM PACRIM 90 Congress Secretariat, P.O. Box 731, Toowong Q 4066, Australia
Phone: (07) 371 7900 (+617) 371 7900 international Fax: (07) 371 4876 (+617) 371 4876 international

International Association of Geochemistry and Cosmochemistry (IAGC)
2nd International Symposium
Geochemistry of the Earth's Surface and of Mineral Formation
July 2-8, 1990
Aix-en-Provence, France
Contact: Y. Noack, Laboratoire de Géologie Dynamique et Pétrologie de la Surface
Case 431, Faculté des Sciences de St. Jérôme, Université Aix-Marseille III, 13397 Marseille Cedex 13, France
Phone: (33) 91-28-82-37 Telex: FACSTJE 402 876 F Telefax: (33) 91-28-80-30
Abstract and registration deadline: December 31, 1989

American Association of Petroleum Geologists
Annual Meeting
June 3-6, 1990
San Francisco, California

SPWLA Annual Symposium
June 17-20
Lafayette, Louisiana

Fifth Circum-Pacific Conference and Exhibition
July 29-August 3
Honolulu, Hawaii

AAPG Eastern Section Meeting
September 10-12
London, Ontario

AAPG Rocky Mountain Section Meeting
September 16-19
Denver, Colorado

GCAGS (AAPG Gulf Coast) Convention
October 17-19
Lafayette, Louisiana

SEPM
Research Conference: "Tidal Inlet and Estuarine Sand Bodies: Modern and Ancient"
San Juan Basin, New Mexico
May 5-11, 1990

Field Trip: "Fluvial Processes and Deposits of the Colorado River"
Deadline 02/21/90
May 24-June 1, 1990

Short Course: "Integrated Stratigraphic Analysis"
San Francisco, CA
June 2-3, 1990

Core Workshop: "Miocene and Oligocene Petroleum Reservoirs of the Sanata Maria and Santa Barbara-Ventura Basins, California"
San Francisco, CA
June 3, 1990

Student Short Course: "Comparative Sedimentology of Coastal Clastic Deposits—Bridges to Ancient Shorelines"
San Francisco, CA
June 3, 1990

K-12 Education Forum: "What You Can Do: Improving Earth Science Education"
San Francisco, CA
June 5, 1990

Research Conference: "Ancient Eolian and ERG-Margin Deposits"
Canyonlands area of Southeastern Utah
August 9-13, 1990

Research Conference: "Cretaceous Resources Event and Rhythms/Global Sedimentary Geology Program"
Denver, CO
August 20-24, 1989

SEPM contact person: Susan Green (918) 743-9765

Commentary

Illite/Smectite as a Paradigm for Clay Science

In recent years few topics in clay science have received as much attention as the investigation of the crystal structure, chemical composition and origin of mixed-layer illite/smectite (I/S). For a variety of practical as well as theoretical reasons, the nature of I/S and its relation to its end-member components is of great interest to petroleum geologists, soil scientists, sedimentary geochemists, sedimentary petrologists, and clay mineralogists. Yet barely two decades ago, studies of I/S, and of mixed-layer clays in general, were practically at a standstill. Mixed-layer clays were known, but efforts to extract useful and reliable geologic information from them was frustrated by a lack of understanding of their most basic characteristics. Only in soil science did progress in understanding even some aspects of mixed-layering appear to be advancing.

What has happened in the interim could easily be ascribed to improvements in analytical technologies alone, and thus implies that the creative energies of researchers are hampered only by the limitations of their machines. But that, as I am sure many would agree, is an oversimplification, and thus misleading, view of history. I would suggest, rather, that as others have pointed out before, researchers all too often perceive only what they expect to see until a new idea arises to reinvigorate the the process. Consideration of the steps that have led us to the current state of understanding of I/S serve as an excellent example of how clay science proceeds when the need to know surpasses the ability to find out.

In the late 1960's and into the 1970's, a series of remarkable papers based on studies in the Gulf Coast Tertiary set forth a new paradigm for I/S formation and carried with it some important and fascinating implications for mudrock genesis and water-rock interactions in mud-dominated basins. In the rush to explore these new ideas, researchers found themselves restricted by the accuracy and precision of instrumentation that previously had served everyone with such imminent satisfaction, a legacy from a previous spurt in new thinking about clays. Moreover, many clay scientists lacked the broadly quantitative experience required for a rigorous pursuit of the new paradigm. Laboratory methods well-known in other fields but new to clay scientists were tried, and clay scientists found themselves collaborating with isotope geochemists, metallurgists, and materials scientists in order to make more precise and revealing measurements. Thermodynamic models were revisited in the search for new insights. Kinetic considerations were explored by laboratory synthesis of I/S. New and greatly improved ways of interpreting powder X-ray diffraction (XRD) data were developed. A by-product of this renewed interest in I/S was the equally provocative notion of fundamental particles and the challenges it set forth to existing ideas of clay mineral structure and formation. New evidence indicated both neoformation and transformation mechanisms were operative. Again, there was more reaching out to technologies new to clay scientists but well-known in other fields. A series of papers appeared in the early and middle 1980's showing superb high resolution transmission electron micrographs (HRTEM) and electron diffraction patterns of I/S on the unit cell scale. Persuasive as these images were, they were nevertheless not easily reconciled with XRD data nor was their crystallographic interpretation unequivocal. And they were unable to give us accurate information on the chemical composition of layers called illite and smectite. Modeling water-rock interactions requires still more precise and definitive information.

Now, in the late 1980's, we are shown by crystallographers how computer simulation of HRTEM images helps interpret them, and that I/S stacking models based on XRD data can be reconsidered using Monte Carlo methods and be shown possibly not to be so different from fundamental particles after all. We understand that there are both high-charge and low-charge smectites interstratified with illite in I/S, and that these smectites are mainly montmorillonite. And we have learned that I/S can form in different ways in a variety of environments: hydrothermal, diagenetic, soil, metamorphic and altered volcanic ash. With this has come the intriguing concept of Ostwald ripening as applied to I/S formation, again opening many new avenues for investigation. And, again, we find ourselves learning more about what surface chemists and materials scientists can tell us and how different (to clay science) and better methods of field and laboratory study can be brought to bear on a slowly unraveling puzzle. The value of interdisciplinary collaboration coupled with advantageous use of improved technologies has never been more powerfully illustrated.

The teaching of science is most fun in times like this, because exciting new ideas beget each other, and new ways of looking at old ideas emerge each year. The new ideas may well prove wholly or only partially correct, but the infusion of intellectual energy coupled with the need to search for new and better investigative tools and new collaborative partnerships has created a paradigm of excellence in clay science that few could have imagined not many years ago. And the end is not yet in sight.

Warren D. Huff
Cincinnati, Ohio

The Clay Minerals Society
27th Annual Meeting
will be held October 6-11, 1990

It will be sponsored by:
University of Missouri-Columbia
Department of Geology
Department of Agronomy
UMC Research Reactor

The meeting will be preceded on Saturday, October 6, by a workshop on "Neutron Scattering and Diffraction."

Three scientific sessions are planned:
General Session
Clays in Sandstones Symposium
Keller 90-Kaolin Symposium,
the latter to honor Prof. Emeritus W.D. Keller in his 90th year.

On Wednesday, October 10, an all-day field trip is planned to visit deposits of central Missouri refractory clays and related soils.

Inquiries can be made to:
Prof. W. D. Johns
Department of Geology, University of Missouri, Columbia, MO 65211 U.S.A.
Tel. (314) 882-3785

The Clay Minerals Society
P.O. Box 880
Evergreen, Colorado 80439