2006 Gordon Research Conference on Rock Deformation: Processes and Patterns

Mark Jessell
Universite Paul-Sabatier, Toulouse

Greg Hirth
Woods Hole Ocean. Inst.

Plans for the 2006 Gordon Conference on Rock Deformation are well on the way, to be held at the Big Sky Resort, Montana over Sept. 3-8. This conference will focus on the relationship between processes of rock deformation and the spatial and temporal patterns of structures that result (see http://www.lmtg.obs-mip.fr/grc2006).

The theme of this conference is the relationship between the processes of rock deformation (from the nano-scale diffusion of atoms up to the lithospheric-scale transfer of large volumes of molten rock) and the spatial and temporal patterns that result. At this early stage the following represent only a partial list of the potential topics of interest.

*history dependent flow laws
*non-equilibrium behaviour
*scaling of patterns in nature
*periodicity of geological processes

*3D & 4D imaging of rock deformation
*single crystal vs aggregate behaviour
*paleo-rheology
*predictive geo-materials simulation
*high resolution dating of deformation

We also hope to offer one or two field trips before or after the conference that take advantage of the spectacular geology and scenery of the region.

Detailed information, including registration forms will be available later on this year via the conference web site: www.lmtg.obs-mip.fr/grc2006

Big Sky, southwestern Montana is located between West Yellowstone and Bozeman, Montana. Nearby Montana tourism attractions include Yellowstone National Park, the Gallatin River Canyon, and the Madison River Valley. Crystalline rocks of Precambrian age underlie the entire State of Montana, but are exposed only in the cores of Laramide-age mountain ranges in the southwest. Big Sky is less than 100km from the Stillwater Complex, and from the western entrance to Yellowstone Park.

AGU and GSA Honors

A number of our colleagues have received special recognition in the past two years for their professional contributions to the geosciences. Mervyn Paterson received the 2004 AGU Walter Bucher Medal and Adolphe Nicolas received the 2004 Harry Hess Medal. Jan Tullis received this year’s GSA Career Contribution Award in Structural Geology and Tectonics. Reid Cooper, Brian Evans, and Ernie Rutter have been recognized as AGU Fellows. Congratulations to all!

PPEM 2005 Dinner

Bill Durham
Lawrence Livermore National Laboratory

Please join us for our annual Physical Properties of Earth Materials (PPEM) dinner at the 2005 Fall AGU meeting. This year’s venue is a critically acclaimed Moroccan restaurant at

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a familiar location in the avenues (right across the street from the location of the 2002 PPEM dinner). Your PPEM Dinner Research Team promises you a unique evening and an absolute culinary delight.

Please pass this invitation along to PPEM-oriented colleagues. Our mailing list may not be all-inclusive. Official announcement and information are given on page 10 of this Newsletter. The PPEM website provides links to the restaurant and travel information (http://geoweb.tamu.edu/tectono/p pem/PPEM_Dinner.html). Please note the reservation deadline of November 18. We look forward to seeing you there.

**MSA Short Course on Water in Nominally Anhydrous Minerals**

_Hans Keppler_

Bayerisches GeoInstitut, Bayreuth

_Joseph Smyth_

University of Colorado, Boulder

MSA will offer a short course on water in nominally anhydrous minerals over October 1-4, 2006 in Verbania, Lago Maggiore, Italy. Two decades ago, water in nominally anhydrous minerals was an esoteric topic studied by only a very few scientists. Now it is in the mainstream of research in mineralogy, geochemistry and geophysics. Nominally anhydrous minerals constitute the main reservoir for water in the Earth’s mantle. Very likely, this reservoir is comparable in size to the mass of all oceans combined. The exchange of water between the mantle and the surface of the Earth may be responsible for slow variations in sea level. Even traces of water in minerals such as olivine drastically reduce mechanical strength, with major consequences for mantle convection. Without traces of water in olivine, plate tectonics would not exist on Earth. Partitioning of water between partial melts and nominally anhydrous minerals controls the water content and therefore the mobility of mantle melts. Some models suggest that the chemical evolution of the Earth’s mantle is largely controlled by water partitioning between nominally anhydrous minerals.

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**Marie Curie Summer Schools on Interdisciplinary Materials Science**

_Mark Jessell_

Universite Paul-Sabatier, Toulouse

Marie Curie Summer Schools will run between 2005 and 2008, each lasting 10 days, and offer young researchers:

- Presentations by 15 world-class materials scientists from all domains of materials science
- A combination of observational methods, experimental procedures, theoretical developments and simulation techniques
- A state of the art knowledge of the similarities and differences between natural and manufactured materials
- Insights into current research at a wide range of scales
- Training in Science and Society, Science Management and Scientific Communication
- International contacts with researchers at all levels and from all materials science disciplines

Applications for funded places for the Alvdalen 2006 summer School will be open on the first of November 2005 at http://www.materialsknowledge.org

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**Fundamentals of Structural Geology**

_David Pollard_

Stanford University

_Raymond Fletcher_

Penn State University


The new text, Fundamentals of Structural Geology provides a new framework for the investigation of geological structures by integrating field mapping and mechanical analysis. Assuming a basic knowledge of physical geology, introductory calculus and physics, it emphasizes the observational data, modern mapping technology, principles of continuum mechanics, and the mathematical and computational skills necessary to quantitatively map, describe, model, and explain deformation in Earth’s lithosphere. By starting from the fundamental conservation laws of mass and momentum, the constitutive laws of material behavior, and the kinematic relationships for strain and rate of deformation, the authors demonstrate the relevance of solid and fluid mechanics to structural geology. This book offers a modern quantitative approach to structural geology for advanced students and researchers in structural geology and tectonics. It is supported by a website hosting images from the book, additional color images, student exercises and MATLAB
scripts. Solutions to the exercises are available to instructors.

- The book integrates field mapping using modern technology with the analysis of structures based on a complete mechanics
- MATLAB is used to visualize physical fields and analytical results and MATLAB scripts can be downloaded from the website to recreate textbook graphics and enable students to explore their choice of parameters and boundary conditions
- The supplementary website hosts color images of outcrop photographs used in the text, supplementary color images, and images of textbook figures for classroom presentations
- The textbook website also includes student exercises designed to instill the fundamental relationships, and to encourage the visualization of the evolution of geological structures; solutions are available to instructors

Visit the textbook website at: http://pangea.stanford.edu/projects/structural_geology/  Contents:


**IUGS Task Group on Tectonics and Structural Geology**

*Mark Jessell*
Universite Paul-Sabatier, Toulouse

The Task Group on Tectonics and Structural Geology (TecTask) represents an initiative of Earth Scientists dedicated to stimulate communication and coordination within the international science community and to provide information to the public. The group encourages innovative research and continued education in Tectonics and Structural Geology, the growth of intellectual capital and hence the impact of our science on the wealth of the global society. TecTask reaches out to scientists and students, particularly those from developing countries, to share cutting edge research and development, and state-of-the-art training. Dialog and cooperation is welcomed with organisations, industries and administrations regarding applications in Structural Geology and Tectonics for sustainable use of the world’s natural resources, the preservation of the environment and prevention of natural hazards.

**Why Register at the TecTask site?**
(http://www.tectask.org)

Registered members of the TecTask site gain access to the full searchable membership list of other members interested in structure/tectonics, as well as access to the free downloadable software library. Members can also submit web links to their favourite sites.

**Committee:** Prof. Cees Passchier - Mainz, Germany (Chairperson), Dr. Mark Jessell - Toulouse, France (Vice-Chair), Dr. Hermann Lebit - New Orleans, USA (Secretary-general), Prof. Paul Bons - Tübingen, Germany, Prof. John Dewey - Davis, USA, Prof. Bruce Hobbs - Perth, Australia, Prof. Ron Vernon - Sydney, Australia

Work plan - In the terms of reference, the potential issues to be addressed are:

1. Develop, maintain and expand a website on research programmes, funding organisations, events, databases, teaching materials etc.
2. Encourage organisation of special sessions on dedicated tectonic related topics in conferences, field trips, prizes and stimulate the production of review papers
3. Develop standards and databases on Rheology and other tectonic/structural issues
4. Promote structural geology education particularly in the developing countries.
5. Advise IUGS, ILP and IGP for their future developments in tectonics and structural geology.
6. Stimulate international cooperation and coordination in Tectonics and Structural Geology.

**Society of Petroleum Geophysicists (SPG)**, India, an associated section of the Society of Exploration Geophysicists (SEG), USA & the European Association of Geoscientists & Engineers (EAGE), Netherlands is organizing its 6th International Conference & Exposition on Petroleum Geophysics with the theme "Geophysics for Mitigating Exploration Risks", Jan. 9-11, 2006, Science City, Kolkata.

The conference is likely to be attended by around 1000 delegates from India and abroad. Around 20 technical sessions covering various facets of petroleum exploration are planned. The conference will also consist of the
international exposition, showcasing cutting-edge Geophysical Technologies for E&P and challenges & opportunities in Petroleum exploration. We invite abstracts related to rock physics and petroleum research for this conference.

Details about Kolkata 2006 are given at www.spgindia.org. If there are any queries, please contact:

Dr. C.H. Mehta  
Vice-President, SPG & co-chairman, Technical Committee, Kolkata 2006  
Phone: +91 135 2763686  
Cell: +91 9837533354

We look forward to seeing you in Kolkata!

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### 2005 Euro-Conference on Rock Physics and Geomechanics

**Christian David**  
Cergy-Pontoise University

**Mickaële le Ravalec**  
IFP

The Euro-Conference on Rock Physics and Geomechanics was held Sept 18-22, 2005 in Île d'Oléron, France, and focused on "Integration and Application to Reservoirs and Repositories." This meeting was part of the series of Euro-conferences devoted to Rock Physics and Geomechanics, which started in 1998 in Aussois, France, and it followed up on the 2003 conference in Kjeldun (Micromechanics, flow and chemical reactions) and the 2004 conference in Potsdam (Scaling laws in space and time). The specific emphasis of the 2005 Euro-conference in Oléron was on integrated studies from the areas of hydrocarbon and geothermal recovery, hazardous waste repositories and deep drilling projects. The meeting was attended by 71 scientists from academia and industry interested in rock physics and geomechanics, coming from 12 different countries all over the world. A total number of 66 contributions were presented during the conference (41 oral and 25 posters). The program was organized in six sessions with different themes:

1) Characterization of reservoirs, with special focus on a) fluid flow and reactive transport, b) seismic monitoring and c) mechanical behaviour and localization
2) Characterization of repositories
3) CO₂ sequestration
4) Deep drilling projects and borehole studies.

Each session was introduced by a keynote lecture. Chin-Fu Tsang (Berkeley) gave the introduction talk with a nice overview on the different conference topics. Paul Bossart, director of the Mont Terri project in Switzerland, presented the challenges that scientists face in the design and monitoring of underground nuclear waste repositories. John Rudnicki (Northwestern University) presented recent advances in models for propagation of compaction bands in reservoir rocks. François Kalaydjian (IFP) introduced the CO₂ storage session with an overview on the challenging task of capturing and storing CO₂ in geological reservoirs in order to reduce CO₂ emissions into the atmosphere. Teng-fong Wong (Stony Brook) presented some recent geomechanical data on cores retrieved during ongoing deep drilling projects (Taiwan Chelungpu fault and SAFOD).

The sunny weather throughout the conference and the beautiful environment fostered dialogue between the geomechanics and rock physics communities working in different areas (reservoirs, repositories). Thanks to the sponsors who supported the conference (IFP, Total, ANDRA, CNRS, University Cergy-Pontoise), 23 young scientists could attend the conference with zero registration fee. The complete list of abstracts can be downloaded on the conference web site (http://www.u-cergy.fr/ec2005).

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### The 2004 Gordon Research Conference on the Role of Water in Rock Deformation

**Andreas Kronenberg**  
Texas A&M University

**Mark Jessell**  
Universite Paul-Sabatier, Toulouse

The 2004 Gordon Conference on Rock Deformation was held at Mount Holyoke College in South Hadley, Massachusetts over Aug. 8-13. Attendance at this meeting was excellent, drawing 138 participants from the United States, Europe, Japan, and elsewhere. Of these, 39 were graduate students and 20 were postdocs.

The objective of the conference was to examine new developments in understanding the fundamental processes by which water influences mechanical properties of rocks, and the geologic and geophysical implications of water weakening. The conference was organized around 21 talks by leading scientists in rock mechanics, tectonics, geochemistry, petrology, mineral physics, and materials science to address the physics and chemistry of water weakening, the occurrence and nature of subsurface fluids, fluid (continued on page 7)
What Will the State of US Rock Mechanics be in 2015?

Stephen Karner
Idaho National Laboratory

As members of the PPEM community, you are assuredly aware of the many contributions that geomechanics has made to a variety of sciences. Yet, despite the many and important past contributions, the US rock mechanics community is increasingly concerned about the future of geomechanics in the USA. This is evidenced by several meetings that have been convened in recent years to help shape the future of geomechanics – including the 1998 Asilomar forum [Glaser and Doolin, 2000], the 2003 Miami workshop [see Bass, 2004, and Lieberman, 2005], and the 2004 Mount Holyoke workshop held immediately following the 5th Gordon Research conference on Rock Deformation.

The 2004 Mount Holyoke workshop specifically focused on the future of experimental rock mechanics in the USA, which is presently at a crossroads in terms of its evolution and contribution to science. As a discipline, experimental rock mechanics has had a long-standing relationship with academia and is currently enjoying a heightened level of attention offered by the private sector and cooperative ventures between the government and industry. However, the present situation in academia is less than ideal because the interest our colleagues have in our science has subsided in recent decades. Experimental geomechanists in academia are also facing difficulties luring new graduate students into the field – due to budgetary issues related to operating costs, waning recognition of and appreciation for the science, and uncertain career paths. The latter is especially significant for those promoting (or seeking) academic careers inasmuch as many university-based rock deformation laboratories in the USA are lead by faculty who are nearing retirement age. These academic laboratories face an uncertain future in terms of who will take over leadership of the labs or, more importantly, whether the labs will continue to exist.

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A New See-Through Deformation Apparatus Enabling the Control of Fluid Pressure

Oliver Schenk
Janos Urai
RWTH Aachen

In-situ deformation experiments allow continuous and real-time observations of the whole range of processes active during and after grain boundary migration. Such deformation experiments in transmitted light on ice have been used in glaciology since the late 1950s. This technique was further used in geosciences to get detailed insight into the complex dynamics of the microstructural evolution during creep (Means, Journal of Structural Geology 11, 163-174, 1989, and references therein) and is now a well established and useful tool in structural geology (e.g. Bons & Urai, Journal of Structural Geology 14, 1101-1109, 1992; Bauer et al., Tectonophysics 320, 141-165, 2000; Walte et al., Geology 11, 1009-1012, 2003).

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Sciences) will be reduced over the next three years, research, graduate and postgraduate education in Earth Sciences will be continued. With the revised portfolio-analysis in hand, the University convinced the politicians of the cantons and the contract for financial support was signed.

Thus, in the future the department will focus more on environmental issues, as it seems to be a current trend in the Earth sciences everywhere. There have been some painful budget cuts, of course, and several teaching and research positions in a traditionally strong field of our department (tectonics) will be lost. However, for the moment, within Basel University, the Earth Sciences have secured their presence among the Geosciences. In the new framework, a reduced program of hard rock geology teaching and research will be continued as indispensible parts of the geology graduate and undergraduate education. The graduate program will be continued as Geoscience MSc and PhD. We owe this success to a large extent to the overwhelming support from our colleagues all over the world, and that includes a lot of people from the PPEM community. We thank you all very much for your help in difficult times!

Concerning our PPEM network, Renee Heilbronner and Holger Stunitz will continue the Rock Deformation Group in Basel with their fabric analysis and experimental set-up consisting of light-, SEM- and TEM-microscopy, image analysis and CIP technique, X-ray texture goniometry, and two Griggs solid medium deformation rigs including all necessary peripheral sample preparation facilities, etc. We are also happy that the Swiss National Science foundation keeps financing our research projects.

We are looking forward to our future research projects and to good collaboration with the PPEM community!

**Earth Sciences Faculty Openings at Boston University**

*Geoffrey Abers*

Boston University

The Department of Earth Sciences at Boston University invites applications for one or more tenure-track positions at the Assistant Professor level, to begin September, 2006, pending approval.

In the field of Tectonics and Deformation, we seek applicants whose research emphasizes quantitative studies of the deformation, rheological properties and physical evolution of earth materials at any scale; approaches might include microstructural analysis, rock mechanics, structural geology, and/or large-scale tectonics.

In the field of Surface Processes, we seek applicants whose quantitative research in geomorphology emphasizes one or more of the following: dynamics of hillslope, fluvial, or coastal systems; soil processes; links among landscape evolution, climate, and tectonics.

The successful applicant will be expected to supervise graduate thesis work in M.A. and Ph.D. programs, maintain an externally funded research program, and teach at all levels in the Earth Sciences curriculum. We seek an applicant whose research complements existing strength in the department and college (see [http://www.bu.edu/ES](http://www.bu.edu/ES)). A Ph.D. at the time of appointment is required.

Applicants should send a curriculum vitae, a statement of research and teaching interests, and the names and addresses of at least three referees to: Search Committee Chair, Department of Earth Sciences, Boston University, 685 Commonwealth Ave., Boston MA 02215 USA; email: Earth@bu.edu. Review of applications will begin on December 20, 2005. Women and underrepresented minorities are particularly encouraged to apply. Boston University is an equal opportunity/affirmative action employer.


**MSA Short Course**

**Water in Minerals**

*(continued from page 2)*

Major progress has been made in recent years by systematic experimental calibrations of water solubility and water diffusivity in minerals, by the development of new analytical methods for quantifying water down to very low concentrations and by the modeling of hydrous defects at the atomistic level. These areas of research are still very active and will continue to be active for many years. Integrating data on water in nominally anhydrous minerals into global models of mantle convection or into models of the global water cycle, is a major new field of research that is only beginning to open up.

The short course will provide an overview over this active area of research by the world’s leading scientists in the field. The keynote lectures by invited speakers will be supplemented by poster sessions and short contributed talks. All participants are invited to submit their own contributions for consideration either as poster or as oral presentation.
For Lecture Topics, Speakers and details about this MSA Short Course, see www.minsocam.org and www.bgi.uni-bayreuth.de

Expected pre-registration deadline will be around June 15, 2006.

Marie Curie Schools - Interdisciplinary Materials Science
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The four summer schools will be organised by:
Prof Günter Gottstein, Aachen 2005 - Single Phase Materials
Dr Sandra Piazolo, Stockholm 2006 - Composite Materials
Dr Mark Jessell, Toulouse 2007 - Partial Melts & Amorphous Solids
Prof Karel Schulmann, Strasbourg 2008 - Hydrous & Porous Systems

In order to provide a wider access to researchers in the European Union, to showcase the research skills of the participants and to capture the training materials prepared by the invited speakers and participants, Prof Paul Bons, Tübingen will combine the teaching materials developed for this course into a continuing Web Portal and CD-ROM resource from mid 2005. Course materials and participant posters are now available from the 2005 Summer School run by Prof. Günter Gottstein of the Institute of Physical Metallurgy and Metal Physics RWTH-Aachen which focused on multidisciplinary aspects of materials science associated with single phase materials.

GRC on Role of Water in Rock Deformation
(continued from page 4)

The 2004 Mount Holyoke workshop outlined several future potential directions for experimental rock mechanics: a) continue with business as usual (given the present situation, not an attractive option), b) set up one or more national centers for rock deformation that will be open to use/collaboration with the entire scientific community (akin to the National Center for Electron Microscopy housed at the Lawrence Berkeley National Laboratory), c) establish a list of currently existing equipment that could be used by others during quiet (or idle) times and to ensure that the equipment is not scrapped at a later date, d) define the key research problems that need to be resolved, and e) determine which design(s) for testing apparatus would provide significant contributions to science and thereby benefit the entire geoscience community.

As the experimental geomechanics community rises to the challenges ahead it is important that all members of PPEM take steps to help redefine the future outlook of the science. While there are many issues to be discussed, one key question relates to how the discipline can contribute to fundamental Earth science research problems that need to be resolved. This is a question for which the PPEM community can provide considerable input and help address the over-arching issues. In working to resolve these issues, we should seek input from the broader geoscience community to learn how we may better contribute to their scientific sciences, and ExxonMobil for funding.

State of US Rock Mechanics
(continued from page 5)
endeavors. I encourage you to step forward, as it is up to us to determine those path(s) that best serve the academic community and thereby our own.

References:


Liebermann, R.C. (2005), The future of high-pressure mineral physics, Eos, 86 (40), 365.

New See-Through Deformation Cell
(continued from page 5)

The newly developed see-through deformation apparatus (Fig. 1) builds on the design of Urai (Tectonophysics: 135, 251-263, 1987), but includes a controlled pore fluid system that allows fluid pressures up to 30 MPa. The design of the apparatus is shown in Fig. 2. It consists of a pressure vessel equipped with high-strength see-through windows at the top and bottom (cover glass plates). The windows are sealed with o-rings and the top window is held in place by a precision nut. The assembly is heated with coils outside the pressure vessel and mantled with insulation material. The maximum operating temperature is 250 °C. The maximum effective stress (σ’1) is limited by the strength of the pistons; we have tested the apparatus to σ’1 = 8 MPa.

The cell interior is a sandwich of glass plates, sample holder and sample. The inner glass plates have slots on one side, which prevent buckling of the piston. The sample assembly consists of a stainless steel holder and a pin guide that acts as a forcing block, (both with a thickness of 300 µm) (Fig. 3). The piston is connected to a constant-speed step motor and thus serves as moving σ1 piston. It is internally compensated, i.e. the loading ram moves into the cell without change of fluid volume (Tullis & Tullis, AGU Geophysical Monograph 36; 297-
Figure 3: The deformation cell with the sandwiched sample assembly.

Figure 4: Image sequence showing migration of a fluid-filled grain boundary that incorporates fluids from inclusions leaving behind a zone that is free of inclusions. Note however that the fluid-rich (thicker) part of the boundary is dragged (T= 70 °C; prior strain rate: 4·10⁻⁵ s⁻¹). The direction of the migrating grain boundary is indicated by the single arrow in the first image.
324, 1986). The opposite piston finely regulates the fluid pressure.

An optical invertoscope with long working distance objectives is used for direct observations of the experiments. The microscope is equipped with a digital camera that takes high resolution images at specific time intervals.

First results of a study of the microscale distribution of fluid in grain boundaries are presented in Journal of Metamorphic Geology, 23, 695-709, 2005. The material used in the experiments was synthetic, polycrystalline bischofite. We deformed the bischofite samples containing small amounts of aqueous fluid at temperatures between 50 and 90°C, with a range of fluid pressure from 0.5 to 1 MPa and strain rates of $5 \times 10^{-6}$ s$^{-1}$ to $1 \times 10^{-4}$ s$^{-1}$. Detailed observations of migrating fluid-filled grain boundaries were made, during and after deformation (Fig. 4). Results showed the incorporation of fluids from inclusions into grain boundaries as well as their pinch-off as a function of the grain boundary velocity, the thickness of the grain boundary and the size and shape of the inclusions. The process is analogous to inclusions in deformed and recrystallized metamorphic rocks. We also found direct evidence of the contraction of the grain boundary fluids into isolated inclusions after grain boundary migration had stopped; a possible indication for commonly observed isolated fluid inclusions rather than continuous fluid films.

Acknowledgments: We thank F.-D. Scherberich and the workshop of the Institute of Crystallography (RWTH Aachen) for constructing the deformation cell and are very grateful to C. Hilgers and F.-D. Scherberich for the many fruitful discussions on the machine's design. Without their essential help, the apparatus would not be in its present state.

PHYSICAL PROPERTIES OF EARTH MATERIALS
2005 FALL AGU MEETING DINNER

PLACE:
Aziza
5800 Geary Blvd @ 22nd Ave
San Francisco
415 752 2222
http://aziza-sf.com/

"Aziza remains by far the best Moroccan restaurant in the city" -- Michael Bauer, SF Chronicle food critic
"Holy smokes, this is good" -- B. Bonner, a voice we can trust
See also Michael Bauer's Top 100 Bay Area Restaurants:
http://www.sfgate.com/cgi-bin/listings/restaurants/top100venue?vid=181752

TIME:
Monday evening, 5 December 2005
6:30 pm cash bar
8:00 pm dinner

NOTE: SEATING IS STRICTLY LIMITED AT 60!
Seating in the main dining room of the restaurant is limited by fire regulations to 60 persons. If your reservation falls beyond 60, we will do as last year: You will be seated in an adjoining 30-seat dining room and, along with regular restaurant patrons, will order off the menu. We will refund your reservation payment at the dinner, probably in cash, and you will deal directly with the restaurant. If you want to enjoy the PPEM crowd, it behooves you to reserve early. If you want to live dangerously and maybe save a couple of bucks, wait until the last moment. In either case you'll enjoy the same great food and great atmosphere.
TRANSPORTATION HINTS:
   Share a cab (15-20 minutes, $20-25/cab)
   Take a Muni bus ($1.25).
   Take the 38L Geary bus schedule, which is a main east-west line originating at the Transbay terminal downtown and passes Aziza. The 38L is an express and stops at 20th Ave, two blocks east of the restaurant. Avoid the 38 Geary, which is a local. A cab should take 15 to 20 minutes; the bus about 30 minutes depending on traffic. The bus schedule is posted at:

MENU: Prix Fixe
   The Prix-Fixe consists of chef's selections from the menu, and actually varies from table to table (usually 8/table).
   Vegetarian tastes are easily accommodated.
   Desserts, selected by the pastry chef, follow the meal.

COST: $58 people/$40 students; includes dinner, limited wine, tip, and tax.
   Payment requested by 18 November 2005
   See reservation form on Next Page.

PAYMENT: PayPal to durham1@llnl.gov, or checks payable to "PPEM"
   Non-U.S. participants unable to pay by check may reserve now, and pay Bill Durham at the AGU meeting.
2005 PPEM Dinner Reservation Form

Reservations must be made and payments received before 18 November 2005. Send this form or reasonable facsimile by e-mail to:

durham1@llnl.gov

or make a hardcopy and send by posted mail to the address below.

Please reserve:

______ places at $58.00 each
______ student places at $40.00 each

Payment: (due 18 November 05)

______ I am mailing a check made out to "PPEM"
(Please DO NOT make checks out to Bill Durham)

to: W. B. Durham, L-201
    UC LLNL
    P.O. Box 808
    Livermore, CA 94550
    USA

______ I will pay by PayPal https://www.paypal.com/
Recipient's Email: durham1@llnl.gov
Type: Quasi-cash
Subject: 2005 PPEM dinner
Note: your name
(Since PPEM does not have a business account, we can NOT accept credit card payment. You must establish your own PayPal cash account, which takes about two weeks)

______ I will pay Bill Durham at the AGU meeting BEFORE the dinner
(please: non-U.S. residents only)

Name: __________________________________________
Affiliation: _______________________________________

Other information, comments, special dietary requests, etc:

____________________________________________________________________
____________________________________________________________________
____________________________________________________________________

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