THE UNIVERSITY OF MARYLAND GEOLOGY DEPARTMENT'S 2004

GEOGRAM

LETTER FROM THE CHAIR

A CAMPUS MOVING UP — REVERE THE TURTLE!

In October I attended the official kickoff ceremony for the largest research park in the State of Maryland and the greater Washington, D.C. region – M Square. President Mote referred to the launch of M Square as " . . . a milestone on the road to new University partnerships with national and international companies, government laboratories and other research organizations . . ."

Our President refers frequently to the University's "unfair advantage" (location, location, location), but it was Samuel Bodman, Deputy Secretary of the U.S. Department of Treasury, who identified Maryland's true "unfair advantage" in his speech when he referred to the partnership between U.S. Rep. Steny Hoyer and President Mote. Why did he say this? Because of their latest coup in bringing the National Oceanic and Atmospheric Administration's new Center for weather and climate prediction to the site. This event was extraordinary for two reasons: first, the long list of distinguished guests and their praise for the University; and, second the allocation of $5 M from the State's "Sunny Day Fund" to purchase the land for the M Square Project – the first example of the State investing in a State institution from that fund.

All of this comes after two years of severe budget cuts, through which, in inflation-adjusted dollars, the Campus has lost about one-quarter of its State appropriation. This mixed message – that the University is moving ever onward and upward while at the same time losing a significant proportion of its State funding – may be difficult to interpret, but it reflects a determination by the University leadership not to lose the momentum that has been gained through the late 1990s.

In this context, our Department has had an extraordinary year, with a very positive review by an External Committee of our peers, in spite of a reduced faculty while we absorbed the budget cuts. Now, we have the opportunity to hire several professors in key disciplines as we move forward on a reduced base budget. This reduction in funding is a significant challenge for any department, but it is especially so for a small department such as ours, which relies so heavily on laboratory facilities and analytical equipment to support the education of our students.

Let me expand on the Review of our Department. We conducted a self-study during Summer 2003, which formed the basis for an External Review Committee to visit the Campus for two days in October 2003. The highlight of the Committee Report is undoubtedly the statement that

". . . no department in the United States has a program in Geochemistry that is clearly superior to that of Maryland."

The report also identified three challenges for the Department: the further leadership of the Department; the limitations imposed by the distribution of assigned space, which is in the Geology Building, the Chemistry Building, the Computer and Space Sciences Building and Jull Hall; and, the demands of the course workload on faculty.

To provide continuity until 2010, I have agreed to continue as Chair, and to help lighten the course load on research-active faculty, the Provost has invested funds to support additional teaching assistants for laboratory classes; however, the College will remain space-challenged for the immediate future and we will need to be innovative in using our existing inventory of space to maximum advantage and to maintain collegial interactions across our disparate space inventory.

The mission of the department is to provide our students with affordable education via excellent academic programs and research opportunities, and

Michael Brown with Leonid Perchuk (Professor in the Department of Petrology at the University of Moscow) at the 32nd International Geological Congress (IGC), which was held in Florence, Italy, in late August this year. Mike was responsible for one of the sessions in the program, and Alan Jay Kaufman also was an attendee, as an invited speaker. Participation in the IGC is just one example of the high profile in national and international activities maintained by our faculty and students.

to maintain a nationally and internationally eminent faculty for this purpose. Our department has a rich history of success in undergraduate education and this has been maintained as we have developed an international research profile in Geochemistry. This combination gives every undergraduate major in Geology the opportunity to be involved in cutting-edge research using modern analytical and laboratory facilities. The symbiosis between education and research reflects the true strength of the Department, which lies in its extraordinary faculty, our inquisitive undergraduate students, the high quality of the graduate students that are attracted to our M.S. and Ph.D. programs and our dedicated staff.

It is a pleasure to acknowledge that John Merck, Director of Studies for Undergraduate Programs in the Department, received the College Award for Best Instructor in AY 2003-2004, and Jeanne Martin received Campus recognition for her twenty years service. The Geology Distinguished Alumna for 2004 was Robin Reichlin (B.S. 1976). Robin's Senior Thesis Advisor and undergraduate research mentor was Ann Wylie, now Assistant President! Robin is now Senior Program Director for the Geophysics Program (see more about Robin later).

Again, I want to emphasize how important our alumni and friends are to our future success, for it is through your support that we are able to provide grants to help our undergraduate students with fieldwork and Senior Thesis research projects, and to offer prizes for Best Senior Thesis, Best Presentation by a Master's Student, and Best Presentation by a Doctoral Student each year.

The last year has been one of change. Steven Lower moved to an Assistant Professor position at the University of Ohio, his home State, Paul Tomascak moved to an Assistant Professor position at SUNY Oswego and Harry Becker moved back to Germany, where he is Professor of Geochemistry at the Freie Universität Berlin.

At the end of this calendar year, Luke Chang, the first Chair of the Department, will retire, and Dazhi Jiang will move back to Canada, taking up a position at the University of Western Ontario. Currently, we are searching for up to three faculty, with one position in "Structural Geology and Tectonics/ Neotectonics/Tectonophysics" and two in "Mineralogy", with a particular emphasis in Geomicrobiology/ Biogeoscience.

As a counterbalance, we welcome Igor Puchel as an Assistant Research Scientist and Laboratory Manager for the Thermal Ionization Mass Spectrometry Facility, and we are pleased to have Seung Lee with the Department as a visitor for 2004 from the Korean Institute of Geosciences and Mineral Resources.

On the staff side, Tracy Ann Gilbert-Johnson, who replaced Kim Frye as my assistant, moved to Florida for personal reasons, and I welcome Rosalind Pinkard, who came onboard in August.

Once more we participated in "Maryland Day", and it was a particular pleasure to entertain a group from the Gem, Lapidary and Mineral Society of Washington, D.C., who toured the Geochemistry Laboratories, the Center for Microanalysis and Microscopy, and the Gems and Minerals Museum in the Geology Building during the morning. Also, we have begun an initiative to bring minority students into the Graduate Program in Earth Sciences across

HOW CAN YOU HELP US?

There's verve here at Maryland in Geology and it's growing stronger every day. We're recruiting world-class faculty and talented students. Our prolific research teams are making discoveries in traditional Geology and exploring new frontiers in rapidly emerging fields. We have one of the best Geochemistry Programs in the world. And we're all working together to become one of the top Geology Departments in the nation.

But, to reach this goal, we need your help!

How can you help us?

In this tight economy, the support of alumni and friends like you is the key to our success and to maintaining our commitment to excellence. Whether you support us yourself or put us in contact with someone who can, your contribution is sincerely appreciated. Your tax-deductible donation will help us strengthen our program with faculty and student recruitment tools, state-of-the-art facilities, an enhanced fieldwork program for our undergraduates and innovative outreach programs.

A growing problem for our undergraduates is the transfer of the cost of Tertiary education from the State to the individual via reduced State support and increased tuition rates. The increased cost commonly increases the time it takes to complete the degree, and our ability to help is limited by a significant under-funding in scholarship support for students. In Geology, this is particularly important, since there are the additional costs associated with fieldwork, particularly Field Camp additional financial help from the Department for those students in need commonly allows these students to succeed.

(continued on back cover)

Campus. As a complement to this effort, we will introduce in the Department Summer Internships for minority students from historically black colleges and universities, Hispanic institutions, tribal college and universities, and minority post-secondary institutions.

Let me finish with a thank you and an invitation. First, my most sincere thanks go to all of our alumni and friends who have contributed so generously with gifts to help support our programs and to assist our students in achieving success. Second, please do visit the Department during Maryland Day 2005 on April 30 (http://www.marylandday.umd.edu/) – we will be hosting visitors in the Gems and Minerals Museum in the Geology Building, and we look forward to seeing you there!

Michael Brown

November 2004

Department News

Geochemistry Renovation and Dedication

After nearly two years of dealing with dust and noise associated with the construction, the renovation of the Geochemistry suite in the Chemistry Building was completed in late 2003. The 1950's atmosphere of the corridor was literally exchanged for 21st century HVAC, and much of the ancient laboratory and office space was modernized. The new HVAC allowed us to remove the dysfunctional window air conditions that obstructed views of the wondrous panoramas outside (especially now that the Chemistry Atrium is complete), and provides cooling for the hallway in the summer. A new ceiling with additional lighting, and brighter floor tiles have transformed the dungeon we once inhabited into a shining beacon of geochemical light. In addition, a new internet-ready conference room and office space was added to the existing Geology space during the renovation. Funding for infrastructure improvements came from the department, college, and university and was largely associated with the acquisition of new geochemical instrumentation through National Science Foundation funding and the hiring of Professors ***Rudnick***, ***McDonough***, and ***Farquhar***. The dedication ceremony, which was held on June 3, 2003, marked a significant step in the development of the Department of Geology. It was attended by everyone in the department as well as University of Maryland Provost, ***Dr. William Destler***, and the Dean of the College of Computer, Mathematical and Physical Sciences, ***Dr. Steve Halperin***, each of whom, along with Chair ***Mike Brown***, offered brief remarks on this important occasion.

Evolution of the Geochemistry hallway over two years of rennovation. Bottom row (left) Rich Walker, faculty liason, and Tom McMullen, AEC construction supervisor; (center) Mike Brown, Chair; (right) Dr. William Destler, University of Maryland Provost.

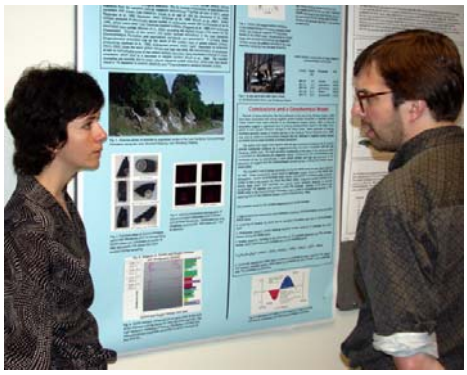







Senior Thesis Program

To date there have been approximately 450 senior theses completed at the University of Maryland Department of Geology. These include laboratory research, as well as theoretical, mapping, and field projects ranging in location from the College Park campus to as far a field as Alaska, Chile, Maine, and Namibia. Many of these theses have resulted in presentations at scientific conferences and publications in refereed journals. The Senior Thesis program was initiated by ***Peter Stifel*** and coordinated by him for over 20 years when the honor was passed on to ***Phil Candela***. All senior theses are kept in the permanent collection of the Geology Department, and lists of these can be found at (http://www.geol.umd.edu/pages/undergraduates/SeniorThesis.htm). A change was recently made to the Senior Thesis program in order to broaden the student's experience by having them prepare and defend a poster on their research project, rather than give a fourth oral presentation in the course. These poster presentations, which provide a fun and interactive experience for the undergraduates, have become an end-of-year highlight for the department.



Spring 2003

Jason Cassara: Taphonomic biases on the preservation of within-community seed size distributions (advisors, Friedmann and Sims, Smithsonian Institution)

Amy Gelinas: Osmium isotope constraints on the proportion of bolide component in the Chicxulub impace melts (advisor, Walker)

Sarah Kearsley: The phylogeny of antiarch placoderms (advisor, Holtz)

Brendan Puls: Evolution of osmium isotopes in the Earth's mantle via study of Tibetan and Northern Chinese ophiolites (advisor, Walker)

Ruth Thompson: Sedimentological, sequence stratigraphic and stable isotopic study of the Late Cambrian Conococheague Formation, Strasburg, VA (advisor, Kaufman)

Lisa Collins: Acid mine drainage; flow through experiments examining pyrite dissolution rates (advisors, Candela and Lower)

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The innaugral 394 poster presentation in the newly rennovated Geochemistry hallway. (left) Ruth Thompson Schulte and Bill Minarik; (center) 393/394 advisor Phil Candela, Roberta Rudnick, and Jason Cassara; (right) Sarah Kersley, CMPS Dean Steve Halperin, Bill Minarik, and Chair Mike Brown.

Spring 2004

Laura Gilbert: Testing deep water depositional models for the Trimmers Rock Formation (advisor, Friedmann)

Joshua Long: Fluvial depositional styles and fluvial lacustrine transition zones of the Passaic Formation, Newark Basin (advisor, Friedmann)

Juanita Stevens: Field and laboratory analyses of controls on groundwater iron concentration in marsh and forested wetland sediments (advisor, Prestegaard)

Jeff Hillebrand: Characterization of the distribution of siderophile and highly siderophile elements in the Milton and Eagle Station pallasites (advisors, Walker, McDonough, Piccoli)

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Distinguished Alumnus

The distinguished alumnus from the Department of Geology for 2004 is ***Robin Reichlin***, the current Senior Program Director for the Geophysics Program at the National Science Foundation. Reichlin attended the University of Maryland from 1972-76 where she received a Bachelor of Science degree (*cum laude*) in Geology. She was advised and employed by ***Ann Wylie*** as a research assistant during her senior year to work on an NIH-funded project to characterize asbestos minerals. After leaving Maryland, Robin started her graduate studies in mineral physics with Charles Prewitt in the Department of Earth and Space Sciences at the State University of New York at Stony Brook. She received her Master's degree in 1978 for a thesis on the crystal chemistry of germanates (a class of minerals that reveal low pressure transformations, which are analogs to phase relationships in silicates at pressures deep in the Earth's crust and mantle). After graduate school, Robin was employed by the University of California Lawrence Livermore National Laboratory where she assembled a high pressure, diamond-anvil cell laboratory for studies of the physics of condensed matter at extreme pressures and temperatures. From 1993-1995 Reichlin was group leader of the Experimental Geophysics Group, managing the scientific and technical investigations of 15 Ph.D scientists and technicians in several experimental facilities on the Lawrence Livermore campus

Robin Reichlin at the NSF.

In 1995, Reichlin served as a temporary Program Director for the Geophysics Program in the Division of Earth Sciences,

Geosciences Directorate at the National Science Foundation (NSF). Robin resigned from Lawrence Livermore three years later to accept a permanent senior position at the NSF. Today she manages a budget of $18M that funds science in the fields of seismology, mineral physics, geomagnetism, rock mechanics, geodynamics, and geodesy, to name a few. Her job involves community coordination, review and decision making on science funding, interagency coordination, and development of initiatives. In addition, Reichlin runs the CSEDI program (Cooperative Studies of Earth's Deep Interior), and has participated in several NSF-wide initiatives, including Mathematical Geosciences, Information Technology, and the Science and Technology Centers. Finally, Robin was extensively involved in the development of the EarthScope MRE initiative ($355M), funded by Congress in 2003.

Alumni News

Gary Solar (Ph.D., 1999) wedded Andrea Gawrys, a Buffalo area schoolteacher, on December 4, 2003. The couple are expecting a child early next year. Gary is Assistant Chair in the Earth Sciences Dept. at Buffalo State.

Rachel Pressley Kirkman (M.S., 1997) gave birth to Benjamin Graham Kirkman on September 16, 2004.

Allegra Small-Jabo (M.S., 2001) gave birth to Ella Scalise Jabo on February 9, 2004.

Mark Frank (M.S., 1996; Ph.D., 2001) is now an Assistant Professor at Northern Illinois University, Dekalb, IL, where he teaches mineralogy and geochemistry, and is setting up a hydrothermal and diamond cell laboratory. Mark is married to Julia Suh (B.S., 2001) who now attends law school at NIU.

Michael J. Wietrzychowski (M.S., 1989) recently accepted a position as a partner in the law firm of Schnader, Harrison, Segal and Lewis, LLP, in Cherry Hill, NJ. Mike practices labor and employment law in New Jersey and Pennsylvania. Before entering the practice of law, he worked for the international environmental consulting firm of Booz, Allen & Hamilton in Washington, D.C., where he provided policy and technical support to the EPA. Part of that support included developing the 1990 National Contingency Plan under Superfund. Mike graduated from the Temple University School of Law in 1993, where he was a Staff Member and an Associate Editor for the Temple Law Review. Mike was the 2003 Distinguished Alumnus in the Department of Geology.

Frederick (Rick) W. Zimmerman (B.S., 1975) started his own oil company, Texas Independent Exploration, in 1986. Working for Sue Ann Oil and Gas in La Ward, Texas (1984-1986), he was responsible for the acquisition of three producing properties, resulting in the subsequent drilling of eleven prospects and re-entry of ten wells which substantially increased production and cash flow. From 1981 to 1985 he was Senior Geological Engineer at the Tenneco-Gulf Coast Division, and was responsible for generating exploration and development prospects in Texas and Louisiana. Rick was the 2002 Distinguished Alumnus in the Department of Geology.

Francis (Frank) H. Chapelle (B.S., 1976) is a research hydrogeologist for the United States Geological Survey, Toxic Substance Hydrology Program. A pioneer in biogeoscience, in 1993 he published a groundbreaking book titled Ground-Water Microbiology and Geochemistry. Frank was the 2001 Distinguished Alumnus in the Department of Geology.

Roland Hellman (B.S., 1982) who was awarded his PhD in Geochemistry from Princeton University in 1988, is a researcher with the Centre National de la Recherche Scientifique, University of Grenoble, France. His main research interest, in a broad sense, is in water-rock interactions-studying these interactions at a variety of scales: at the field scale looking at chemical degradation of rocks in glacial environments in the Alps; mineral-water and glass-water dissolution reactions at the macroscopic scale based on laboratory experiments up to > 300 degrees C; and finally, he is investigating how the structure and chemistry of fluid-solid interfaces change at the to m-scale using various high resolution microscopy and spectroscopy techniques. Roland is a member of the International Program Committee, Aqueous Geochemistry, for the 15th Annual Goldschmidt Conference: A Voyage of Discovery being held in Moscow, Idaho, May 20-25, 2005.

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Please send your alumni news to:

geology@geol.umd.edu

A look back to 1984. From left to right, Luke Chang, Phil Candela, Robert Ridky, Eileen McLellan, Ann Wylie, Tony Segovia, and Roger Nielsen.

Meet The Faculty

Mike Brown, Chairman and Professor (Ph.D. University of Keele, U.K. 1975)

My research is concerned with understanding the evolution of Earth's crust, including processes of crustal recycling. This is accomplished by investigating metamorphic belts with respect to pressure, temperature, and deformation through time, as well as the generation, segregation, and emplacement of granitic magmas within the crust. In addition, my field and laboratory based studies include the effects of granulite facies metamorphism. Areas of active research include: 1) southern Brittany in the Variscides of France, 2) Neoproterozoic fold belts in Brazil, and 3) the contact aureole of the Bushveld Complex, South Africa,. My research group includes ***Julie Baldwin*** (Ph.D. MIT, 2004; post-doctoral Research Associate) and ***Barry Reno*** (Ph.D. student: Tectonic evolution of the Andrelândia Group) working in Brazil in collaboration with ***Renato Moraes*** (Visiting Scientist, University of Sao Paulo, Brazil), ***Margaret Baker*** (Ph.D. student: Petrogenesis of the Platreef, Bushveld Complex, South Africa) and ***Tim Johnson*** (Visiting Scientist, University of Graz, Austria) working in South Africa.

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Philip Candela, Professor (Ph.D. Harvard University, 1982)

My research is concentrated in areas broadly related to mining and resources, especially the application of physical chemistry to problems in economic geology. My current projects include: 1) chrysotile decomposition as a function of temperature, pressure and time; 2) the solubility of Ag in minerals, fluids and melts; 3) the partitioning of Cu, Au, and As in melt-vapor-brine-magnetite-sulfide-metal systems; 4) the controls on apatite composition in granitic rocks; and 5) the textural evolution of granitic rocks. The research on ore metals is geared toward understanding the controls on the metal ratios in porphyry and epithermal type deposits, with the ultimate aim of developing better exploration vectors for precious and base metal deposits. My current graduate students are ***Courtney Crummett*** (M.S. student: Examination of the thermal transformation of chrysotile), ***Leah Englander*** (M.S. student: An experimental study of silver in magmatic hydrothermal systems), ***Adrian Hughes*** (M.S. student: Using the Silurian Tuscaraora Sandstone as a natural analog for carbon sequestration), and ***Jennifer Teerlink*** (M.S. student: Dissolved inorganic carbon cycling in 1st-order agricultural streams, Kent County, MD).

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Luke L.Y. Chang, Professor (Ph.D. University of Chicago, 1963)

My studies are aimed at understanding the relationship between structure and stability in mineral systems, with particular focus on the mineralogy of Pb-Ag-Cu-Sb-Bi-Sn sulfides, selenides, and tellurides. I am equally interested in the process mineralogy of industrial materials, and recently published a textbook on the subject titled Industrial Mineralogy: Materials, Processes, and Uses. This book bridges the gap between the basics of mineralogy and the applications of mineral-based materials. While it was primarily designed to introduce science and engineering students to the fundamentals of industrial minerals and mineral-based materials, Industrial Mineralogy may also be used by professionals in mineral industries as a reference in research and development.

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James Farquhar, Assistant Professor (Ph.D. University of Alberta, 1995)

The general focus of my research is on the application of stable isotopes to geochemistry and cosmochemistry, in particular on the application of multiple isotope fractionation effects to the study of basic scientific questions. These include: 1) atmospheric evolution on Earth (and Mars), with particular focus on the Archean and early Paleoproterozoic rise of atmospheric oxygen; 2) atmospheric deposition of nitrate and sulfate; 3) studies of the early evolution of water in the solar system; 4) the antiquity of biological processes; and 5) experimental studies of photochemical mass-independent isotope effects. My current graduate students are ***Elizabeth Brabson*** (M.S. student: Impact of deep water formation in the North Pacific on Indonesian throughflow: Implications for regional climate variability during the last glacial maximum), ***Katherine Young Cooney*** (M.S. student: Stable isotopic investigation of precipitation nitrate in the Chesapeake Bay watershed), ***John Jamieson*** (Ph.D. student: Sources and mobility of sulfur at the Kidd Creek VMS deposit, Ontario, Canada), ***David Johnston*** (Ph.D. student: Multi-isotope signatures of biological systems), and ***Mark Tyra*** (M.S. student: Terrestrial alteration of carbonates in a suite of Antarctic meteorites).

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To learn more about the University of Maryland Department of Geology visit:

http://www.geol.umd.edu/

Thomas Holtz, Assistant Research Scientist (Ph.D. Yale University, 1992)

My primary research interests are the evolution and functional morphology of Tyrannosauroidea ("tyrant dinosaurs") and related members of Theropoda (carnivorous dinosaurs). Current research projects include a major new phylogenetic analysis of theropod dinosaurs, description (with colleagues in Utah, New Jersey, California and New Mexico) of a newly discovered small theropod from the Late Cretaceous of the American Southwest, and an integrative paleoecological analysis of dinosaurian faunas throughout the Mesozoic with emphasis of predator guild diversity and disparity. In terms of public outreach, I am a consultant on a new exhibit on theropod evolution at the National Science Museum in Tokyo and am writing a coffee-table format children's encyclopedia of dinosaur science for Random House. Currently I am advising ***Christine Missell France*** (Ph.D. student with Alan Jay Kaufman: Isotopic investigations of metabolism in ancient animals).

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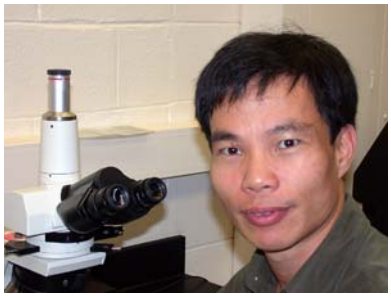
Dazhi Jiang, Assistant Professor (Ph.D. University of New Brunswick, Canada, 1996)



Over the past year I have been working on forward modeling of fabric evolution in flowing rock masses. The discovery and methodology of modeling allow rock deformation history to be quantitatively reconstructed from tectonites in mountain belts. My current graduate students, ***Callan Bentley*** (M.S. student: Rock fabric analysis of the Sierra Crest shear zone system, California) and ***Tianhuan Dai*** (M.S. student: Structural evolution of the Cross Lake greenstone belt, Manitoba, Canada) are applying these models to their respective field areas .

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Alan Jay Kaufman, Associate Professor (Ph.D. Indiana University, 1990)

My research has focused on the determination of changes in the isotopic composition of the oceans through time, by the analysis of stratigraphic suites of little-altered carbonate and shale. The variations may be used as stratigraphic tools within and between basins, and through detailed correlations allow us to order key tectonic, biogeochemical, and paleoenvironmental events in Earth history. These studies have mainly focused on glaciogenic intervals at the beginning and end of the Proterozoic Eon, and at the evolutionary and mass extinction events across the Precambrian-Cambrian and Permian-Triassic boundaries. My present field areas include Azerbaijan, Brazil, arctic Canada, northern India, Namibia, South Africa and Western Australia, as well as Death Valley and Virginia in the USA. Current graduate students include, ***Kristina Bartlett Brody*** (M.S. student: Biomarkers in Neoproterozoic shale from Brazil), ***Christine Missell France*** (Ph.D. student with Tom Holtz: Isotopic investigations of metabolism in ancient animals), ***Nick Geboy*** (M.S. student: Re-Os age determinations of Neoproterozoic shale), ***Kataryna Klochko*** (Ph.D. student: Novel B isotopic measurements of carbonate by laser ablation ICP-MS techniques), and ***Kate Scheiderich*** (Ph.D. student with Bill McDonough: Isotopic and elemental investigations of Pliocene sediments from the Caspian Sea).

William F. McDonough, Associate Professor (Ph.D. Australian National University, 1988)

I gather chemical and isotopic data which are then used to model the composition and evolution of the core-mantle system of the Earth and of other terrestrial systems (e.g., Moon, inner planets and asteroids). My research program is linked to chemical and isotopic analyses of materials (a wide range of solids and liquids). Some of my research also involves the development of techniques used to analyze samples, including improving on our limits of element detection at the micron scale with laser ablation techniques. Students working with me and associated faculty are involved in a diverse spectrum of studies, including the composition and evolution of the silicate Earth, fractionation processes involved in core-mantle separation, the composition and evolution of continental crust, the chemical signatures of up welling in the oceans, the nature, evolution and timing of differentiation of meteorites, the condensation behavior of elements in the solar nebula, and other topics. My current graduate students are ***Jenise Honesto*** (M.S. student: A comparison of iron meteorites and asteroids by spectral and elemental data) and ***Fangzhen Teng*** (Ph.D. student with Roberta Rudnick: Lithium isotopic composition in the upper continental crust).

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John Merck, Jr., Lecturer (Ph.D. The University of Texas at Austin, 1997)

My research is committed to improving our picture of the tree of vertebrate evolution using the methods of phylogenetic systematics. I focus on the poorly understood relationships of extinct primitive saurians, including the aquatic ichthyosaurs and sauropterygians, the relatives of living archosaurs, and the poorly understood array of primitive terrestrial reptiles of saurian grade. I seek to illuminate hypotheses of phylogeny developed in this way with reference to biostratigraphy, resulting in the identification of stratigraphically encrypted "ghost-lineages" and the refinement of taxonomic search-images. As a compliment, I am interested in empirically testing the assumptions that necessarily underlie phylogenetic analysis. The reconstruction of phylogeny ramifies into a wide range of disciplines that address the history of evolving organisms and ecological communities, including biomechanics and biostratigraphy. The ultimate aim of my research is to provide a firm foundation for all such endeavors by expanding and improving our basic knowledge of vertebrate phylogenetic history.

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Philip Piccoli, Associate Research Scientist (Ph.D. University of Maryland, 1992)

My research deals with a variety of problems broadly defined as petrology and geochemistry. Specifically, I am interested in: 1) characterization of apatite in felsic and hydrothermal rocks as an indicator of ore potential; 2) characterization of accessory phases using microanalytical techniques to infer tectonic processes; 3) fluid compositions in high grade metamorphic rocks determined using apatite chemistry; 4) characterization of the role of silicates, oxides, and sulfides in the sequestration of trace and ore metals; and 5) controls on the composition and timing of vapor and brine exsolution associated with felsic magmatism.

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Karen Prestegaard, Associate Professor (Ph.D. University of California, Berkeley, 1982)

My studies focus on various topics in river mechanics and watershed hydrology, with emphasis on surface-groundwater interactions. Current research projects include studies of channel morphology complexity on several scales, and surface-groundwater interactions in watersheds and tidal channel networks, with consequences for nitrate flux and rates of denitrification. My recent graduate students include ***Kate Folk Clancy*** (Ph.D. 2003: Organization of large particles in natural streams), ***Pamela Boyle*** (M.S. 2004 in MEES: Effects of urbanization on stream chancel complexity), ***Karen Phemister*** (M.S. student: Characterization of the spatial differences in hydrological functioning in a tidal marsh), ***Gwendolyn Rhodes*** (Ph.D. student: Hydrometerological mechanisms for large magnitude floods in the Potomac Basin), and ***Jacqueline Mann*** (Ph.D. student: Simultaneous determination of sulfur isotope composition and concentration in snow and firn using a double spike method). Together, we are working with working with other hydrologists in the region through CUAHSI (pronounced quasi: Constorium of Universities for the Advancement of Hydrologic Science) to look at the Potomac River Watershed. I have been a working member of several National Academy of Sciences committees on tasks evaluating wetland mitigation policy, water use, and the stream flow information system of the USGS. In a new direction, I have recently begun working with a team of filmmakers to develop projects about watersheds.

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Igor Puchtel, Assistant Research Scientist (Ph.D. IGEM, 1992)

My research interests center around chemical and temporal evolution of the Earth's mantle and core as well as the late accretion in the solar system. I study radiogenic isotope systems, including Rb-Sr, Sm-Nd, U-Pb, Pb-Pb, Re-Os, and Pt-Os, and lithophile and highly siderophile element abundances in various types of materials derived from diverse geological processes, using inductively coupled plasma mass-spectrometry and thermal ionization mass-spectrometry.

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Roberta Rudnick, Professor (Ph.D. Australian National University, 1988)

My research focuses on the composition, origin and evolution of the continents using geochemical data collected in our laboratories integrated with geophysical and geological information. Current projects involve a comprehensive investigation of lithium isotope behavior in the solid earth and geological and geochronological evolution of cratonic and mobile belt lithosphere in Tanzania. This past year I edited 'The Crust,' one of ten volumes in the new geochemistry reference work: Treatise on Geochemistry, which was published in late 2003 by Elsevier. These volumes were selected for the Mary B. Ansari 'Best Reference Work' Award by the Geoscience Information Society, which was

presented at the National GSA meeting in Denver this November. My current graduate students are ***Sean Timpa*** (thermal chonometry and continental dyuamics in Tanzania) and ***Fangzhen Teng*** (Ph.D. student with ***Bill McDonough***: Lithium isotopic composition in the upper continental crust).

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Richard Walker, Professor (Ph.D. S.U.N.Y. Stony Brook, 1984)

I conduct research in several areas of Earth and planetary science, including: 1) the chemical evolution of the Earth's mantle, particularly with respect to the behavior of highly-siderophile (iron-loving elements; 2) the formation and crystallization histories of early solar system planetesimals, with current emphasis on early condensates and core formational processes; 3) the accretional and differentiation histories of Earth, Moon and Mars; 4) the origin of platinum-group element (PGE) and gold ores; and 5) the use of Sr, Li, Mo and Os isotopes as tracers of Earth surface processes, such as continental weathering, ocean chemistry evolution, and the movement of toxic metals through the environment. My current graduate students are ***Tracey Centorbi*** (M.S. student: Re-Os systematics of North Carolina ultramafic bodies)***, Amitava Gangopadhyay*** (Ph.D. 2004: Geochemical and Os isotopic study of Precambrian komatiites)***, Thomas Ireland*** (M.S. student: Re-Os and Hf-W isotopes in ocean island basalts), and ***Ruth Thompson*** (M.S. student: Re-Os isotopic systematics of the Taitao Ophiolite, southern Chile).

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Ann Wylie, Professor (Ph.D. Columbia University, 1972)

Despite my current administrative responsibilities as Assistant President and Chief of Staff of the University (and now Interim Dean of the Graduate School), I have continued my basic work as a mineralogist. I remain involved with the health effects of fibrous minerals and with the mineralogy of serpentine and amphibole generally. This year, Phil Candela and I are funded by the automotive industry to study the thermal transformation of chrysotile. I am currently advising ***Courtney Crummett*** (M.S. student with ***Phil Candela***: Examination of the thermal transformation of chrysotile).

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E-an Zen, Adjunct Professor (Ph.D. Harvard University, 1955; Member of the National Academy of Sciences)

My research interests are the geomorphology and hydraulics of the Potomac River and the associated chronology, and the matter of global sustainability and the role of earth science knowledge in that endeavor.

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Report on the Periodic Review of the Department of Geology: The Provost's Recommendations

The University should be very proud of the enormous progress made by the Geology Department since its last review, and of its accomplishments and outstanding reputation, particularly in Geochemistry. It is no small matter to be judged as unsurpassed nationally in such a highly competitive area in one's discipline. . . . . Chair Brown points to the outstanding quality of faculty recently recruited to the Department and to the support of the University in establishing a world class laboratory infrastructure as the reasons for these accomplishments. Dean Halperin points to the energy and dedication of Mike Brown, and particularly to his insistence on the very highest standards in faculty recruitment as being the driving force. I am delighted that Mike has agreed to continue as chair for yet another term, and look forward to seeing continuing progress under his forceful leadership.

Geology at Maryland is very small compared to leading departments nationwide. Being unable to match the breadth of expertise elsewhere, and with little chance for significant expansion in the current fiscal climate, Chair Brown argues that it is unrealistic to expect the Department to rise into the top thirty in national rankings. He suggests a strategy of continuing improvement through development from our current strengths and from expertise available through collaboration with other units. . . . . Chair Brown also points out issues of faculty workload and course availability that are the result of our limited faculty size and the heavy load of service and special undergraduate courses that the faculty eagerly assume. Some relief might be provided by a relatively modest investment in additional teaching assistants. It is a very difficult time for either the college or the university to make even such modest investments, but I will look into what can be done in this respect. The institution is very appreciative of the commitment of Geology faculty to College Park Scholars and to general interest and honors classes.

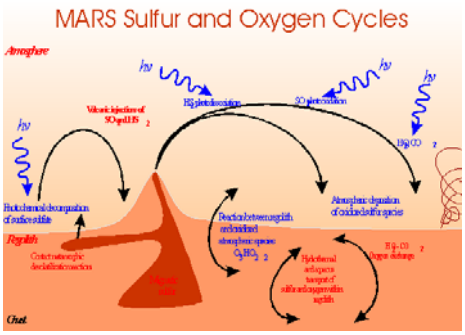
Department Highlights

Faculty - James Farquhar

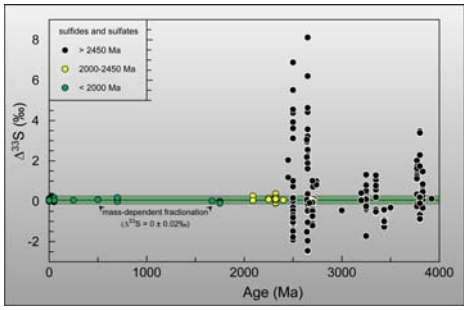
James Farquhar's scientific travels transcend both space and time. The sulfur and oxygen isotope studies of this Assistant Professor in the Department of Geology and Earth System Science Interdisciplinary Center at the University of Maryland, which range from far-flung Martian meteorites to diamonds deep in the Earth's crust to the earliest terrestrial atmosphere, reveal startling new insights to the ancient history of the inner solar system.

The techniques Farquhar currently uses in his well-equipped laboratory (see http://www.geol.umd.edu/~jfarquha/stable_isotope_lab.htm) were developed in part with Doug Rumble and colleagues at the Carnegie Institution Department of Terrestrial Magnetism while he was a post-doctoral fellow studying oxygen-18 redistribution during metamorphic processes. Insightfully, James recognized that with his new isotopic toolkit he might also be able to answer questions about issues more relevant to society. Armed with an NSF post-doctoral fellowship to study oxygen-17 abundances in SNC (read Martian) meteorites, he joined the atmospheric laboratory of ***Mark Thiemens*** at the University of California, San Diego.

Farquhar's oxygen isotope studies of carbonate minerals in the famed Martian meteorite ALH84-001 (read the first meteorite found in the Allen Hills of Antarctica in 1984) didn't say much about the so-called 'microfossils' in this piece of space debris. They did, however, provide evidence for exchange between the Martian atmosphere and water hidden beneath the surface of the planet. These findings were reported in James' first article in ***Science*** in 1998 (v. 280, p. 1580-1582), followed up two years later by an article in ***Nature*** (v. 404, p. 50-52) on sulfur-33 anomalies in a variety of Martian meteorites.



Having found these remarkable isotopic anomalies on Mars, James turned his focus to finding similar ones in rocks on Earth. In his initial attempts at O-17 measurements he found no anomalies in a survey of Archean carbonates and paleosols, although there was a hint of an effect in modern sulfates. On a hunch, James wondered if there might be biological effects on isotope distributions, especially those of sulfur. He quickly tuned the magnet on his mass spectrometer and began a search for sulfur-33 anomalies in modern seawater and ancient sulfates, looking for tale tell evidence of bacterial sulfate reduction. Remarkably, the very first ancient samples he analyzed (from the 3.5 billion-year-old Barberton Greenstone Belt in South Africa) revealed an unprecedented sulfur-33 anomaly, which James could hardly believe. Arriving home that evening he said, "Lisa, I either broke the mass spec or found something really big!"

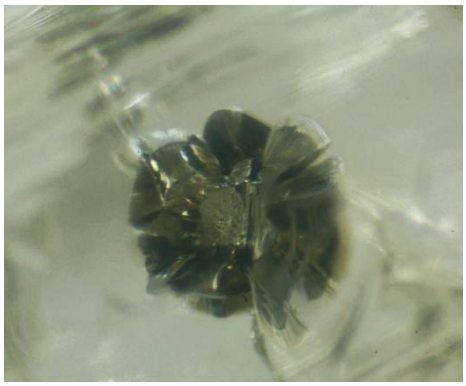


Many analyses later Farquhar showed that the anomalous S-33 results were time sensitive; they only occurred in sediments older than about 2.5 billion years. But how, James wondered, could this record of sulfur isotope anomalies say something about early oxygen?

To this end, working in the Thiemens laboratory was fortuitous. Thiemens had earlier demonstrated that such anomalies are the result of atmospheric photochemical reactions in the absence of ozone – the three oxygen molecule that acts as Earth's sunscreen to harmful ultra-violet radiation from the sun. Since ozone is formed from molecular oxygen, James surmised that the historical record of these anomalies must record the rise of atmospheric oxygen. These results, published in James' second ***Science*** article in 2000 (v. 289, p. 756-758) startled the scientific community, and provided a new tool for understanding the evolution of the Earth's sulfur cycle in the atmosphere and on the surface, as well as its effects on biology. The sulfur fire James started has also ignited the media, and his results have been reported by newspapers and magazines alike. This year the discovery,

James, his colleague ***Alan Jay Kaufman***, and graduate students ***Elizabeth Brabson***, ***David Johnston***, and ***John Jamieson*** were highlighted in an American Museum of Natural History exhibit called "The Rise of Oxygen" (see ARCHIVES at http://sciencebulletins.amnh.org/earth/).

The discovery of sulfur-33 anomalies in ancient sediments made James wonder if the signal of unusual atmospheric photochemistry could be recycled into the deep crust and mantle? To test this hypothesis, James aimed the cesium gun of an ion probe at the University of California, Los Angeles at microscopic sulfide grains encased in Archean diamonds formed 150 to 200 km deep within the Earth. Again, he found that S-33 anomalies were present, suggesting that parts of the atmosphere were transferred to the deep Earth in a plate-tectonic like process over three billion years ago! These results were published in his third ***Science*** paper published in 2002 (v. 298, p. 2369-2372).



Based on the insight of these studies (and only days after signing a contract with the University of Maryland), James was awarded the prestigious F.W. Clarke Medal in 2000 as the top geochemist of the year. Notably, Professor ***Rich Walker*** likewise received this award early in his career, making the Department of Geology home to two of these medalists.

With the momentum of these past results and insight to the future, James has been handsomely rewarded with grants to build a laboratory at the University of Maryland and continue his far reaching stable isotope studies. He has been funded by the National Science Foundation from several different programs including, Instrumentation – to purchase gas source mass spectrometers and UV laser systems, as well as funding of technical support for the stable isotope laboratory (with ***Alan Jay Kaufman***), and Geochemistry & Petrology. In addition, Farquhar was awarded an important CAREER grant from NSF-EAR for his proposal titled "Earth system science perspective on the sulfur cycle." The NASA programs of Astrobiology (James is a member of the Carnegie Institution of Washington Astrobiology Institute), Cosmochemistry, and Exobiology (with Research Associate ***Bozwell Wing***) have also awarded Farquhar and his colleagues a number of separate grants. Finally, grants from the American Chemical Society, Petroleum Research Fund and from the Maryland Water Resources Research Council are helping James to run his crowded laboratory and to fund his many graduate, undergraduate, and high school students.

To date, James Farquhar has given 17 invited talks to national and international audiences on his stable isotope studies, which keeps him on the road when he is not in the laboratory, or caring for his wife Lisa, and two young children (Henry, age 6 and Anna, age 4) who live in nearby University Park.

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See the AMNH story, "The Rise of Oxygen" with *James Farquhar, Alan Jay Kaufman,* and UMd graduate students in ARCHIVES at:

http://sciencebulletins.amnh.org/earth/

Undergraduate Student - Allie Gale

Allie Gale is a 4.0 GPA double-degree student in the ENSP and Geology programs who doesn't have enough time on her hands. Since beginning her studies at the University of Maryland as a freshman from nearby Paint Branch High School on a Dean's Scholarship, Allie has worked on research projects with several faculty on campus and at the Carnegie and Smithsonian Institutions. In separate, and sometimes overlapping semesters she has worked on geological studies of meteorites (with ***Rich Walker*** and ***Paul Tomascak*** in the Department of Geology and Tim McCoy at the Smithsonian Institution), chromites (with ***Bill Minarik***), and xenoliths (with ***Roberta Rudnick***). Not forgetting her degree in environmental sciences and the Goddard Memorial Scholarship from the College of Agriculture that funded her studies for four years, Allie has also worked with Marilyn Fogel at the Carnegie Institution of Washington in a study of poultry-impacted areas of Maryland and Delaware. "It was basically chicken shit," said Gale, who presented the results of her work at the Carnegie Institution of Washington intern symposium in August, 2003. In addition, Allie won the 'best undergraduate presentation' award for her environmental studies presentation at the 2004 Atlantic Estuarine Research conference in Salisbury, Maryland. To fill in the remaining time, Allie is also working on a Citation in Musical Performance as a percussionist. She said that playing the drums fits her interests because they allow her to be both "systematic and creative," which encourages her to "think outside the box." She has played for a number of semesters with graduate level ensembles, and feels fortunate to be able to train with the notable percussionist John Tafoya. After completing her senior thesis Allie Gale is aiming for a Ph.D. in geology, with a particular focus on biogeochemistry. Given her remarkable momentum, a bulls-eye is almost certainly assured!

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Graduate Student - Kristina Bartlett Brody

Kristina Bartlett Brody is a second-year Master's student studying the biomarker geochemistry of Neoproterozoic sediments in Brazil with Associate Professor ***Alan Jay Kaufman***. Kristina returned to the university environment after spending five years at *Geotimes*, the monthly earth science newsmagazine published by the American Geological Institute, first as a science journalist and later as Managing Editor. At *Geotimes* she had the chance to meet and work with geologists of many disciplines. As a journalist, Kristina gained a wide breadth of knowledge in geology, but ultimately realized (through the many interviews and articles she wrote) that depth could be obtained only through focused study. Fortunate for us, she decided to enter graduate studies here at the University of Maryland and approach Earth sciences at the interface between geology and biology. Soon after her wedding to Loren Brody, Kristina set off to Brazil on her first month-long field excursion to collect cores of organic-rich sediments deposited during and after widespread Neoproterozoic glaciation. She has spent the first year learning to extract and characterize biomarkers from these sediments, and gave a report of her progress this year at the annual Geological Society of America convention in Denver. The aim of these studies is to elucidate whether these bio-chemical signatures of past life-forms hold information about the causes and aftermath of extreme ice ages in the ancient past.

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The biogeochemistry class checks out acid mine drainage at Kempton, Maryland.

Tom Holtz and students from Earth, Life, and Time in the Galapogos Islands, Equador.

Kate Scheiderich feeding the fires at a methane seep in Baku, Azerbaijan.

Petrology field trip to a tonalite outcrop near Port Deposit, Maryland.

To contribute electronically please visit:

http://www.geol.umd.edu/pages/contribute.htm

Please consider strengthening your connection to the Department. I ask you to join with me and the faculty in supporting our students reach their goals.

I invite you to join the College of Computer, Mathematical and Physical Sciences as members of the Dean's Circle (gift level >$2,000) or the Newton Society (gift level >$1,000). An envelope is enclosed, giving you a convenient opportunity to participate, right now, in the exciting and important work that our students and faculty are doing.

You can help us to help future generations of Geology majors by earmarking your tax-deductible gift for Geology.

Your generous help allows us to provide grants to undergraduate students from the Fernow Field Fund to assist with the costs of field camp, and to award prizes for the Best Senior Thesis from the Stifel Undergraduate Research Fund and for the Best Graduate Student Presentations from the Chang Graduate Research Fund. The Hutton General Fund is used to address other needs in our drive for excellence in Education. In the future we aim to offer funded Summer Internships to undergraduate students.

Gifts to the Department of Geology also may be made directly to the Department by check or online (http://www.geol.umd.edu/pages/contribute.htm) using a credit card. Contributions to the Department of Geology by check should be made out to the University of Maryland College Park Foundation with "Geology" in the memo. To ensure that Geology is the receiver of your gift to the University of Maryland, please be careful when completing the Online Gift Form. On line two, please scroll down to "Other: Specify the gift designation in the following field", and on the third line in response to the question "Specify "Other" Fund or School/College" insert "Geology". If you do not change these items, Geology will not receive your gift.

I want to thank those of you who responded last year, and on behalf of the Department, offer my thanks, in advance, for your early and positive response to this request for your help this year.

Michael Brown

Bill Minarik, Ruth Thompson Schulte, and Tracey Centorbi discuss dunite near Corundum Knob, North Carolina.

Roberta Rudnick with Introductory Geology students at Great Falls, Maryland.

Kristina Brody, Jennifer Harvey, Craig Hebert, and Christine Missell at a Neoproterozoic glacial deposit at Goose Creek, northern Virginia

Students in sedimentation and stratigraphy pose on a wave rippled surface at Horseshoe Bend, Pennsylvania