STRUCTURAL GEOLOGY and TECTONICS DIVISION *Newsletter*

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CHAIRPERSON'S MESSAGE

A most important development for all of us who pursue research in structural geology and tectonics is the identification, by several recent high-level reports, of *Active Tectonics* as a high-priority research area at the national level. In order to turn this identified research area into a funded initiative, however, it will be necessary for the scientific community to work together to develop a compelling science plan, demonstrating a genuinely new approach and involving collaboration between field observationalists, experimentalists and theoreticians, geologists and geophysicists, as well as ultilization of the most modern tools and techniques. George Davis and Roy Dokka have generously contributed substantial time and energy already this spring and summer in organizing a response from the SG&T community that will effectively address these research goals. Please see the detailed report of this initiative elsewhere in this *Newsletter*, and plan to attend the Division's Business and Awards Meeting at the Boston GSA Annual Meeting for an update on the initiative and open discussion of it.

The schedule for the Boston meeting is now finalized, and there should be sessions of strong interest to Division members on all days. A two-day pre-meeting short course on "Fracture mechanics of rock" will be presented by Terry Engelder, with help from Mike Gross and Mark Fischer. Our divisional symposium on "Inferring paleoseismicity from fault-zone fabrics", organized by Fred Chester and Ron Bruhn, is scheduled for Monday afternoon, Oct. 25th. It fits in very well with the general theme of *Active Tectonics* , since it will involve contributions from both experimentalists and field workers, and will address processes and properties on a variety of scales. In addition, there are at least nine theme sessions of strong interest to Division members. The Division's Business and Awards Meeting is scheduled for Tuesday, Oct. 26th, from 5:30-6:30, to be followed, as usual, by our no-host reception (held jointly with the Geophysics Division). You have already seen the announcement in *GSA Today* that this year's Career Contribution Award goes to Ben Page, emeritus professor at Stanford. This year's Student Research Award also goes to a Stanford affiliate, Jed Mosenfelder. Please make sure to come to the meeting to honor these people, together with the still-to-be-announced winner of the Best Paper Award.

It's election time again! You will notice that this year's ballot contains, in addition to the names of our three fine candidates for Second Vice-Chair, a new name for Secretary-Treasurer, Art Goldstein. Don Secor is stepping down after generously serving three two-year terms. Thanks, Don, and welcome aboard, Art!

I mentioned in the last *Newsletter* that the Management Board decided it would be extremely useful to appoint a four-member Short Course and Symposium Committee. The attached ballot contains an addition to our bylaws that will formalize the existence of this committee, if it is approved by Division members. Meanwhile, we have gone ahead and constituted a committee for this year consisting of Rick Almendinger, Jeff Karson, Tekla Harms, and Board member Ed Beutner. If you would like to organize a short course or symposium yourself, or have an idea for a topic that would be of broad interest to the membership of the Division, then please contact one of these people with your suggestions.

There is increased interest and emphasis these days on the teaching side of our profession, which is a healthy thing as all of us hope to be life-long learners. At the Boston annual meeting there

will be several workshops related to teaching methods and curriculum innovation (see list in *GSA Today*) and a theme session on "Teaching mineralogy", in addition to numerous field trips and other programs aimed at K-12 teachers. Several of us are still seriously thinking of organizing a workshop (or theme session?) for the Seattle annual meeting along the lines of "Teaching structural geology". We would welcome your suggestions for the most useful content and the most effective format for such a workshop. [My email address is: jt@gech033.geo.brown.edu]
These are stressful times for many of us. I think we can lessen the stress by pulling together, with increased communication and collaboration. Hopefully our Division can play a helpful role here -- but we do need your input! Please make sure to send in your ballot (hopefully we can improve on last year's 14% returned ballots); send in nominations for Career Contribution and Best Paper awards; submit suggestions for symposium and short course topics, for field trips and workshops, or for new activities you think we should become involved in; and finally, heed the fervent call of the *Newsletter* co-editors for letter of opinion or contributions to the various columns (The Resource Bin, Have You Heard ...?).
I hope to see you in Boston this fall, and hear your ideas!
Jan Tullis, Department of Geological Sciences
Brown University, Providence, RI 02912
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ABSTRACT REVIEW FOR SG&T SESSIONS AT ANNUAL MEETINGS: IS THE PROCESS REALLY NECESSARY?

The question has been raised in Divisional circles if the formal review of abstracts submitted for the Annual Meeting in the areas of structural geology and tectonics should be continued. In the past, one purpose of the review was to reduce the total number of abstracts in order to keep session scheduling under control; the percentage of rejected abstracts rarely exceeded 10%. Review and rejection of some abstracts was deemed especially important when meeting facilities and lecture rooms were limited. Fewer papers allowed for saner scheduling of technical sessions, less overlapping of sessions, and in some cases the opportunity for coffee breaks in the middle of sessions. Review of abstracts has usually involved the efforts of six to eight Division members. The argument has recently been made that the convention centers in which GSA's Annual Meetings are now held are so large as to not present problems about the number of sessions or room availability. Of course, other major reasons for past formal review of Annual Meeting abstracts continue: 1) to cull out scientifically weak abstracts (sometimes a fairly subjective proposition), 2) to reject abstracts of only local interest (or those best delivered at regional GSA section meetings), and 3) to eliminate the practice of "double dipping" (an individual presenting more than one non-invited abstract as its senior author).
Jan Tullis has suggested that comments concerning a change in abstract review policy should be solicited from the membership of the Division. Should the present procedures for review (and limited rejection) of volunteered abstracts be continued, or should, in effect, all submitted abstracts be accepted for oral or poster presentation? Your opinions can be mailed to Jan at the address below her presidential message, or if you'd like to share them with the membership, please send us (the editors) a letter or note for publication in the March 1994 *Newsletter* (you should know by now that we love to get mail).

NSF NEWS

Late spring and summer were busy months at NSF, with a good bit of time spent on the Active tectonics "initiative." This is an outgrowth of the Structural Geology and Tectonics Division's efforts to more effectively present the value of our science to policy makers, and as a consequence bring much needed new money into the Tectonics Program (more on this later). In June, Roy Dokka returned to LSU as planned (he agreed to come for only one year whereas the rotator position can be for up to two years), and Carol Simpson agreed to return for a year. Roy worked hard at exploring ways to organize our community and to formulate ideas for the so-called "initiatives" for NSF management to consider. He talked to several Congressional staff members and managers in other government agencies about how to approach the problem of steering an initiative through the funding system. As a result, we are much further along in this category than would have been the case without his efforts. Carol is continuing to work on the Active Tectonics initiative, as well as dealing with regular program duties. In the "business as usual" department, Carol's arrival coincided with 136 new proposals from the June 1 deadline, so we put in lots of time reading proposals and assigning reviewers to them. Here are some interesting statistics about the June 1 submittals.

Total number 136 (up by a few from last time)
Total dollars 16.5 m (up a lot, mostly due to increased durations)
% resubmittals 39% (up some from last time)
of recently
declined proposals
number of 24 (two or more universities
collaborative submitting joint proposals
proposals for the same project)
% requesting 42% (up a lot due primarily to
36 month the new guidelines that
or longer durations encourage longer durations)
% involving 40% (about the same)
foreign research

With a level budget projection, to at best an increase matching inflation (Tectonics had 6.8 m last year), the above trends are not particularly heartening. In the last issue of this *Newsletter*, we discussed the emerging problems caused by the increase in resubmissions and asked for your ideas; to date, we have not received responses. The obvious solution is to have more money, and we are working on that, but in the meanwhile there are several options: 1) do nothing -- allow declined proposals to be resubmitted for the next deadline and review them the same way as new proposals; 2) same as 1), but require a minimum of "change" however that might be defined; 3) require a delay of one review cycle before resubmittal; 4) review resubmittals differently (abbreviated addendums and reduced additional review); 5) establish (enforce actually) the "three times and you're out" rule; and 6) (YOUR ideas go here...let us know what you think). Silence from the community (on this and other things) means a Washington bureaucrat will have free rein to really run amok!

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Update on the Active Tectonics initiative

Since the last newsletter was published several things have happened. The long awaited National Research Council's "Solid-Earth Sciences and Society" report, otherwise known as the "Keck Report" became available, and a meeting of the Advisory Committee of the Earth Sciences Division (ACES) was held. *Darrel Cowan*, then an ACES member, acted as spokesman for an "Active Tectonics" initiative that built on earlier concepts along the same line. (You may recall from the SG&T AGM last Fall that this topic was chosen for our current initiative because your proposals made it quite clear that this is an area of much current interest and potential breakthrough, two of the main justifications for a successful initiative). The initiative also fits nicely with the emphasis placed on Active Tectonics in the Keck report. The Advisory Committee enthusiastically endorsed the Active Tectonics concept and included it in their long range plan. Roy followed up on this and discussed it with a number of people. *George Davis*, University of Arizona offered to help organize a workshop to develop a science plan. In late spring the Structural Geology and Tectonics Division leadership (*Jan Tullis* and *Rick Groshong*) and George came to NSF to discuss how best to proceed with the initiative. The group met with various program directors and on the last day met with Dr. *Robert Corell*. Dr. Corell is the Assistant Director of NSF in charge of the GEO Directorate (of which the Earth Sciences Division is a part) and is a key person as far as the success or failure of this or any initative is concerned. The presentation made by George was well-received, and we were encouraged to proceed. By the time you read this, a first workshop to develop a science plan should have occurred. The workshop report will then be used to help justify NSF in placing a high priority on Active Tectonics in the budget process, and with any luck we will be able to bring in some new money to the program to help support all these Active Tectonics proposals! There is a lot of work to be done still, so please contact us, Jan, Rick or George to offer your help.

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The *Newsletter* editors suggested that an update on "international" research may be useful. The Tectonics program is no stranger to projects in part performed outside US territory. In fact, approximately 40% of awards involve foreign activities of one sort or another (besides conference attendance). Furthermore, we commonly ask overseas reviewers for their opinions when they have appropriate backgrounds, especially if they also have some experience with our system. These projects vary from simply involving a foreign site or research area with little or no collaboration with the local geologists to those conducted under formal government-to-government bilateral agreements. All involve more planning and investigation of local laws, customs and practices than domestic ones do- sometimes a lot more. Of course it is scientifically worth the extra work (and aggravation) if the research can be done in the world's best place for the particular problem rather than in a lesser but logistically simpler place in the US.

NSF recognizes the value of international research and collaboration, and has a Division of International Programs (INT) that is charged with encouraging the establishment of new links between scientists in foreign countries and US researchers. They also coordinate with counterpart funding agencies on the many protocols and agreements between the US and other countries. They sponsor planning visits, workshops and, less commonly, some aspects of regular research projects.

The Tectonics program (and other scientific programs at NSF) is basically neutral on the question of domestic vs. foreign. The bottom line in determining the priority of a project is the perceived value or significance of the proposed work, tempered by cost-effectiveness and assessment of potential problems in actually getting the planned work done. If an "international" proposal has competed successfully with other proposals submitted, it is nice that various agreements and protocols exist, because (presumably) their presence will help with things like access to field areas, official government approvals, work permits, shipping of samples, import of equipment (and its return!) etc. However, just because a Tectonics proposal was submitted under a bilateral agreement it is not entitled to preferential treatment. It competes on an equal footing with all other kinds of proposals. In your dealings with potential foreign collaborators not familiar with our system, try to get across the idea that a bilateral agreement does not mean entitlement or a guarantee of funding, nor does a declination constitute a change in official policy towards the project or the country involved, nor is it an attempt to send a political message.

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The following awards were made by NSF from the Tectonics Program for the period January 1993 to July 1 1993...Congratulations!

Tom Wright
Carol Simpson

Avé Lallemant, Hans Rice University Uplift and Exhumation of Eclogites and Blueschists in Venezuela: Constraints based on Structural Analysis, Geotherobarometry and Geochronology
Bauer, Robert University of Missouri Analysis of Proterozoic Deformation in Archean Rocks North of the Cheyenne Belt in the Central Laramide Range, SE Wyoming
Beraten, Katherine University of Pittsburg RPG: Sedimentary record of Interactions between the Garlock and Southern Death Valley Fault Zones, Avawatz Mts., CA
Burbank, Douglas University of Southern California Calibration of Fold-and-Thrust Belt Models: Sequencing, Geometries and Rates of Thrusting and Syntectonic Deposition, Spain

Burchfiel, B. Clark MIT Field and Laboratory Study of the Emplacement of the Scandian Allochthon, Northern Scandinavian Caledonides: Subduction/Extension or both?
Chamberlain, C. Page Dartmouth College COLLABORATIVE RESEARCH: Thermochronologic Closure Temperature in Regional Metamorphic Settings: An Empirical Study
Crawford, Maria L. Bryn Mawr College COLLABORATIVE RESEARCH: Thermal Evolution of the Maryland Pennsylvania Piedmont: Application of U-Pb Geochronology to Collisional Tectonics
De Celles, Peter University of Arizona Reconstruction of Thrust-Wedge Taper in the Wyoming-Utah Sevier Thrust Belt
De Paor, Declan George Washington University The Design of Geological Structures Using Bezier Polynomials
Erslev, Eric Colorado State University Non-volatile Element and Volume Flux in Cleaved Rocks
Fisher, Donald Pennsylvania State University Investigation of Fluid Flow in an Ancient Subduction Zone

Furlong, Kevin Pennsylvania State University COLLABORATIVE RESEARCH: Thermal Modeling of Himalayan Geology
Goodwin, Laurel New Mexico Inst. of Mining & Tech. RPG: Characterization of Pseudotachylyte formed in an Extensional Tectonic Regime

Harper, Gregory SUNY Albany Oceanic Faulting in the Northern Appenine Ophiolites, Italy
Hodges, Kip MIT Mesozoic Extensional Processes in the Sevier Orogen: Studies in the Funeral Mts., CA-NV and the Bitterroot Mts., ID-MT
Hodges, Kip MIT COLLABORATIVE RESEARCH: Thermochronologic Closure Temperature in Regional Metamorphic Settings: An Empirical Study
Holm, Daniel Kent State University Fnd. Unroofing History of the Early Proterozoic Penokean Fold-and-Thrust Belt
Jones, Craig University of Nevada-Reno COLLABORATIVE RESEARCH: Paleomagnetic Investigation of Miocene Sediments in the Gale Hills, S. Nevada: Tectonics of Vertical Axis Rotations
Karlstrom, Karl University of New Mexico Middle Proterozoic Tectonic Regimes in the Southwest: "Anorogeny" or an Orogeny?
Kusky, Timothy Boston University Structural and Magmatic Disruption of an Accretionary Wedge during Ridge Subduction, Kenai Peninsula, Southern Alaska
Law, Richard Virginia Polytechnic Institute & S.U. Structural and Tectonic Significance of Shear Zones in the Sierras Pampeanas near Cordoba, Argentina
Lawton, Timothy New Mexico State University Tectonic Inversion of Early Cretaceous Bisbee Basin as a Primary Control of Laramide Structural Style and Trends, SE Arizona and SW New Mexico
Miller, Meghan Central Washington University The Role of Extension during Evolution of a Transform Plate Boundary, Northeastern Baja California, Mexico
Paterson, Scott University of Southern California Pluton Roofs: Testing Pluton Emplacement
Pavlis, Terry University of New Orleans COLLABORATIVE RESEARCH: Tectonic Consequences of Ridge Subduction and Plate Reorganization: the Chugach Metamorphic Complex, Alaska
Phillips, Fred New Mexico Inst. of Mining & Tech. Determining the Uplift Rate of the Tibetan Plateau from Cosmogenic 36Cl in volcanic rocks
Rowley, David University of Chicago Mechanisms and Timing of the Exhumation of an Ultra-High Pressure Terrain, Dabie Shan, China
Rye, Danny Yale University Stable Isotope Investigation of Solution Mass Transfer, Strain and Fluid Flow in High-P Low-T Sandstones
Salyards, Stephen University of California Los Angeles COLLABORATIVE RESEARCH: Paleomagnetic Investigation of Miocene Sediments in the Gale Hills, S. Nevada: Tectonics of Vertical Axis Rotations
Scholz, Christopher Columbia University The Growth of Faults
Serpa, Laura University of New Orleans Investigation of 4-dimensional Fault Interactions at the Garlock-Southern Death Valley Fault Intersection
Sinha, Akhaury Virginia Polytechnic Inst. & S.U. COLLABORATIVE RESEARCH: Thermal Evolution of the Maryland Pennsylvania Piedmont: Application of U-Pb Geochronology to Collisional Tectonics

Sisson, Virginia Rice University COLLABORATIVE RESEARCH: Tectonic Consequences of Ridge Subduction and Plate Reorganization: the Chugach Metamorphic Complex, Alaska

Sonder, Leslie Dartmouth College COLLABORATIVE RESEARCH: Paleomagnetic Investigation of Miocene Sediments in the Gale Hills, S. Nevada: Tectonics of Vertical Axis Rotations
Snyder, Walter Boise State University COLLABORATIVE RESEARCH: Heterogeneity in the Evolution of Foreland Basin Systems: A Case Study of the Late Paleozoic Foreland, Nevada
Teyssier, Christian University of Minnesota Transpression: Consequences for Pluton Emplacement in the Sierra Nevada
Trexler, James University of Nevada-Reno COLLABORATIVE RESEARCH: Heterogeneity in the Evolution of Foreland Basin Systems: A Case Study of the Late Paleozoic Foreland, Nevada
Tucker, Robert Washington University Timing of Paleozoic Metamorphism in the Appalachians of N. Massachusetts and S. New Hampshire
Umhoefer, Paul Northern Arizona University RUI: Jurassic-Cretaceous Tectonostratigraphy and Structure of the Western Margin of the Intermontane Terrane, Chilko Lake Area, British Columbia
Van der Pluijm, Ben University of Michigan Grenville Shear Zones of the CMB, Southern Ontario
Wallace, Wesley University of Alaska Geophys. Inst. The Geometry and Kinematics of Detachment Folds, Northeastern Brooks Range, Alaska

Wesnousky, Stephen University of Nevada-Reno Slip Partitioning in the Basin and Range
Yeats, Robert Oregon State University Earthquake Hazards in the Himalayan Foothills of Northwest India

REPORT: AN ACTIVE TECTONICS FUNDING INITIATIVE FOR NSF

In the recent past, there have been discussions within our Division and between our scientific community and the Tectonics Program at NSF about the possibility of moving forward with a scientific initiative in the area of "ACTIVE TECTONICS" (cf. Cloos, Newsletter, September, 1992). *George Davis* (U. of Arizona) tells us that preparations for such an effort have now formally begun.

Groundwork for expanded research in active tectonics goes back to the mid-1980's. Recall, for example, the NRC volume on *Active Tectonics* published in 1986. Much more recently -- this last March -- the NRC Keck Report on *Solid-Earth Sciences and Society* identified "active tectonics" as one of eight priority themes that should be pursued to improve basic understanding of solid-earth processes. In April, the NSF Advisory Committee for Earth Sciences (ACES) recommended in its long-range plan for the Division of Earth Sciences that "active tectonics" be recognized as one of five high-priority initiatives for the Earth Sciences Division of NSF. The recommendation was "to foster and facilitate interdisciplinary collaborations among sub-disciplines such as experimental and theoretical rock mechanics; field studies of active and Neogene faults and the rock products of faulting; geodynamic modeling in areas of active

deformation; seismology and earthquake mechanics; quantitative geomorphology and paleoseismicity ..."

In response to this call, George Davis submitted a proposal to NSF for a planning effort to prepare a major ACTIVE TECTONICS initiative. The goal of this initiative is to expand active tectonics research in ways that will enhance basic understanding of the ongoing deformation of the Earth's lithosphere. An organizing committee convened by George is composed of *Mark Brandon* (Yale), *Roy Dokka* (LSU), *Bob Smith* (Utah), and *Bernard Minster* (UC San Diego). At its initial meeting held in Tucson in July, the commitee began to isolate and clarify the distinctive emphases of an ACTIVE TECTONICS initiative, with the understanding that what emerges should complement and strengthen even further the active tectonics research on contemporary deformation that is presently being carried out by geoscientists, and supported by a number of programs and agencies.

The committee's preliminary designation of emphases looks like this:

1) Understanding the basic science of fundamental active tectonics processes, as well as how these processes interact with one another at all rates, frequencies, and spatial dimensions in which they operate;

2) Understanding how active tectonic processes are made manifest at the surface of the Earth in topography and surficial processes;

3) Harnessing the power of the GIS approach to data base management of very large and complex data sets; and transforming such data into formats that can be more easily assimilated and interpreted;

4) Harnessing scientific visualization tools that permit three-dimensional rendering and animation. [These technologies will also make it easier for nonscientists or nonspecialists, who are interested in public policy or technology transfer applications (e.g., hazard reductions, the environment, resources, and climate), to grasp the nature and implications of active tectonic processes and to "see" the effect of critical parameters);

5) To reduce barriers to fuller collaboration between geologists and geophysicists of diverse specialties who are working on different kinds or different dimensions of active tectonics processes. This would include establishing high-speed information networks between workstations and hubs, through which data sets and ideas can be rapidly exchanged worldwide.

By the time this *Newsletter* is mailed, the ACTIVE TECTONICS Organizing Committee will have convened a Planning Committee meeting to be held in Washington, D.C., in early October. Later that month, George Davis is scheduled to make a presentation on ACTIVE TECTONICS at the Business Meeting of the Division in Boston. This will be a good opportunity for the membership to learn what is happening with the initiative and to provide input into it. If you have ideas before then, George invites you to contact him at the U of A. Of course, your comments and ideas are also welcomed by both the officers of the Division and your *Newsletter* co-editors.

---BIOGRAPHIES OF THE CANDIDATES FOR DIVISION OFFICERS---
(eds. note to June F.--- this heading should run across the page, i.e. it should not be limited to a single column's width; text under this heading should be double column)
The 1993 Nominating Committee of the Division (*Darrel Cowan*, Chair) has selected the following candidates for Division offices for 1993-1994:
For Chair (one candidate):
Richard (Rick) H. Groshong, Jr. was born in Lakewood, OH, in 1943. He received his B.S. degree from Bucknell University in 1965, M.A. from the University of Texas at Austin in 1967, and Ph.D. from Brown University in 1971. From 1971 to l973, he taught at Syracuse University. In 1973, he joined the Cities Service Oil Company Research Laboratory in Tulsa, eventually becoming manager of structural research and then Senior Research Associate. In 1983, he came to the University of Alabama where is now Professor. He is a Fellow of GSA and has been on the Membership Committee, a member and Chairman of the Committee on Research Grants, on the editorial board of *Geology*, and was the first Secretary-Treasurer of the SG&T Dvisision. He co-chaired the Division's symposium on "Structure and tectonics of continental interiors" (1983) and helped organize the Division's short course on the "Use of microcomputers in structural geology" (1988). His current research interest include: low-temperature rock deformation fabrics; kinematic models for the evolution of oil-field scale structures; and the attempt to relate the results from each of these research areas to the other.

For First Vice-Chair (one candidate):
Edward C. Beutner was born in Tucson, Arizona, in 1939. He received his B.S. degree from Oregon State University in 1963 and his Ph.D. from Penn State University in 1968. he labored in the vineyards of California with the tectonics research group of Shell Development Company from 1968 to 1970, when he left to teach at Franklin and Marshall College. He is a Professor there and has just completed his second stint as Chair of the Department of Geosciences. A Fellow of the GSA, Ed has served on the editorial board of *Geology* and he is currently an Associate Editor of the *Bulletin*. His current research interests include: the generation of bends; the relationship of solution cleavage to veining; the generation and effects on deformation styles and mechanisms of near-lithostatic fluid pressures in the external belt of the Quebec Appalachians; recent onland deformation associated with the migration of the Mendocino triple junction; and basement-cover structures and interactions along the western portion of the Beartooth Range front, Montana.

For Second Vice-Chair (three candidates listed alphabetically; vote for one):
John M. Bartley received his Ph.D. degree from MIT in 1980, and is a Professor in the Department of Geology and Geophysics at the University of Utah. He is currently serving as an Associate Editor for both *Geology* and the *GSA Bulletin*. and he is on the Steering Committee for the 1997 GSA National Meeting. John's research interests include three-dimensional kinematics of crustal extension in orogenic belts, time-space and genetic relations between Cenozoic crustal extension and magmatism in western North America, sykinematic metasomatism and volume

changes in metamorphic core complexes, and structural geology and tectonics of continental thrust belts, particularly in the Basin and Range region.

Roy K. Dokka received his Ph.D. degree from the University of Southern California in 1980. He is currently a Professor in the Department of Geology and Geophysics at Louisiana State University, where he has been cited for excellence in teaching at both departmental and University levels. Roy recently completed a Visiting Scientist appointment with the NSF where he served as co-Director for the Tectonics program. He is currently a member of the Steering Committee for the Active Tectonics Initiative. His research interests include multidisciplinary studies aimed at understanding rifting and transform faulting within continents, and the structural and tectonothermal implications of low-angle subduction, especially within the Mojave Desert and other portions of the western U.S.

Brian P. Wernicke received his Ph.D. from MIT in 1982. In 1982/1983 he taught at Syracuse University; from 1983-1992 he was at Harvard University, and since 1992 he has been a Professor at Cal Tech in its Division of Geological and Planetary Science. Brian has served on numerous earth science panels and working groups. His research interests include the tectonic evolution of the continental lithosphere and the physical processes governing the large-scale structural evolution of orogenic belts.

For Secretary-Treasurer (one candidate)

Arthur G. Goldstein received his Ph.D. from the University of Massachusetts in 1980. He is currently Associate Professor and Chairman of the Department of Geology at Colgate University. Art's research interests include magnetic measurement of fabric and strain in rocks, tectonic history of the northern Appalachians, and microstructures and genesis of mylonites and shear zones.

BYLAW ADDITION

The Division's Management Board would like to propose an addition to our bylaws, making our new Short Course and Symposium Committee "official". Please mark your ballot for this proposed change. The wording for our proposed bylaw addition is as follows:

"Short Course and Symposium Committee. This Committee shall consist of a Chair and two other voting affiliates of the Division who are not members of the Management Board, plus the Second Vice-Chair of the Division. Appointments will normally be for three-year staggered terms, with each member assuming the Chair during his/her third year of service. Each year immediately following the annual meeting, one new member of the Committee will be chosen by the Second Vice-Chair and appointed by the Chair of the Division. A vacancy can be filled by the Division Chair at any time.

The Committee shall solicit from the Division membership and from any other sources suggestions for Division-sponsored short courses and symposia for the annual meeting. The Chair of the Committee will report to the Division Chair by one month prior to the annual meeting with a recommendation of at least two topics for short courses along with possible instructors, and at least two symposium topics along with possible conveners. Final selection of topics and instructors/conveners will be done by the Management Board during the annual meeting."

NOMINATIONS FOR DIVISIONAL AWARDS

Once again, it is time for Division members to nominate candidates for our two awards, the Career Contribution Award and the Best Paper Award. For a Division with a current membership of approximately 1800, the number of nominations for each award is surprisingly small from year to year. YOU can make a difference! Forms for nominations are included in this Newsletter and members are strongly encouraged to take the time to get involved.

Who would you like to see nominated for the Career Contribution Award? Which structural geologist or tectonicist has influenced you the most in your professional career? Take a moment and change somebody's life! This Award is made to an individual who throughout his/her career has made numerous distinguished contributions that have clearly advanced the science of structural geology or tectonics. Candidates need not be a U.S. citizen, or even a member of GSA. For additional details of the nomination procedure, please see the accompanying form.

What paper has really turned you on in the past year or two? Wouldn't it be fun to be partly or wholly responsible for setting in motion a nominating procedure that would lead to that paper's author(s) being rewarded with the Division's Best Paper Award (included an engraved plaque and citation)? Any publication (paper, book, or map) published within the 5 years prior to the year of the award is eligible, e.g. 1989 through 1993 for this year's Award. This award for a publication of exceptional distinction is not restricted to members of either the Division or GSA, and awardees may be single or multiple authors of any nationality or citizenship. For more details, please see the accompanying nomination form.

1993 GSA GRADUATE STUDENT RESEARCH AWARD

For the second year in a row, a Stanford graduate student has won the Student Reserach Award sponsored by our Division. *Jed Leigh Mosenfelder*, a second-year M.S. candidate in the Department of Geology, submitted the winning grant application: "Emplacement history of the Oman ophiolite." The problem to be addressed in the funded research is best stated by Mosenfelder himself (from his grant application):

"Two contrasting models exist for the origin and emplacement of the Oman ophiolite. The nature of the emplacement process in these models depends on whether the ophiolite was generated at a mid-oceanic ridge (Boudier and Coleman, 1988) or in an island arc setting (Lippard et al., 1986). Constraints on the emplacement history of the ophiolite can, therefore, be used to test these two models and to determine the original tectonic setting of the ophiolite. These constraints can be obtained by study of the conditions of formation of the metamorphic sole, which consists of oceanic and continental material accreted to the base of the ophiolite and metamorphosed during its obduction onto the Arabian continental platform. This sole is thought to represent the original fault zone along which obduction occurred (Ghent and Stout, 1981; cf. Jamieson, 1986). The sole exhibits an unusually steep inverted metamorphic field gradient (>1000° K/km), which has not been explained by any of the usual models involving conduction and deformational heating. Hacker (1990,1991) hypothesized that continuous downward shifting of the fault zone during metamorphism juxtaposed rocks with differing P-T histories, resulting in an overall metamorphic field gradient that is steeper than any thermal gradient present during thrusting and emplacement.

This hypothesis can be tested by examining the spatial variation of P-T histories of rocks in the sole, and assessing the deformational history of the sole by field mapping and structural analysis."

Mosenfelder will make his second trip to Oman this September for field mapping and sample collecting. He will analyze samples at Stanford using petrographic and electron microprobe techniques to acquire information on peak P-T conditions and P-T paths. Fission track dating (Mosenfelder) and Ar-Ar isotopic studies (Hacker) will further constrain the lower temperature history of the metamorphic sole. Jed's advisers on this project are *Bob Coleman*, *Gary Ernst*, and *Brad Hacker*.

Runners-up for the Division-sponsored Student Research Award were *Angela Coulton* (SUNY Albany), *Michael Edwards* (SUNY Albany), *Cheryl Petrina* (Duke), and *Kirk Stephens* (Western Washington). The Division extends its congratulations to all 5 student finalists and wishes them great success in the completion of their research projects.

LETTERS TO THE EDITOR

Dear Editors Davis and Paterson,

The comments by Fletcher and Pollard (*Newsletter*, March, 1993) on the earlier exchange of letters by the two of you (*Newsletter*, September, 1992) were significant. Their remarks were more than a critique of the Paterson/Davis discussion; they were a challenge to the practice and teaching of analytical structural geology in 1993. In this sense, the Fletcher/Pollard comments are historically important and deserve more of a response than "Aw come on guys, lighten up!"

I agree with all but one of Fletcher/Pollard's complaints. In particular, I think it is important that there be greater appreciation of the fundamental role of displacement fields (cf. Fletcher/Pollard's comment [2]). The analysis of displacement fields has been a badly treated part of analytical structural geology. The focus of current practice literally seems to be on points in space, particularly points where strain markers are present. Yet, displacement fields are implicit, for example, in all forward-modeling and reconstructed cross-sections. As noted by Fletcher and Pollard, displacement fields lead to statements of strains as a function of time and position. (The fact that a fault is a discontinuity in a displacement field, for instance, is probably not the way most geologists think about faults.) I would be interested to know if there are any textbooks for geologists which explain and illustrate in geologic terms the construction and analysis of displacement fields.

I disagree with Fletcher/Pollard on one point, i.e. their comment that "the terms 'total strain' and 'incremental strain' are superfluous." In my view, these two terms express two distinct and important concepts. "Total strain(s)," as I understand and would define the term, refers to strains determined when the shape of the body prior to any deformation is compared to its present shape (e.g. flat lying beds before any deformation compared with present configuration). "Incremental strain(s)," I say, refers to strains determined when the shape of a body at a prior stage of deformation is compared to its shape at a later stage of deformation . The distinction between the two terms and concepts is important when examining strain markers that may have come into existence during the course of deformation (e.g. chlorite fringes on pyrite crystals as reported by field geologists). In a sense, the unit circle is placed on the deforming body after deformation has started (cf. Howard, *JSG*, in press, "Restoration of cross-sections through unfaulted, variably

strained strata"). I believe that an understanding of incremental strain may be especially important in interpreting petrofabric diagrams with girdles.
I appreciate your invitation for responses from members of the Division regarding the Paterson/Davis/Fletcher/Pollard letters. It has been over 100 years since many concepts important to our practice have been known and used effectively in other disciplines. I sincerely hope that this exchange of letters will lead to a better paradigm of analytical structural geology in the 21st century.
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Dear Editor Davis,
I am writing as a Division member and emphasize that the comments which follow reflect my personal views. I appreciate the past efforts of Fletcher, Pollard, and Howard to respond to the original Paterson and Davis letters about lineations. Although I agree with much of what is said in their letters, I am concerned about the implications of several of their comments and wish to respond.
Fletcher and Pollard imply that a nomenclature with older roots is better. However, historical precedence has never been a good scientific argument, unless these authors are implying that we should also go back to Lamarkian evolution and granitization. Fletcher and Pollard also imply that Davis and I were "inventing a new nomenclature." Although I haven't bothered to trace the nomenclature we used in our respective letters back to the 1800's, all terms were in existence well before I became a geologist. Implicit in the Fletcher and Pollard argument is that only one language is appropriate in scientific studies. Ideally this might be true if all scientists had the same background, were tackling similar problems with similar methodologies, and if the nomenclature was perfectly suited for all situations. However, this is not true and never will be true in scientific studies. I argue it is as equally valid to ask what is the relationship between structures and point properties such as strain or vorticity as it is to attempt to relate structures to displacement gradients. In fact, I would argue that our science is ultimately healthier if scientists do take different approaches and use different terminology's.
A much better argument made by Fletcher and Pollard concerns whether a particular nomenclature allows us to better understand and communicate about geological systems. Certainly Cauchy's laws of motion and continuum theory are powerful mathematical tools with which to study displacement fields. It is in this context that I agree with their discussion about finite and infinitesimal strains and their criticism that our terminology is vague. However, it was also in this context that I eagerly read the rest of their letter hoping for new insights about lineations and better ways to describe displacement fields in rocks only to find that they had none to share and even confessed "not to understand, more than superficially, the physical and chemical processes involved in the development of lineations." Given this lack of progress is it not appropriate to use other approaches, which might use other terminology's? I also wonder whether continuum theory is really that elegant an approach to explore geological systems when there is clear evidence for the operation of complicated processes such as (1) crossing displacement paths of particles during intragrain diffusion and recrystallization, (2) numerous and nonsystematic displacement discontinuities on all scales, and (3) nonlinear, path dependent histories resulting from complex particle interactions. Maybe chaos theory is better?
For example, in my original letter (*Newsletter*, Sept., 1992) I referred to structures in the Chiwaukum schist, central Cascades, Washington. Here mineral and grain alignment lineations

are parallel to fibrous overgrowths on porphyroblasts and to stretching directions defined by boudins. But there are other structures of the same age (e.g., folds, faults, S-C fabrics) that indicate large displacements perpendicular to these lineations. At the same time numerous batches of magma were intruding these rocks and preserve internal structures that indicate complex internal flow. I see little hope of using continuum mechanics or any other presently available mathematical system to describe the Cretaceous displacement field in this part of the Cascades, largely because there is so little agreement about the relationship between preserved structures and displacement gradients. I hope Fletcher and Pollard can provide suggestions on how to do a better job of understanding and describing to others such complex displacement fields.

In his letter, Howard was concerned about our comment to Fletcher and Pollard to "lighten up." Although Davis and I appreciated the scientific information provided by Fletcher's and Pollard's letter, we also couldn't avoid noticing the tone, which led to our response. Shouldn't and can't learning be fun?

I also was surprised by Howard's comment about the historical significance of the Fletcher/Pollard comment. I think that the concepts of displacement fields, and faults as displacement discontinuities, have been known to geologists for quite some time. Where I differ from these authors is in regards to the applicability of continuum theory to many geologic systems and to the usefulness of other approaches. For example, in apparent contrast to Fletcher and Pollard, I think it is equally relevant, and at times more practical, to view a fault as a surface along which two bodies of rock are being displaced relative to one another and to ask whether lineations preserved on the fault surface give us information about this displacement.

In summary, I agree with Fletcher and Pollard's suggested methodology of careful (and initially non-genetic) field descriptions of lineations and other structures followed by analysis based on Cauchy's laws of motion (and sometimes continuum mechanics). But I argue that the later step requires that we know how to ascertain paleo-displacement fields from different configurations of structures, including lineations. I thus challenge Fletcher and Pollard to further convince us of the appropriateness of their approach by instructing us how to use lineations and other structures to evaluate displacement fields. I challenge other Division members to share insights about lineations in whatever language they are most comfortable with.

Scott Paterson, Geological Sciences
Univ. Southern California, LA, CA

Dear Editors,

On the rewards of reviewing ....!

In a recent Editorial (Treagus, 1993 *Jour. Struct Geol.,* **15**, 674) Sue Treagus summons more of us to help with reviewing *Journal* articles. She calls such work "altruistic", but there's another side to it too. Let me reinforce her campaign, by pointing out some of the benefits of reviewing, to the *reviewer*.

When you review, you get to see full accounts of new work months or even years ahead of ordinary readers. Some of this stuff is on the "cutting edge". Some of it can propel your own work into orbits formerly undreamt-of.

When you review, particularly if you *sign* your review, you read every sentence. You ask, of every sentence and every equation, "*Does this make sense to me ?* What a wholesome departure

from our usual kind of reading! Wouldn't it be good for you (not to mention the literature) to take this kind of medicine several times a year?
When you review, and *sign* your review, your labors are not altogether without public reward. The author thanks you in the Acknowledgements. If you persist in reviewing, your name becomes familiar to those who read this fine-print. You become an apparent authority.
When you review, and *sign* your review, you become familiar to the author. This may lead to further correspondence, or even collaboration, which is good for your career and, we hope, for Science.
When you review, and I am still urging you to *sign* your review (favorable or not), you do *not* have to respond to the Editor's request for a decision: recommend publication with minor changes, with major changes, rejection and burning of manuscript, etc.. I have seen excellent reviews by younger workers who point out the strengths and weaknesses of a manuscript tellingly, but wind up saying they feel too inexperienced to know whether acceptance or rejection is appropriate. This is fine. What Editors (and authors) need most is thoughtful and quite detailed comments on manuscripts. The Editors can go the rest of the way on their own.
Finally, when you review, you may easily learn some fundamentals. It's wonderful remedial work. I often take a whole day, or two, or three, to review a paper, because once I get into it, I find I know less than the author does about something basic that I should have learned years ago. So I go off and look up some of the references that I have never heard of, and scratch my head. I usually learn more than I forget on reviewing days.
As Sue Treagus says, authors, readers, and reviewers are all the same people -- the same fallible people. None of us is "God's Gift to Geology", but anyone can edge a bit closer, by **REVIEWING**!

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JOURNAL OF STRUCTURAL GEOLOGY

The *Journal of Structural Geology* (Pergamon/Elsevier Science Publishing Group) has announced its special 1994 subscription price for members of the Geological Society of America. Next year's price will be $72.00 US, compared with the current rate of $68.00. This increase in price will be more than offset by a 20% increase in page budget for 1994. From *Sue Treagus* (Manchester), *JSG* Chief Editor, comes news that 1992 manuscript submissions were up approximately 17% over that of 1991. The "top five" countries of manuscript origin for the year ending in October, 1992, were the US (~33%), UK + Ireland (~14%), Australia + NZ, Canada, and France (all at ~8%). The rejection rate for the same period was about 38%, slightly higher than in previous years. *Jim Evans* (Utah State) is the new Associate Editor for North America, replacing *Dave Pollard* who stepped down last year because of heavy administrative responsibilities at Stanford.

THE RESOURCE BIN

The "Resource Bin": a listing of non-commercial earth science educational materials and services in the general areas of structure and tectonics that are available for personal and/or institutional use. Individuals with materials, e.g. software, reading/reference lists, slide collections, etc., or services that they are willing to share with others on an at-cost or non-profit basis are encouraged to add to the "Bin" [contact Davis/Paterson, Dept. of Geol. Sciences, U.So. California, Los Angeles, CA 90089-0740; phone (213) 740-6103 (SP) or 740-6726 (GD); fax (213) 740-8801; E-mail: Scott%GEO%57363@RAMOTH.USC,EDU

Field guides for the U K (Verbatim from *GEOLOG*, newsmagazine of the Geological Association of Canada, 1993, v. 22, pt. l, p. 16)

The Geologists' Association of London has been publishing regional guidebooks on British geology since its centenary in 1958. These staple-bound guides ... have been used by amateur, student, and fieldtrip leader alike. The aim of these guides was to cover selected parts of the British coastline, classic localities, and areas around University towns. They contain itineraries to geologically important and interesting areas of Britain and Northern Ireland. The Geologist' Association Guides reached up to #41 with the guide for Jersey. If you are considering a trip to the United Kingdom, with the opportunity for some geological touring, these guides are valuable companions. Some of the earlier guides are still in print. For details write to the Geologists' Association Office, Burlington House, Piccadilly, London W1V 9AG, ENGLAND.

HAVE YOU HEARD ... ?

Hirings in the academic world continue at a low level, but we have learned of several recent faculty appointments. *Jane Selverstone* has moved to Boulder, where she is now a new member of the faculty at the U. of Colorado. *Kim Bishop* (Ph.D., ë93, U.So.Cal.) has begun an Assistant Professorship in structural geology-tectonics-engineering geology at Cal State University, Los Angeles, where he effect fills a faculty vacancy left by the recent retirement of *Perry Ehlig*. *Jeff Connelly* (Ph.D., '93, U. Tenn.) will soon take residence at the U. of Arkansas-Little Rock. His fellow student *Beth McClellan*, also completing her Ph.D. in Knoxville this year, has a temporary appointment at nearby Western Kentucky U. From farther north comes news that *Paul Kelso* (Ph.D., '93, U. Minn.-Minneapolis) joins the faculty of Lake Superior State U. in Sault Ste. Marie, Michigan this month.

Among other academic news, several Division members have recently learned of their promotions to tenure, including *An Yin* (UCLA), *Neil Lundberg* (Florida State), and *Scott Paterson* (USoCal.). Lundberg won a distinguished FSU "Developing Scholars Award" for early to early-mid career faculty members, and Scott Paterson received the College of Letters, Arts, and Sciencesí Junior Raubenheimer Award for being its most outstanding junior faculty member in 1993. *Dave Rowley* has been appointed Associate Professor at the University of Chicago. *Jack Reed* of the USGS (Denver) is a recent winner of the Department of Interior's Distinguished Service Award. While on the category of winning, *Maria Luisa Crawford* (Bryn Mawr) has received a prestigious MacArthur Foundation Fellowship, and *Don DePaolo* (Berkeley) and *Brent Dalrymple* (USGS-Menlo Park) were elected to the National Academy of Sciences in late April. Although Crawford, DePaolo, and Dalrymple are not Division members, we encourage them to join up soon (a Division can't have too much prestige)!

Returning to new positions, a number of diverse post-doc appointments should give some measure of hope to recent graduates who can justifiably feel "bummed out" by the languishing permanent job market. *Jerry Magloughlin* (U. Minn.-Minneapolis) began an NSF post-doctoral fellowship at the U. of Michigan, Ann Arbor, this last August. *Jonathan Burr*, recently Ph.D'd. from U. Mass., has taken a post-doc position with *Sharon Carr* at Carleton University in Ottawa. Two classmates at Brown U. who have completed their Ph.D.'s this year are heading west for post-doc positions. *Gayle Gleason* joined *Harry Green*'s rock deformation lab at UC Riverside this summer to study interactions between partial melt and deformation, and *Linda Reinen* begins work at ARCO's Research Lab in Houston this month. *Bruno Lafrance* (Ph.D., '90, U. New Brunswick) has completed post-doc work at Macquairie U., Australia, and begun post-doctoral studies with *Barbara John* at Wyoming; they will study emplacement mechanisms for the Laramie anorthosite. *Shangyou Nie* (a recent Ph.D. from the U. of Chicago) has taken up residence at UCLA for post-doc research on Chinese tectonics in a combined effort with An Yin (UCLA) and U.of Chicagoans *Dave Rowley* and *Alfred Zieglar* . Of general interest: a measure of the changing nature of U.S. academic training and research comes from a recent NSF report which found that foreign nationals constitute 28% and 48%, respectively, of fulltime graduate students in science and in engineering. Two-thirds of our international students come from Asia, and more than one-third plan to return to their home countries upon completion of their studies [*Physics Today*, **46**, July, '93].

Comin's-and-goin's: *Nick Walker* has been appointed Senior Research Associate at Brown University, where he will continue his geochronologic/tectonic studies of the Precambrtian and early Paleozoic evolution of the Antarctic margin of Gondwana. This academic year's Crosby Lectureship at MIT will be held by *Douglas Burbank* (USoCal). The new Director of NASA's Geodynamics program in Washington D.C. is *Earnest Paylor* (UCLA). *Jamie Robertson* , formerly of the New Mexico Bureau of Mines, is now Director of the Wisconsin Geological and Natural History Survey in Madison. In other state survey news, *Tim Davis* (Ph.D., '93, Tenn.) has joined the North Carolina Geological Survey in Raleigh, and *Giovanni Guglielmo, Jr.* (Ph.D., UC Santa Cruz) left a post-doc position at UC Santa Barbara in July to become a Research Fellow at the Bureau of Economic Geology at the University of Texas, Austin. [Speaking of Austin, it may soon rival Boulder as a power center for the GSA. Three(!) of the Societyís 12 Councilors come from UTís Department of Geological Sciences, including 2 members of our own Division -- *Sharon Mosher* and *Mark Cloos* -- elected this year to three year terms.]

Retirements, and still more retirements of some of our senior Division members ... *Perry Ehlig*'s retirement from Cal State Los Angeles was mentioned above. *Sig Snelson*, long of Shell Developmentís research labs, has retired and left Houston for the lovely setting of a cabin in the San Juan Islands of Washington State. His new neighbor across Puget Sound is *Clark Blake*, who recently retired from the USGS (Menlo Park) and is now living in Bellingham. *Cliff Hopson* has retired from the Geological Sciences at UC Santa Barbara and that has to be a disaster for all of the Santa Barbarians (as they sometimes call themselves); the good news, however, is that he'll keep his office and stay involved. Pretty much the same stay-on-status will apply to *J. Robert Butler*, who has retired from the University of North Carolina-Chapel Hill, although word has it that Bob will try to find more time to spend out west in Colorado. *Don Wise* has stepped down from the U. Mass faculty and moved back to the Lancaster Valley area of Pennsylvania.

In the "hard-to-get-jobs" category (our last mentioned was a position for a structural geologist in Beirut), comes the announcement (*Geotimes*, July) of a possible professorship in structural geology at the University of Alberta with an emphasis on economic aspects of fold-and-thrust

belt development. Among others invited to apply, the advertisement states that "the university encourages applications from ... members of visible minorities." Presumably applicants from invisible minorities should arrive at their interviews swathed in white gauze bandages (at least it worked in oldtime movies!). Disregarding the Alberta advertisement, our candidate for the most inscrutable job-announcement-of-the-month comes from *Nature* (**364**, 8 July) where Kyoto University advertises an associate professorship in historical geology with candidates invited from the ranks of structural geology and tectonics. The announcement states that "Candidates are not required to have a working knowledge of Japanese, but should be prepared for an academic life operated in Japanese". Say what? The application deadline is September 30th. Although not at all tectonic, we couldn't resist this one: the same issue of Nature advertises a "USED PET-CAMERA FOR SALE" from a hospital in Stockholm, Sweden. So, if you want pictures of an old pet, write soon; the camera, by the way, comes with a "15 slice brain PET-scanner including software". Wait till the SPCA hears about this!

Science News (**143**, 6/12/93, 382) reports that *Susan Owen* of the Menlo Park USGS and her co-workers have discovered what may be the ìfastest faultî in the world -- a nearly horizontal surface 9 km below the southern flank of Kilauea along which overlying rocks are calculated as sliding seaward at 25 cm/yr. Without quibbling about whether or not the surface of slip is a fault or the base of a mega-landslide, its title as the ìworldís fastest-moving faultî (quoting *Science News*) is highly suspect. After all, many field geologists have mapped a fault one day, only to find that itís nowhere to be found the next. Now thatís fast!!

Random thought of this issue: Have you noticed over the past several years (as many of us have out here in LA-LA-land) the damage focusing abilities of mobile home parks on natural disasters (earthquakes, tornadoes, floods, and hurricanes)? Is it possible that Congress might develop a national geologic hazard mitigation program by restricting such parks to localities far distant from urban areas? If so, would Republicans vote for it?

J. Tuzo Wilson, as many of you have already heard, passed away in April at the age of 84. To some he was the ìfather of plate tectonics,î an appellation stemming largely from his recognition in 1965 of tranform faults and the kinematic role that they play in bounding what he referred to in 1965 as ìlarge rigid plates.î Wilson, with doctoral degrees in both geology and geophysics, was clearly one of the few giants among this centuryís mobilist tectonicians (Wegener, Argand, Holmes, Dietz, and Hess come to mind as others) -- a conclusion that one of your *Newsletter* co-editors (GD) didnít always appreciate. I still remember a surrealistic dinner in Prague, 25 years ago, on the evening of the first day of the astonishingly rapid occupation of Czechoslovakia by the Warsaw Pact armies. Wilson, *Clark Burchfiel* and I were enjoying a spectacular roast goose dinner at the somber International Hotel while the proud nation around us was dying. The shock and sadness of the day made meaningful conversation difficult. Wilson broke a period of collective silence by asking us abruptly, ìWhat do you think about my idea that the Atlantic Ocean has had a history of multiple closures and openings?î The abruptness of his question, was matched by the suddenness and succinctness of my answer. ì**Not much!**î The three of us, all embarassed by my insensitivity, returned silently to our dinners. For more than two decades now I've regreted that all too-hasty answer and my chance to have been educated in person by Tuzo.

Editors' note: We apologize to individuals whose personal news did not get reported in this column, and we encourage all members of the Division to send us people-type items that we can use in the next *Newsletter*. Please don't be shy in sending us information about yourself -- a transfer, new job or appointment, a promotion or retirement, a recent award, etc. Thanks this time to correspondents Cowan, Faulds, Hatcher, K. Howard, Hudleston, Means, Mosher, Thomas,

Tull, and J. Tullis, who've helped us extend our geographic coverage of what's happening, where, and to whom.

SYMPOSIUM SUMMARY

"RECONSTRUCTING THE STRUCTURAL HISTORY OF BASIN AND RANGE EXTENSION USING SEDIMENTOLOGY AND STRATIGRAPHY"

Cordilleran/RockyMountain combined section meeting, Reno, Nevada, May
Conveners: Kathi Beratan, Univ. of Pittsburgh, and James Schmitt, Montana State University
The Mojave and Basin and Range structural provinces have experienced a complex Neogene extensional history. These regions are thus of great interest in improving our understanding of extensional styles and kinematics in continental lithosphere. To date, most of the research in these regions has involved structural mapping, mega- to macroscopic analysis of fault kinematics, seismology, and deciphering of complex spatial and temporal overlap of extensional fault systems. One potentially powerful research approach which has been slow to follow the lead of these structure-based studies involves the investigation of the syn-extensional stratigraphic record of sedimentation. Analysis of tectonosedimentary relations in extensional sedimentary basins provides information about changes in paleotopography over time, allowing delineation of near-surface structural patterns through time. This can provide critical temporal constraints on extensional events, improving our understanding of the structural aspects of extensional sedimentary basin development. To highlight recent advances in these areas, a symposium was convened in Reno. Twenty-two talks were presented, with study areas ranging from Utah to southern California. Both detachment fault-related and classic Basin and Range-style basins were discussed, and a variety of approaches were reported upon -- including, field-based descripive stratigraphic analysis, high-precision radiometric dating, detailed lithofacies analysis of depositional environments, seismic stratigraphy, computer modeling of basin geometries, biostratigraphy, and detailed field-based structural mapping. Interest in the last-day-of-the-meeting symposium topic was strong, based on good attendance for the even during the last talk!
Although each basin reported upon had a unique history, some features were common to all. All display abrupt lateral and vertical facies changes. The structural geometry of syn-extensional basins can be determined quite well based on lateral facies relationships, whereas vertical facies changes represent datable horizons marking structural events or, rarely, climate change. Because

syn-extensional volcanism commonly includes ash eruptions, tephrachronology is a powerful tool for dating and stratigraphic correlation.

The sedimentary basins associated with both detachment and Basin and Range faulting typically are typically half graben formed by tilting of crustal blocks along high-angle normal faults. The basin-bounding normal faults are <20 km in length, and tend to be truncated by transverse structures. Individual basins filled and in some cases merged with adjacent basins once active extension had slowed down. Seismic data from Nevada suggests that in some areas normal faulting was proceeded by developing of broad sags.

Research presented in this symposium will be published as a GSA Memoir or Special Paper, hopefully within a year.

GEOLOGICAL SCIENCES OVERSEAS:

SOME ASPECTS OF GERMAN GEOLOGICAL EDUCATION AND EMPLOYMENT

There are 26 public universities in West Germany and 5 in East Germany with departments of geosciences. There are a few private universities, most supported by the Catholic church, but they do not teach geosciences. In our federal system, cultural affairs and education are the responsibility of individual states. Therefore, school education as well as university education varies from one state to another. The budgets of the universities are paid by these states and depend on their prosperity.

Every year about 1000 students start to study geology in Germany. This is a multi-faceted and challenging process. During the first 2 years students take courses in mathematics, physics, inorganic chemistry, botany, and zoology, as well as mineralogy and a course in geology. Most of these courses finish with a written or oral examination. This part of their study ends with 4 oral examinations, half an hour each in geology, mineralogy, and two of the other subjects mentioned above, which the student is free to choose. We call this "Voediplom"; it is a little lower than the U.S. bachelors degree. In Germany this examination does not finish an education: you can not get any job with it. On average, about 50% of all students fail this examination twice, which means that they have to change their profession.

Those who pass their exams specialize either in mineralogy or in geology. During the next 2 to 3 years geology students must take courses (lectures, lab exercises, and 93 days of field trips) in all areas of geology including paleontology, sedimentology, applied geology, hydrogeology, regional geology, petrology, and structural geology. In the final stage students specialize in one of these subjects. In addition, each student is obligated to learn one mineralogical subject like petrology, petrography, sediment petrography, etc. and one other subject like geophysics, geochemistry, geobotany, etc.. This stage is completed with a final examination we call "Diplom," which is similar to a U.S. masters degree. This examination consists of three different parts: geological mapping of about 10 km2 in alpine geology and up to 25 km2 in sedimentary rocks, a thesis, and 4 one hour oral examinations, in each of the following: in the chosen area of specialization, in

the mineralogical topic, in the additional geoscientific topic, and in all other geological subjects. During this stage another 10% give up on their education, so about 400 students pass the final examination. The other 600 do not have a chance to get any job because they have not completed their education. Influenced by the guilds of medieval age, everyone must have an education in their profession. A geologist must have a degree in geology just as a tailor must have three years of tailor education.

During this stage of their education, students must pay all their expenses since there is little university funding. To enable the students to study, the government provides students with up to 900. DM (about 600 US$) per month, based on the financial situation of the parents, for at least 4 years. This money is not a gift; it is an interest free loan that students have to pay back after getting a job. A number of students start their careers with a debt of about 28,000. U.S. dollars. On average, 10% of the geologists stay at the university to get their Ph.D. They get temporary jobs at the universities (permanent jobs are generally unavailable) that are not paid by the state, but are funded by different political, economical or religious institutions. The most famous of these is the "Deutsche Forschungsgemeinschaft" or "DFG," which is similar to the National Science Foundation. As in the U.S. you have to write a scientific proposal to get a grant and you have to fulfill some requirements and limitations. You must be employed by a German university or scientific institution and your salary must be paid for by the state. It is not possible to ask for your own salary. The grants provide support for research, scientific purposes like attending a meeting abroad, or pay the wages of coworkers who are engaged in the project for 2 to 3 years while doing their Ph.D. At the moment we have 2 big scientific projects where large amounts of money is provided for research: the continental deep drilling project (KTB) and the modeling and quantification of the mid-European Variscides. Nearly all geoscience departments in Germany are involved in both of these projects.

To understand recent employment trends for geologists in Germany, I have to go back in history a bit. Shortly after World War II, the West-German economy boomed, in part because of financial help provided by the American Marshall plan. Industry, particularly heavy industry, had tremendous growth rates up to the mid sixties. This period, known as the "Wirtschaftswunder," also marked an increased demand for energy. West Germany only had coal mining at that time and had to import a large supply of raw materials from neighboring countries, such as iron ore from Sweden. Strong exploration programs were established to supply, at least partially from Germany itself, the increased demand for energy and raw materials. This led to such a great demand for geoscientists that there were not enough qualified persons to fill all the positions in industry. Because salaries in the public sector were much lower than those in the industrial sector, universities ran short of scientific staff.

From the mid-sixties through the early seventies Germany had its first postwar economic recession. But because of the previous demand, a large number of geologists continued to be educated in the universities. This led to an oversupply, at which time the permanent staff of geology departments increased rapidly. This growth of academic staff was not restricted to geology but was a general effort to keep unemployment of university trained academics to a minimum.

In the early seventies, Germany's first oil crisis emphasized the strong dependence of our economy on foreign energy. Fortunately, from a geologist's point of view, this led to a busy time of exploration, particularly for oil, gas and, other energy resources, since domestic production was cheaper than their import. Thus, in West Germany, the typical profession for geologists until

the early eighties was hydrocarbon exploration and, to a lesser extent, nonferrous metal exploration.

The early eighties marked a time of great change for geology in Germany. For several years few geologists could find jobs because German hydrocarbon exploration decreased considerably and German nonferrous metal exploration was shut down. Positions at the universities were still filled, leaving only a few temporary jobs for young geologists. In addition, a new national education policy, established 10 to 12 years ago, stated that everyone must be allowed to receive a high school final examination, which is the requirement to study at a university. Because of this policy, and in spite of the poor job situation, the number of geology students increased. This led to a considerable prolongation of the average completion time for a Diplom in geology from about 5 years to 7.5 years, because students were afraid of becoming unemployed after finishing their education. Statistics from fall, 1992, show that this tendency is still continuing: the average time is around 7 years for completion. To give these young scientists future prospects, a lot of money was spent to establish research programs in which nearly 50% of all these students began studies leading to a Ph.D. exmination. All others were reeducated, mainly as computer programmers.

But once again geologists stood on the lucky side of life. In the middle of the eighties, pollution control became very important and geology played a leading role in environmental sciences. This guaranteed good employment opportunities until the recession of the last few years. Recently, the reunification of Germany, which is much more expensive than our politicians ever imagined, is deepening this recession.

In the former GDR, geosciences were concentrated in four government-owned companies, each employing about 700 geoscientists and involved in the exploration for different resources. These geologists were not allowed to have any western contact or to read western literature. All research results were secret. Therefore, a lot of work was duplicated by one or more of the companies. With reunification these companies were closed and small private enterprises and geological surveys were established in each of the 5 new states. However, they needed only about 50% of their geologists, therefore another 1000 to 1300 geologists became unemployed (I would estimate the total number of geologists in Germany at less than 10,000). In the new eastern states, universities with new departments of geosciences as well as new science centers were started. Because of a government decision, 90% of these jobs have been filled with East German geologists.

Today, the academic education of geologists in many cases differs considerably from what they are expected to know in industry. In February, at this year's annual meeting of the German Geological Association (one of three German geological societies) all participants, including those in industry, in universities, as well as students agreed with the necessity to define new topics to improve the employment situation of geologists as well as to give geology new directions for the future.

Dr. Eckardt Stein, Institut fur Mineralogie
Darmstadt

OUR DIVISION'S 1993 ANNUAL MEETING SHORT COURSE, BOSTON

"FRACTURE MECHANICS OF ROCKS"

This 2-day Division-sponsored short course will be taught by Terry Engelder and Mark Fischer (both of Penn State) and Michael Gross (Florida International) and held on Saturday, Oct. 23 and Sunday, Oct. 24, from 8 AM to 5 PM. The course is designed for all geoscientists, professionals and students alike, who want an in-depth introduction to modern methods of field interpretation of joints and fractured rock. Its goal is to introduce the principles of fracture mechanics and to apply those principles to outcrop observations through a series of lectures, hands-on-exercises, and informal discussion and problems sets. See *GSA TODAY* (June, p. 155) for additional information on topics to be covered.

The course will be limited to 50 participants. The fee, $240 ($220 for students), includes a course manual and lunch both days. A course *only* registration fee of $25 is required for participants not attending the Annual Meeting. For more information contact Edna Collis, GSA Continuing Education Coordinator, GSA Headquarters, P. O. Box 9140, Boulder, CO 80301; phones (303) 447-2020, (800) 472-1988; fax (303) 447-1133. Pre-registration by Sept. 24; cancellation deadline, Oct. 1. Payment by check, AE, Visa, or MasterCard (give card number and expiration date).

INTERNATIONAL DIVISION'S 1993 SHORT COURSE, BOSTON

"ASIA: A CONTINENT BUILT AND ASSEMBLED OVER THE PAST 500 MILLION YEARS"

A two day course to be held concurrently with our Division-sponsored short course. It will be instructed by Kevin Burke (Univ. Houston) and A. M. Celal Sengor (Istanbul Technical Univ.). The course is intended for geoscience professionals, graduate students, and senior undergraduates. It will treat the tectonic assembly in Phanerozoic time of Asia. Stratigraphy, structure, mountain-building, igneous activity, basin development, and climate change can all be related to a 500 million year-long process of continental construction that continues today. See *GSA TODAY* (June, p. 155) for additional information on topics to be covered.

The course will be limited to 50 participants. The fee, $230 ($210 for students), includes a course manual and lunch both days. A course *only* registration fee of $25 is required for participants not attending the Annual Meeting. For more information contact Edna Collis, GSA Continuing Education Coordinator, GSA Headquarters, P. O. Box 9140, Boulder, CO 80301; phones (303) 447-2020, (800) 472-1988; fax (303) 447-1133. Pre-registration by Sept. 24; cancellation deadline, Oct. 1. Payment by check, AE, Visa, or MasterCard (give card number and expiration date).

1993-1994 GRANT APPLICATION DEADLINES (SUBJECT TO CHANGE)

National Science Foundation Dec. 1, 1993; June 1, 1994
Petroleum Research Fund (PRF) October 1; Jan. 15, 1994

U.S.G.S. National Earthquake Hazard Reduction Program (NEHRP) Late April (tentative)
GSA Research Fund (student grants) February 15, 1994
Society of the Sigma Xi (student grants) Nov. 1; Feb. 1, May 1, 1994

FUTURE MEETINGS, CONFERENCES, AND COURSES

[Notices of future events of interest to Division members are welcomed by the editors]

1993

Sept. 25-Oct. 1: Ancient volcanism and modern analogues (IAVCEI General Assembly meeting): Canberra, Australia [contact IAVCEI ACTS, GPO Box 2200, Canberra ACT 2601, Australia; phone 61 6 2573299; fax 61 6 2573256].
Oct. 4-9: Basin inversion international conference: Oxford, England. See "Meetings", *GSA Today*.
Oct. 20-22: Overthrusting into foreland basins: sedimentological consequences: Troy, N.Y. See "Meetings", *GSA Today*.

Oct. 29-30: Geological Association of New Jersey, Precambrian traverse of northern New Jersey: See "Meetings", *GSA Today*.

Nov. 5-21: International circum-Pacific and circum-Atlantic terrane conference VI: Guanajuato, Mexico. See "Meetings", *GSA Today*.
Nov. 8-12: Annual meeting of the Mexican Geophysical Union: Puerto Vallarta [contact: Francisco Medina, IGF-UNAM, PO Box 189003. 1415 Fourth St., Suite 002, Coronado, CA 92178; phone 011-52-617-44602; fax 011-52-617-44603]. Traditional topics plus workshops on seismotectonics and tectonics of western Mexico. Abst. deadline: Sept. 10.
Nov. 10-13: Basement and basins of eastern North America (AAPG Hedberg Research Conference): Ann Arbor, Michigan. See "Meetings", *GSA Today*.
Dec. 13-15: The Dublin experiment: Tectonic Studies Group 24th Annual Mtng.: Dublin, Ireland [contact: Dave Johnston or Ken McCaffrey, Dept. of Geology, Trinity College, Dublin 2; phone 353-1-702-1074; fax 353-1-671-1199].

1994

Jan. 10-14: Gondwana (international meeting): Hyderabad, India [sponsor: Geological Survey of India; contact: Organizing Secretary, Gondwana, c/o International Wing, Geol. Survey of India, 27, J. L. Nehru Road, Calcullta, 700 016; fax 301-921- 0373].
Feb. 6-11: Deformation processes in the Earth's crust ... from microcracks to mountain belts (4-day international conference with pre-, mid-, and post-conference field trips): Jindabyne, New South Wales, Australia [sponsor: Specialist Group in Tectonics and Structural Geology of the Geological Society of Australia; contact: Mark Rattenbury, Australian Geological Survey Organisation, P. O. Box 378, Canberra, ACT 2601; fax 61 6 249-9983].
Febr. 9-12: New developments regarding the K/T event and other catastrophes in earth history (conference and 3-day post-meeting field trip to Mexico): Houston, Texas [sponsor: Lunar and

Planetary Institute, 3600 Bay Area Blvd., Houston, TX 77058-1113; phone (713) 486-2149; fax (713) 486-2160]. Topics: K/T boundary; other biological extinction events; processes that may drive catastrophic biological extinctions. Extended abst. deadline: Oct. 25, 1993.

April 25-30: VII international syposium on the observation of the continental crust through drilling (with pre- and post-conference field trips to California, Creede caldera and San Juan volcanic field, Colorado, and the Newark Basin): Santa Fe, New Mexico [contact: Earl Hoskins, DOSECC, College of Geosciences & Maritime Studies, Texas A&M, College Station, TX 77843-3148; phone (409) 845-3651; fax (409) 845-0056]. Tentative themes of special interest include "Active tectonic processes", "Thermal regimes," and "Evolution of continental lithosphere." Abst. deadline: Jan. 15. Sign-up deadline for pre- and post-meeting field trips: Oct. 1. Registration fees: $400 ($450 after March 1); student fee, $50.
June 1-3: lst North American rock mechanics symposium (international conference with pre- and post-meeting field trips to the Superconducting Super Collider site): Austin, Texas [sponsors: U.S. Natl. Comm. on Rock Mechanics, Sociedad Mexicana de Mecanica de Rocas, and the Canadian Rock Mechanics Assoc.; contact: Priscilla Nelson, phone (512) 471-5664, or Stephen Laubach, fax (512) 471-0140, or write to: NARM Symposium, Continuing Education Studies, Cockrell Hall 10.324, Univ. Texas, Austin, TX 78712]. Papers are sought that represent most recent developments in research and applications, and reports on specific areas of rock mechanics and geotechnical engineering. Extended abst. (300-1000 words) deadline: Sept. 30, 1993.
June 6-7: Weddell Sea tectonics and Gondwana breakup (meeting): Cambridge, U.K. [sponsor: British Antarctic Survey; contact: Edward King, B.A.S., High Cross, Madingley Rd., Cambridge, CB3 0ET, UK; phone 44-22-361188; fax 44-22- 362616]. Aim of meeting is to bring together those working on tectonic problems related to the breakup of Gondwana in the Weddell sea sector.
July 25-29: 11th International Conference on Basement Tectonics: Potsdam, Germany [contact: Onno Oncken, GeoForschungZentrum, Telegrafenberg, D-O-1561 Potsdam, Germany; phone, 331-310306; fax, 331-310601]. Some major topics: continental scale features of basement rocks of Phanerozoic cratons; correlations of geological and geophysical data from basement rocks; mechanism and processes of tectonic decoupling of crustal layers; the role of basement exhumation in the evolution of orogenic belts. Abstr. deadline: March 1.
Sept. 12-16: International volcanological congress: Ankara, Turkey [contact: Ayla Tankut, Dept. of Geological Engineering, Middle East Technical Univ., 06531, Ankara; phone 90-4-210-1000, exts. 2682, 2679; fax 90-4-210-1263].
Nov. 15-17: Geology and resources of the eastern frontal belt, Ouachita Mtns., and SE Arkoma Basin, OK (one-day workshop and papers; two-day field trip): Poteau Oklahoma [sponsor: Oklahoma Geological Survey; contact Neil Suneson, O.G.S., Sarkeys Energy Cntr., Rm. N-131, 100 E. Boyd St., Norman, OK 73019-0628].

1995
April 10-13: Geology and ore deposits of the North American Cordillera (symposium and field trips): Reno/Sparks, Nev. [sponsors: Geol. Soc. of Nevada, U.S.G.S; contact: Geol. Society of Nevada, P. O. Box 12021, Reno, NV 89510; phone, (702) 323-4569, fax (702) 784-1766. The symposium will focus on the metallogeny of the American Cordillera from the Precambrian to the present, and the role that depositional, tectonic, and magmatic events have played in the

formation of ore deposits of the region. Abstract deadline: April 1, 1994; accepted paper deadline: Oct. 1.

August 28-Sept. 1: Tectonics and metallogeny of early Precambrian orogenic belts (international meeting): Montreal, Canada. Contact: John Percival, Geol. Survey of Canada, 601 Booth St., Ottawa, Ontarion K1A 0E8; fax (613) 995-9273.