

STRUCTURAL GEOLOGY AND TECTONICS DIVISION

Newsletter

Volume 13, Number 2 September 1994

-----CHAIRPERSON'S MESSAGE-----

The Division continues its emphasis on active tectonics this year at the annual meeting in Seattle with both our symposium and short course devoted to aspects of this topic. The symposium will be "New Frontiers in Active Tectonics" and is co-sponsored by the Geophysics Division to run all day Wednesday. George Davis and Bernard Minster are the conveners. The Division short course, "GPS Geodesy and Active Tectonics," will be taught by Michael Bevis and Charles Mertens on Saturday and Sunday before the meeting. It will provide hands-on experience with GPS equipment and data processing.

I hope that the Division's emphasis on "active tectonics" is serving to help broaden the meaning of this term. One gets the impression that in the news media, and probably in the Congress, the term means earthquakes and offsets on surface faults. As I am sure you are aware, these dramatic events are only a small part of the total picture. Anyone who has ever run physical models of structures (or shoveled sand or snow, for that matter) knows that large regions deform simultaneously and that slip on specific faults, either blind or emergent, can be expected in more than one place and at more than one stage of the experiment. Probably one reason that earthquake prediction has been, in general, relatively unsuccessful, is that the work has been too sharply focused on earthquakes. The entire fold and fault system must be understood before the activity of any single element can be predicted. Many Division members work on exactly these types of problems. I hope that they are supporting the Active Tectonics Initiative at NSF and, in turn, will be supported by the program in the future.

A related issue is the ongoing planning for one or more national data repositories for subsurface information generated by industry. Currently the planning is sponsored by DOE and is led by Marcus Milling, the executive director of the American Geological Institute. The purpose of the repositories is to provide permanent storage for, and public access to data such as well logs, cores and seismic reflection profiles that are no longer needed by industry. Huge amounts of data have been amassed by the petroleum industry and stories abound of data being taken to the dump because it is no longer of economic value. For example, as 3D seismic replaces 2D seismic in the petroleum industry, the economically obsolete 2D lines could be released to the archive and would constitute an incredibly important resource for understanding active tectonics (as several recent papers about the Los Angeles basin area and its earthquakes have demonstrated). Making these data permanently and publicly available will be a major contribution to the understanding and predicting of earthquakes. I encourage you to actively support this program. Support from Division members within industry is likely to be especially helpful.

One of the most gratifying activities of the Division is the honoring of individuals for their accomplishments in structural geology and tectonics. This year at the Seattle business meeting (Tuesday, 5:30-6:30 PM) we will be presenting two student research awards, one to Christopher Hedlund of Colorado State University and the other to Jonathan Lewis from the University of Connecticut. The Division's top award, the Career Contribution Award, will be presented to emeritus Professor Richard Nickelsen of Bucknell University for his distinguished record of teaching and research. We will also be presenting the Best Paper Award to its first author who plans to come from France to accept in person (but the names of the awardees remain our secret

until the meeting!). Our meeting will be followed by a no-host reception held jointly with the Geophysics Division. I look forward to seeing you there.

Rick Groshong

In the interest of ready access, here are the addresses for the Board members this year:

Richard H. Groshong, Jr.:

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EDITORS' COMMENT

We wish to thank Tom Wright and Carol Simpson for their continued efforts in writing the highly informative "NSF NEWS" column for this *Newsletter*. As stated before (and undoubtedly again in the future), we welcome your letters, comments on *Newsletter* content and on topics of interest to the Division, information about career changes by you or others for the "HAVE YOU HEARD ... ?" column, and announcements of forthcoming special events. We also welcome suggestions for other types of material that you would find useful in future *Newsletters*. The deadline for inclusion of materials in the next issue is January 15, 1995. Please send lengthy items on a Mac diskette if possible or transmit to us via e-mail. Greg Davis: phone (213) 740-6726; fax (213) 740-8801; e-mail, davis@usc.edu; Scott Paterson: phone (213) 740-6103; e-mail, Scott@usc.edu.

BIOGRAPHIES OF THE CANDIDATES FOR DIVISION OFFICES

The 1993 Nominating Committee of the Division has selected the following candidates for Division offices for 1994-1995:

For 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 First Vice-Chair (one candidate):

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

For Second Vice-Chair (three candidates listed alphabetically; vote for one only):

Karl Karlstrom is currently a professor at the University of New Mexico. His prior teaching posts were at Northern Arizona University (1984-1991) and North Carolina State University (1983-1984). He received his B.S. at Northern Arizona University (1973), his M.S. (1977) and Ph.D. (1981) from the University of Wyoming under Bob Houston, and then did a post-doctoral fellowship at the University of New Brunswick (1981-1982) under Paul Williams (working in Newfoundland). He has recently been active as a member of the NSF Tectonics panel, as liaison from the Tectonics panel to the Continental Dynamics panel (1993-1994) and has served on advisory panels for the NSF I.L.I. and post-doctoral fellowship programs. He has served on the editorial board of *Geology*, and is an associate editor for *Precambrian Research*. Karl's research interests involve the Proterozoic tectonic evolution of southwestern North America, and more generally, the interactions of deformation, plutonism, and metamorphism during middle crustal tectonism. His current research involves transects in the Grand Canyon, Arizona's Transition Zone, and northern New Mexico. These areas provide an excellent laboratory for understanding growth, stabilization, and reactivation of continental lithosphere. He has been active in efforts to provide research opportunities for undergraduates through NSF REU site grants to both Northern Arizona University and the University of New Mexico.

Terry Pavlis was born in Wagner, South Dakota, in 1953. He received his B.S. degree from the University of South Dakota in 1974 and his M.S. and Ph.D. in 1979 and 1982, respectively, from the University of Utah. He taught at Lehigh University in Bethlehem, PA from 1981-1985 and has been on the faculty of the University of New Orleans since 1985. Terry was co-organizer, with Virginia Sisson and David Prior, of the recent Penrose Conference on "The effects of triple junction interactions with convergent plate margins" and he received the Structure and Tectonics Division's Best Paper Award in 1991. His current research interests include the geology of convergent plate margins, Alaskan tectonics, fold-thrust belt systems, Cordilleran extensional tectonics, and fault zone studies. He and his students have been involved in projects ranging from active tectonics associated with the Himalayan mountain belt to extension in the Death Valley region to the study of Mesozoic subduction events in Alaska.

Ben A. van der Pluijm was born in Enschede, the Netherlands, in 1955. He received an undergraduate degree in Geology from the University of Leiden in 1977, and an M.Sc. degree from the same institution in 1981. In 1984 he completed a Ph.D. at the University of New Brunswick. After a brief period as visiting researcher at the University of Utrecht, he joined the

faculty of the University of Michigan in 1985, where he currently is Associate Professor. Ben is a Fellow of the GSA and read hundreds of student proposals for its Research Grants Committee from 1992-94. He has received several teaching awards from the University of Michigan. Ben is on the editorial boards of *Precambrian Research* and *Tectonophysics*; he served on *Geology's* editorial board from 1991 to 1993. His field research interests include the northern Appalachians (primarily the stretch from Maine to Newfoundland), the cover sequence of cratonic eastern North America (including the Michigan Basin), the Grenville in southern Ontario and northern New York and, most recently, the Cascadia and Barbados accretionary wedges (through ODP). In addition to field work, Ben, and particularly his students, use a variety of approaches to address field-oriented problems in structure and tectonics. These include phyllosilicate and calcite textures (using both optical methods and a new X-ray goniometer), electron microbeam techniques (microprobe, STEM), development and application of magnetic anisotropy methods, Paleozoic paleomagnetism, and stable and radiogenic isotope geology.

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.

NSF NEWS

The Tectonics program received 130 proposals for review from the June deadline and as of this writing (June 28) we are more than half way through assigning reviewers. These proposals were the first to be under the new guidelines set out in the "Grant Proposal Guide-NSF 94-2, January 94". As you might expect, "the word" didn't reach everybody intact about the 15 page limits, what counts (figures do count), what forms are needed etc., but all in all the adjustment went reasonably well. We know that many of you spent a lot of time in trying to sort out the new rules, and in some cases had to re-do everything at the last minute. Hopefully the shorter proposals (they are a little bit shorter now, even considering the tiny type and single spacing) will save time for all concerned. For those of you who contemplate submitting a proposal in December, please make sure you follow the new rules, use the new forms, etc.

In the last *Newsletter* we pointed out that proposals received for the past few deadlines included a high percentage that were revisions of recently declined proposals. While quick turn-arounds on proposals not funded are understandable, especially when the scores and reviewer comments are basically favorable, it undeniably adds to NSF's and reviewers' workloads. Several options have been considered, and there is a good chance that the Earth Sciences Division will institute a policy that some other NSF divisions have had for some time -- namely to require revised proposals to skip at least one deadline. For example, a proposal originally submitted in December of 1994 could be revised and re-submitted the following December ('95), but not for the June 1995 deadline. This policy change will be announced by a "dear colleague" letter if and when it is instituted, so keep an eye out for it, and plan accordingly. Your comments on either the new NSF guidelines or on this possible revision of Earth Sciences Division policy are welcomed. There are two fundamental aspects of the funding system at NSF that greatly benefit from your help. The most obvious one involves the new ideas you generate and put forward in the form of proposals and your comments and judgments of others' proposals. The other, perhaps less direct,

are your activities that promote, advertise, educate and otherwise bring the value of your science to the attention of the public, their elected representatives and other powers-that-be which influence the funding of NSF. Both are really important. One aims to increase the public's interest and therefore financial support of research, while the other aims to make the most scientific progress possible with the money that is actually made available. It is useful to keep these two aspects in mind when you are dealing with NSF matters.

In a way, writing proposals and writing reviews of other's proposals is the more satisfying of the two, because they deal with the science in which we are all interested, and the audience is composed of other scientists plus only a few bureaucrats. The other aspect is less straightforward, has no real external stimuli (such as deadlines or the arrival of the dreaded brown envelopes that appear several weeks after deadlines) and has a much longer time delay between actions and results. The target audience is also much more difficult to define.

Consequently this activity has not received as much attention in the past as it should have. We are now experiencing a continuing inability to secure funds to support basic research at desired levels or to support many new projects. Many of you have first-hand knowledge of this predicament, and all of you are aware that there is considerable stress and frustration in our research community and research institutions because of it.

Here is what will help. Do whatever you can to educate others about the value of geological research. This varies from hard-ball politics, complaints to officials, agitation to and with professional societies about research issues, to activities like public lectures and leading field trips for local schools. It includes organizing and pushing for new scientific initiatives.

On the other hand, with our present competition levels, it is very important to continue to write strong insightful proposals and to carefully, competently and fairly review proposals. Each proposal submitted represents an investment of many hours of someone's time, and requires many hours of NSF reviewer and NSF review panelist time. Most people dealing with us provide strong, statesman-like inputs to the system. There have been a few departures, however, that basically stem from overall frustration with the unsatisfactory funding environment, and do not actually help either the proposer or NSF in assigning priorities for funding. These departures vary from comments such as "overhead outrageous" to using reviews or specific proposals as a platform to lambast the system: "NSF only supports safe sciences, and this PI only proposes that..." or, "I haven't gotten my grant, so to hell with you. I'm not ever going to review anything for you again, ever!"

Aim your ideas, suggestions and complaints at the right audience. Don't preach to (or in some cases bludgeon) your colleagues about things over which they have no control. Do transmit your views to NSF management, professional societies, etc. It'll take time, but efforts along these lines will eventually pay off.

The following awards were made by NSF from the Tectonics Program for the period January, 1994, to July, 1994. There are a few more than last time because NSF caught up on moving-related delays in making awards.

Tom Wright and Carol Simpson

Program Directors, Tectonics Program

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twright@NSF; csimpson@note.nsf.gov; csimpson@NSF

PI Name Institution Title

Anastasio, D. Lehigh U Volumn Strain, Mass Transfer, and Fabric

Development in Carbonates

- Baldwin, Susan U of Arizona Thermochronologic Evolution of the High Pressure Metamorphic Terranes and Granodiorites of New Caledonia
- Bazard, D. U of Mississippi COLLABORATIVE RESEARCH: Paleomagnetic and Detrital Zircon Analyses of Cretaceous Gravina Belt Rocks
- Bird, Peter U of Cal, LA Quantitative Synthesis of Structural, Paleomagnetic & Stress Data from North America since 85 Ma
- Bruhn, Ronald U Utah Fluid Pressure & Compartments: Origin and Role, Southeast Alaska
- Butler, R U of Arizona COLLABORATIVE RESEARCH: Paleomagnetic and Detrital Zircon Analyses of Cretaceous Gravina Belt Rocks, Southeast Alaska
- Butler, R. U of Arizona Where in the Siluro-Devonian World was Gondwana?
- Butler, James U North Carolina Eclogite from the Blue Ridge Thrust Complex, W. Chapel Hill Carolina; New Constraints on Tectonics and High Pressure Metamorphism
- Cheney, John Amherst College RUI: Laser $^{40}\text{Ar}/^{39}\text{Ar}$ Study of Muscovite from the Major Tectonic Zones in SW New England
- Chester, Judith Saint Louis U RPG: Mechanisms of Crustal Block Rotation in the San Gabriel Mountains, CA
- Coe, R. U of Cal., Paleomagnetic Study of An Active Continent
- Santa Cruz Collision
- Crespi, Jean U of Conn A Structural and Thermal Maturity Investigation of Synorogenic Normal Faulting in Taiwan
- Crespi, Jean U of Conn RPG: Strain History Partitioning in the Northern Taconic Allochthon: A Preliminary Investigation
- DiPietro, J. U Southern RUI: A Tectonic Analysis of the India-Kohistan
- Indiana Collision in the Western Himalaya, Pakistan
- Faulds, James U Iowa COLLABORATIVE RESEARCH: Structural Development of Interference Accommodation Zones in Extensional Orogens
- Geissman, John U of New Mexico COLLABORATIVE RESEARCH: Studies of Large-Magnitude Extensional Tectonism in the Basin and Range, California and Nevada
- Geissman, John U of New Mexico Footwall Deformation and Regional Crustal Structure of Deep-Type Metamorphic Core Complexes, Western Arizona and Southeastern California
- Hoisch, Thomas U of Arizona COLLABORATIVE RESEARCH: Alternating Contraction and Extension During the Late Mesozoic to Early Cenozoic, NW Utah
- Janecke, S Utah State Univ Structural, Geochronologic and Stratigraphic Studies of Paleogene Extension, Idaho and Montana
- John, Barbara U of Wyoming Role of Mid-Crustal Plutonism in Extreme Crustal Extension Southern Basin and Range
- Johnson, Roy U of Arizona Structure and Chronology of Tectonism, NW Great Valley: Implications for Convergent-Margin Evolution
- Kneupfer, P. SUNY Bing- Tectonic Geomorphology of Active Collision, hamton Western Taiwan
- Kodama, K Lehigh U Correcting for Compaction-Caused Inclination
- Shallowing in Sedimentary Rocks: A Rock

Magnetic End Paleomagnetic Study

Lahren, Mary U Nevada, Mackay Partitioning of Longitudinal Slip in Magmatic Arcs: Mesozoic Crustal Structure and Evolution, CA-NV Border Near 38 Degrees North

Logan, J Texas A&M U Pore Fluid Chemistry and Mechanical Behavior of Faults

McKee, James U Wisconsin- RUI: Mesozoic Paleogeography and Tectonics, Oshkosh Northern Sonora, Mexico

McCaffrey, R. Rensselaer Poly Investigation of Oblique Plate Convergence in Continents

Morrison, Jean U Southern Cal The Role of Fluids in Brittle Versus Ductile Deformation in the Whipple Mountains

Metamorphic Core Complex

Patchett, J. U of Arizona The Continental Component Added to the Sedimentary Assemblages in the Canadian

Cordillera: Nd Isotopic and other Geochemical Studies of Miogeoclinal Sequences

Patrick, B. U of Cal, SB Thermomechanical Development of the Internal Zone and Linkage with the Fold and Thrust Belt, Central Brooks Range, Alaska

Pollard, D. Stanford U Geometry, Mechanics, and Evolution of Well Exposed Mylonitic Faults Developed in Granitic Rock

Ralser, S. NMIMT Middle-Late Proterozoic Tectonic and Thermal Evolution of New Mexico: Inboard Thermal

and Deformational Response to the Grenville

Orogeny (?)

Saleeby, J. Caltech Testing of Possible Direct Relationships between Late Cretaceous Dextral Shearing of

the Sierra Nevada Batholith and Large

Magnitude Thrust Faulting of Southern CA

Schedl, A. LA State U Fluid Flow through the Linville Falls, Stone Mountain and Little Pond Mountain Thrusts,

and its Implications for Kiaman

Magnetization

Scholtz, Chris Columbia U Fault Process Zones

Silver, Eli UC, Santa Cruz Surface Uplift History of the Finisterre Mountains, Papua New Guinea

Sisson, V. William Marsh A Penrose Conference: Effects of Triple Junction

Rice U Interactions at Convergent Plate Margins

Selverstone, J. U of Colorado PTt and Kinematic Constraints on Proterozoic Tectonism in the Northern Colorado Front

Range

Steckler, M. Columbia U Parameterization of the Flexural Rigidity of Continental Margins and Basins from

Rheologic Models

Stump, Edmund Arizona State U Thermotectonic Evolution and Exhumation of a Modern Collisional Orogen (Everest

Region of Nepal Himalaya)

Van der Voo, R. U Michigan Rotations in Curved Fold and Thrust Belts: Further Paleomagnetic and Rock Fabric Studies
Van Schmus, W U Kansas Assembly and Ancestry of Gondwana: Tectonic History of the Borborema Province, Northeast Brazil
Varga, R. College of COLLABORATIVE RESEARCH: Structural Wooster Development of Interference Accomodation Zones in Extensional Orogens
Wells, M U Nevada, COLLABORATIVE RESEARCH: Alternating Las Vegas Contraction and Extension during the Mesozoic to Early Cenozoic, NW Utah
Wernicke, B. Caltech COLLABORATIVE RESEARCH: Studies of Large-Magnitude Intra-Continental Extensional Tectonism in the Basin and Range, California and Nevada
Wiltschko, D. Texas A&M Deformation Mechanisms in Thrust Fault Zones in Mudrocks
Yin, An U of Cal, LA Investigation of Timing and Magnitude of Crustal Shortening in Southern Tibet

LETTERS TO THE EDITORS

Dear Greg:

I enjoyed your comments about the Northridge 'quake in the GSA structure-tectonics newsletter. However, your comment about Resedans moving to Nebraska prompts me to point out that Lincoln, Nebraska is in the "moderate" seismic risk zone based on quake intensity (see Skinner & Porter's "The Dynamic Earth" fig. 15.11, for example).

Furthermore, in the 10 years since I moved here, my house has been almost struck by tornadoes on two occasions. The first resulted in my barbecue cooker being twisted into a corkscrew out on the patio -- presumably by a tornadic storm that passed over the house without setting down. An even more frightening storm occurred last July 7, when my neighborhood was hit by a line storm with imbedded tornadoes. Our only warning was a crash as the wind hit the house, and an instant later we were plunged into darkness as all the power lines went down.

The next morning when we inspected the damage, we realized that every tree and aerial on the block had been topped at a level about 10 feet above our roof. The debris was twisted and wrapped around itself, confirming its tornadic character. A lawn chair and several bird-feeders had vanished, presumably winding up in Oz. Power to our block was restored only 3 days later. We were very lucky -- if those tornadoes had been about 10 feet lower I would probably not be writing you.

It sounds like you were very lucky too. Congratulations on having saved your art glass!

Nan Lindsley-Griffin, University of Nebraska

Dear Editors:

Re: Division members need to be heard on the California Desert Protection Act of 1993.

This act, sponsored by Diane Feinstein (Senate Bill 21), has passed the Senate and is under consideration by the House. Once the House version is completed the bill will go to conference

for reconciliation of the House and Senate versions. S. 21 is of deep concern to the scientific community because it designates nearly every mountain range in eastern California as wilderness, subject to administration under the Wilderness Act of 1964. This will make what is already a logistically challenging area to work in virtually inaccessible. This designation will have disastrous impact on tectonic studies unless the legislation is modified to meet the needs of the scientific community.

In mapping roadless areas in Death Valley, my students and I have cached water and food by helicopter, typically a 55 gallon barrel of water and another containing enough food for about two weeks of fieldwork by backpacking into the cache. For roughly \$2500-3500 of helicopter time (about 6-8 hours), it is possible to emplace 15-20 caches in a given mountain range, enough for two full field seasons of detailed work, for about \$150 for each two-week cache. It seems to me that this is the least invasive way to map in roadless areas in the desert. The alternative, a pack train, mars the landscape with trails, eats large amounts of local vegetation, fouls springs, and probably wouldn't transport enough food or water in most desert ranges to be useful for geologic studies. If S. 21 becomes law, backpacking to helicopter caches will be the only way geological study can continue at anything like its current level.

The Wilderness Act of 1964 does permit limited, brief helicopter landings in wilderness areas, in the event of medical emergency, fire and insect control, and (believe it or not) for mineral exploration, although the latter is subject to approval by the Interior or Agriculture secretaries and is rarely granted. As already pointed out to me by the Superintendent of Death Valley National Monument, helicopter landings in support of scientific investigations would not be permitted in wilderness areas once the bill passes. I have therefore recommended to Senator Feinstein and the appropriate committee chairs that a provision to allow helicopter landings in support of science be included.

If members of the Division are basically in support of this provision, the most influential thing they can do is to send a short letter to their congressional representatives, with copies to the following:

The Honorable Bruce Babbitt, The Secretary of the Interior, Dept. of the Interior, Room 6151, Interior Bldg., 1849 C Street, Washington, D.C. 20240;

The Honorable George E. Brown, Jr., Chairman, Committee on Science, Space, and Technology, 2300 Rayburn House Office Bldg., Washington, D.C. 20515-0542;

The Honorable Dianne Feinstein, U. S. Senate, 331 Hart Senate Office Bldg., Washington, D.C. 20510;

The Honorable Al Gore, Vice President of the United States, Office of the Vice President, Old Executive Office Bldg., 17th Street and Pennsylvania Avenue, Washington, D.C., 20500;

The Honorable George Miller, Chairman, Committee on Natural Resources. 2205 Rayburn House Office Bldg., Washington, D.C. 20515-0507

Brian Wernicke, Cal Tech

Editor's comment: Wernicke's letter raises a very serious problem that will dramatically effect future research in up to 8 million acres of California desert. The wilderness area designation, soon to be applied to a score or more of desert mountain ranges, fails to note the inherent differences between wilderness areas in forested temperate regions and the arid ranges of the Mojave, Sonoran, and Basin-Range deserts. The principal difference is the absence of water in the desert ranges. With few exceptions, their wilderness status will preclude hiking into and within the ranges because hikers must carry their own water with them. No one will be able to hike into a desert range for any longer time or greater distance than that permitted by the water

supply one can carry. This means visitation times of hours, never days. No hikes into the high, scenic, central parts of the many ranges. No backpacking or overnight camping! No more vehicle-based recreational camping in secluded washes where lovers of the out-of-doors can enjoy the solitary splendor of the surrounding mountains. Scientific study of the geology, flora, and fauna of our desert ranges will essentially cease. Many spectacular examples of geologic phenomena that currently attract geologists from around the world to the Mojave and Sonoran deserts will no longer be visited because vehicular access to central parts of the ranges will not be permitted. I presume that the other natural sciences will suffer as well.

Wernicke proposes that helicopter access be granted for scientific studies. It is a good proposal in my opinion, but one with economic and environmental disadvantages (for example, the additional expense needed to fly out the empty 55 gallon barrels -- which become an eyesore if left abandoned). A broader approach to the problem of access for field studies would be to allow vehicular access into the lower reaches of desert range wilderness areas by permitting travel up existing roads (that have commonly been renamed iwaysî to pretend that some wilderness-designated areas are iroadlessî) and dry washes. The cost to the environment of driving up dry washes is temporary -- tire tracks left in the gravelly or sandy washes are swept clean during the next flash flood. Restrictions against off-road driving over playas, dune fields, lowland desert pavement and alluvial fans should be enforced. Our desert areas have contributed much to an understanding of geologic processes -- not just in California but around the world -- and much research remains to be done. While helicopter landings, if permitted, will ameliorate the access problems posed by the rugged ranges, wilderness area restrictions against vehicular access up dry stream beds will severely impact future field studies. I, too, urge Division members to make their opinions known on this pending legislation. GD

ANNOUNCEMENTS

Penrose Conference on Fine-grained Fault Rocks

This is a preliminary announcement of a G.S.A. Penrose Conference entitled "Fine-grained fault rocks". The focus of the meeting will be on high strain products of faulting and plastic deformation at all crustal levels: fault gouge, cataclasite, pseudotachylite, and ultramylonite. One goal of this conference is to consider these rocks from a wide variety of perspectives, including experimental, field, petrologic, geochemical, and isotopic methods, and to attempt to integrate these approaches where possible. Another goal is to promote discussion among those interested in fault rocks working in various sub-disciplines, and to encourage wider application of (especially new) techniques to all fault rocks. A third goal is to reconsider the fault rock classification scheme in light of recent discoveries, questioning whether it needs expansion and if it currently hinders investigations into the nature of fault rocks by establishing unnatural boundaries. Specific topics and sessions will be published in future issues of this *Newsletter*. The conference will be held in mid-September, 1995, in the North Cascade Mountains of Washington state. Plans currently are for a one-day field trip, followed by three days of discussions, talks, and posters, and a second, optional one-day field trip.

For further information, questions, comments, and suggestions, please contact the conveners:

Jerry Magloughlin, Univ. of Michigan, 313-747-0664, jerry.magloughlin@um.cc.umich.edu

Fred Chester, St. Louis University, 314-658-3124, chester@slueas.slu.edu;

John Spray, University of New Brunswick, 506-453-3550, jsg0@unb.ca

Allmendinger Shareware of Cornell University

Rick Allmendinger, Cornell University, reports that he can no longer accept regular mail requests for his structural geology programs for the Macintosh. Please do not send him disks or money! All of his programs continue to be available for free to non-commercial users via Internet anonymous FTP. The address of the FTP site is: "silver.geo.cornell.edu" and the directories are "/pub/rwa_programs". Users will always find the most recent versions of the programs at that site.

Geowriting Short Course Offered

The Geoscience Information Society (GIS), the American Geological Institute (AGI) and the Association for Earth Science Editors (AESE) will co-sponsor the short course "Geowriting: Guidelines for Writing and Referencing Technical Articles" at the 1994 Geological Society of America annual meeting in Seattle, Washington. Learn the methods of technical writing and bibliographic research in the geosciences. The morning session will focus on technical report writing, and will use the newly revised book *Geowriting*, published by AGI, as a resource and text. Discussion will cover organization, getting started, editing, common grammatical problems, graphic presentation of data, and a brief introduction to common software packages available for word-processing and graphics. The afternoon session will focus on library research and referencing: the use of library catalogs and bibliographic databases, the compilation of references, and the use of software for compiling references and bibliographies.

When: Saturday, October 22, 1994, from 8 a.m. - 5 p.m.

Where: Seattle Sheraton Hotel, Seattle Washington

Limit: 35; preregistration required

Fee: Professional: \$140 (after August 1);

Student: \$99 (Includes handouts and a copy of the *Geowriting* text)

For more information and registration, contact Julie Jackson, American Geological Institute, 4220 King Street, Alexandria, VA 22302; 703-379-2480; fax 703-379-7563; internet e-mail: lar@aip.org

HAVE YOU HEARD ... ?

It's become traditional to start this column with announcements of new academic appointments. So here it is: from Austin (Texas) comes news that UT has filled two faculty positions since the start of the year. [Now that's impressive!] *Jim Connelly* (Ph.D. Memorial Univ., Newfoundland) whose specialty is U/Pb geochronology and structural geology, started at UT in January. Jim's Ph.D. adviser was *Toby Rivers*; after leaving Memorial he studied U/Pb techniques with *Tom Krogh* at the Royal Ontario Museum and then returned to Memorial to work with *Greg Dunning*. UT has more recently filled its structure/tectonics position with the appointment of Randy Marrett of Amoco Production Co. Marrett, a former student of Richard Allmendinger, received his Ph.D. in 1990 from Cornell. *David H. Malone* (Ph.D., 1994, Wisconsin-Madison) began a tenure-track Assistant Professorship in August at Illinois State University in Normal, IL. That same month saw *Phyllis A. Camilleri* (Ph.D. 1994, Wyoming) joining the faculty of Austin Peay State University in Clarksville, Tennessee, also as a tenure-track Asst. Prof. *Art Snoke* was her adviser in Laramie. Not too far away from Clarksville, *Joseph Allen* (Ph.D. Kentucky, 1994) has

accepted an Assistant Professorship at Alice Lloyd College in Pippa Passes, Kentucky. A bit farther north in Meadville, PA, *Ron Cole* (Ph.D., '93, Univ. of Rochester, *Peter DeCelles*, adviser) is Allegheny College's new environmental/structural geologist. *Amy Thompson* (University of New Mexico) is a visiting assistant professor at Hope College in Michigan, and *Joe Reese* (UT Austin) is filling a sabbatical leave position at Idaho State University. Both Amy and Joe are Ph.D. expectants.

Recent academic promotions to tenure include those of *Sandy Cruden* at the University of Toronto, *Marcia G. Bjornerud* at Miami University (Oxford, Ohio), and *Joann Stock* at Cal Tech. *An Yin* received tenure at UCLA this Spring at an advanced Associate Professorial rank.

Eldridge Moores (UC Davis) is the first recipient of the Geological Association of Canada Medal. The honor is awarded to a non-resident of Canada for contributions to earth science -- no small number so far as Eldridge is concerned! Eldridge is the Society's candidate for our next Vice-President. Once again, the GSA's prized Donath Medal (Young Scientist Award) goes to a member of our Division: *An Yin* of UCLA will receive the 1994 award in Seattle. Four of the six awards given to date have honored Division members (*Yin*, *Mark Cloos*, *Brian Wernicke*, and *John Grotzinger*) -- despite the fact that we constitute only about 13% of the Society's total membership. Kinda tells us something doesn't it? Whatever it tells us, let's keep it a secret! Congratulations An!

Still another award to a Californian! *John S. Shelton*, La Jolla, is a recent recipient of AGI's Outstanding Contribution to Public Understanding of Geology Award. The award recognizes John's unique success in integrating geology and photography over a career that has spanned more than five decades. John, now 80 (but who'd believe it if they saw him?), and his glorious aerial photography were the subjects of a recent article in *Earth* (March, 1994). From 1946 to 1991 he shot 28,000 pictures (solo from his one-seated planes) logging more than 5800 flight hours. First published in 1966, John's *Geology Illustrated* (W. H. Freeman) showcased nearly 400 of his favorite photos. This book is still in print and eminently worthy -- both for its photos and text -- of being on every geologists bookshelf.

Miscellaneous people news includes word that *Chris Henry* has left the Texas Bureau of Economic Geology for the Nevada Bureau of Mines and Geology. *Giovanni Guglielmo* has joined *Martin Jackson's* group at the Texas Bureau. Elsewhere among the state agencies, *Robin McDowell* (Ph.D, Kentucky, '92) is now with the Georgia Geological Survey in Atlanta. *Jeffery R. Unruh* has been appointed as Assistant Research Geologist at UC Davis. *W. K. Fyson* has retired from the Geology Department of the University of Ottawa after 33 years of service. Bill, a former Chair of the department from 1984-1990, is known for his research and that of his students in the Nova Scotia Appalachians and the Grenville and Slave provinces. He plans to remain active in the Department despite his retirement. John Christie (of quartz deformation fame) retired from UCLA this year as well.

For the first time, our Division will be presenting two "GSA Student Research Awards" at the forthcoming annual meeting. After consideration of the five highest ranked applications for Society research funding, the Management Board has selected *Christopher A. Hedlund* of Colorado State and *Jonathan C. Lewis* of the University of Connecticut for Seattle awards. Hedlund's dissertation topic "Geometry, kinematics, and mechanics of decollement folding in the Canadian Rockies" is under the supervision of *Eric Erslev*. "The effect of changing plate motions on the structure of an accretionary prism: the Tertiary Shimanto Belt, Japan" is the title of Jonathan's Ph.D. research; his adviser is *Tim Byrne*. Congratulations guys!

Attention academic advisers: looking for an enterprising student (obviously Eric Erslev and Tim Byrne are)? The June issue of *The Main Thrust*, the newsletter of the Structural Geology and Tectonics Division of the Geological Association of Canada, carries this ad: "Looking for a Ph.D. project in Neotectonics - Mountain Building. Will soon complete MSc in Applied Structural Geology and Rock Mechanics at Imperial College, London. richard.holmes@ic.ac.uk." Speaking (writing) of the GAC and students, *Matthew Manson* of the Erindale Campus, University of Toronto, has won an abstract award with a definitive \$150 cash prize. Manson's abstract, "The closure of the mid-continent rift through Grenville compressive tectonism: evidence from eastern Lake Superior" was selected for the GAC-MAC's 1994 Best Student Abstract Award.

From Los Altos comes the sad news that *Bill (William G.) Pierce* passed away last January at the age of 89. Long affiliated with the USGS, Bill began his noteworthy career in 1927 as a Survey field assistant. Bill was best known scientifically for his long term field studies and provocative interpretations of the enigmatic Heart Mountain fault in northwestern Wyoming. His publications relating to the fault spanned a period of time of more than half a century! He was the recipient in 1965 of the Department of Interior's Distinguished Service Award. This editor (GD) remembers him as a warm, gracious, folksy man whose love of geology (and his beloved Heart Mountain fault) never dimmed over the years. Condolences are extended to his family, including son *Ken*, a member of our Division.

Post-docs overseas: *Philip Jarvis* (Hawaii, 1991) has begun his second post-doc in Japan. After a position with the Geological Survey of Japan, Phil has now begun post-doc research sponsored by the NSF with Dr. Kensaku Tamaki at the University of Tokyo's Ocean Research Institute. *Claudia Lewis* (Harvard Ph.D., June, and a student of *Joann Stock*) arrives in September at the University of Barcelona on a Fulbright fellowship. While there she'll work with Profs. *Josep Anton Muñoz* and *Mariano Marzo* on physical mechanisms for the uplift and topographic incision of NE Spain.

In-continent postdocs (that doesn't sound quite right, does it?): *Paul Sacks* has a Canada International fellowship from NSERC to the Georesources program of the University of Quebec. He'll be working on Taconian and Acadian faults in the Gaspé portion of the Appalachians. *Basil Tikoff* (Ph.D.-soon-to-be at the U of Minnesota, Minneapolis) will undertake a post-doc there with *Christian Teyssier*. *Matthew Nyman* (Ph.D. Wyoming under *Robert Houston*) has joined *Karl Karlstrom* as a post-doctoral fellow at the University of New Mexico.

Northridge earthquake update: six months after the January 17th magnitude 6.8 event, 377,000 disaster housing assistance grants totaling \$948 million have been approved by FEMA and 89,000 loans for \$2.7 billion have been approved by the Small Business Administration. The death toll of the tremor was 62, an astonishingly small total considering that the early morning earthquake damaged more than 86,000 buildings containing a total of 308,900 dwelling units! As of July 17th, nearly 1400 buildings remain partly vacated, and 20,089 dwelling units in 1587 structures still stand empty. In the six months following 1/17, the U.S. government had allocated about \$12 billion for various forms of disaster assistance and recovery. Less than half of the total property damage was covered by insurance. Insurance carriers are facing \$6.5 billion dollars in payable claims. Fearing another, even larger future quake in the greater LA area, insurance companies are balking at continuing to issue homeowners earthquake insurance in California. The 353 acre Cal State Northridge campus alone suffered \$350 million in damage -- by far the greatest loss ever experienced by a U.S. academic institution. (Ref: *Los Angeles Times*, 7/17, with data from various U.S., CA, and insurance company sources)

SYMPOSIUM SUMMARIES

GSA Cordilleran Section Meeting, 3/94, San Bernardino, CA

"Episodic Mesozoic and Cenozoic Extension in the Basin and Range"

Conveners: Wanda Taylor (UNLV) and David Miller (USGS, Menlo Park)

This symposium was filled with 21 interesting and exciting presentations on the Mesozoic and Cenozoic geologic development of the Basin and Range province (see *GSA Abstracts with Programs*, v. 26, no. 2, for abstracts and list of contributors). It appears that throughout the geographic region covered, from southern Canada to southern Arizona and California, extensional structures have similar geometrical and mechanical characteristics. Both high- and low-angle normal faults are common and some faults may be associated with strike-slip faults.

Despite these similarities, structural, stratigraphic, geochronologic and petrologic evidence indicate that dramatic differences exist in the ages of faults, number of faulting episodes and the relationship between magmatism and extension across the province. Mesozoic extension is Jurassic and/or Cretaceous in age and was best documented in two regions -- from near the Canadian border into the northern Great Basin and in the Mojave Desert/Death Valley region. This extension generally was closely associated in space and/or time with magmatism and/or crustal shortening. Eocene and Oligocene extension is documented from southern Canada to central Utah and Nevada. The contributors established the occurrence of multiple Cenozoic (Eocene to Quaternary) periods of extension that locally resulted in overprinted and reactivated faults in the Great Basin. A number of speakers provided evidence for as much as 90 degrees of rotation in extension direction between extensional periods in the Oligocene and/or Miocene. It was suggested that the rotation of extension direction may be associated with either the onset or cessation of magmatism or both in the central and southern Great Basin. In contrast, data and interpretations suggest roughly synchronous extension, magmatism and sedimentation during the Miocene in parts of the southern Basin and Range province.

The data and interpretations discussed during this symposium provide a basic framework in which to compare and contrast Mesozoic and Cenozoic extension throughout the western Cordillera. At least three important points in the regional tectonic development emerged during this symposium: (1) Mesozoic and Eocene extension are significant aspects of Cordilleran structural evolution, (2) major differences exist in the age and number of periods of extension in various parts of the Basin and Range province and (3) magmatism and extension do not appear to have the same upper crustal spatial and temporal relationships throughout the province.

Thanks to the contributors for excellent talks and their food for thought. Thanks to all the contributors, questioners and listeners for participating and making this symposium interesting and intellectually stimulating.

"Paleoseismology"

Conveners: Glenn R. Roquemore (Irvine Valley College) and Robert Yeats (Oregon State U.)

This symposium was co-hosted by the International Lithosphere Program (ILP). It included 10 presented papers and a two-day field trip to the Garlock fault led by Dr. Sally McGill.

Bob Yeats discussed the emerging field of historical paleoseismology, the correlation of historical earthquakes to specific faults, specifically those with surface rupture. The first historical paleoseismologist was Andrew Lawson, who in 1908 described surface rupture on the Hayward fault during an earthquake in 1868. Hiro Tsutsumi presented a segmentation model for the Median Tectonic Line in southwest Japan, comparing geometric segmentation with segmentation based on earthquake recurrence. He raised the possibility that part of the MTL may have ruptured in the great Keicho earthquake of 1596. Glenn Biasi discussed a quantitative method for refining radiocarbon dated paleoearthquake events. Biasi and Weldon suggest that relying on carbon dates alone can lead to significant uncertainties. The use of auxiliary information contained within the strata can be used to limit potential uncertainties. Scott Lindvall presented the most recent results on paleoseismic studies on the southern portion of the 1992 Landers rupture zone. Lindvall and Rockwell have found a complex rupture history within the rupture zone. They recognize at least three Holocene events that do not consistently involve the same segments along the present rupture zone. Tom Rockwell presented an update on his research on clustering of earthquakes in the Imperial Valley. Rockwell has found evidence for multiple earthquake events that were closely spaced temporally. This finding challenges the commonly accepted method of estimating the recurrence interval and, to some extent the slip rates, on Holocene faults. Larry Gurrola discussed recent work on the paleoseismology of the Superstition fault in Imperial Valley. Gurrola and Rockwell described evidence for 3 earthquake events on the Superstition Hills fault. These events are clustered and suggest uneven strain release over the last few recurrence cycles. Marith Reheis reported on her recent work on the central Fish Lake Valley fault, western Nevada. Reheis has found several moderate to large earthquakes in the last 5,000 years. In addition, timing of the last event to present is greater than the average recurrence interval. Salley McGill provided preliminary slip rate and recurrence interval data on the western Garlock fault. McGill has determined that this portion of the Garlock faults has a slip rate of 10m/yr and an average return time of 2762-2377 years. Glenn Roquemore presented the results of initial studies required to locate appropriate trenching localities on the Harper and Blackwater faults, northern Mojave Desert. Roquemore and Simila have found significant Holocene fault morphology along both faults and indicated sites for future paleoseismic studies. John Siskowic reported on new potential evidence for coseismic liquefaction at the Sandy River delta, Oregon (east of Portland). Siskowic and others, presented data to suggest that these liquefaction features formed during the last great earthquake in the Cascadia region.

"Tectonic Evolution of Baja California"

Conveners: Becky Dorsey (NAU, Flagstaff) and Arturo Martin (Dept. de Geologia, CICESE, Apdo Postal 2732, Ensenada)

Speakers in this symposium presented new data and interpretations from a number of ongoing studies related to the tectonics of Baja California. Topics ranged widely from displaced Jurassic ophiolites and ^{40}Ar - ^{39}Ar dating of Cretaceous granitic plutons to Pliocene paleomagnetism and present-day seismotectonics. Richard Sedlock kicked off the morning session with a summary of the Mesozoic and Cenozoic tectonic history of western Baja California. Sedlock presented a model for Late Cretaceous to mid-Tertiary extensional exhumation of subduction-related

blueschist-facies metamorphic rocks, which occurred roughly coevally with about 1500 km of lateral northward translation of these rocks (along with the rest of Baja California) from the latitude of southern Mexico to their present position. On a related topic, Doug Smith discussed an intriguing and still unresolved paradox between conflicting models for the magnitude and timing of strike-slip terrane displacements since Cretaceous time. Paleomagnetic data (Beck, 1991) support a model for 10° to 12° (up to 1500 km) of northward translation of the Peninsular Ranges terrane (PRT) during Paleogene time. In contrast, substantial geologic data (Gastil, 1991) indicate that the PRT has moved northward only about 2° since the Paleozoic, with most of this displacement occurring since early Pliocene time along the modern Gulf of California margin.

The venue then switched to new studies of the Cretaceous Sierra San Pedro Martir (SSPM) pluton, a favorite among friends of Baja California geology. Amabel Ortega-Rivera presented high-precision ⁴⁰Ar-³⁹Ar data that show a progressive decrease in plateau ages, from 95 Ma (hornblende) and 93 Ma (muscovite and biotite) at the margin, to 91 Ma (hbd) and 87 Ma (musc, biot, plag) at the core of the pluton. Geochemical data presented by Gordon Gastil provide evidence that the pluton formed by early crystallization of a hornblende tonalite outer margin, leaving an evolved melt that became concentrated inward (granodiorite and monzogranite).

David Rothstein presented quantitative estimates of metamorphic P-T conditions, based on equilibrium mineral phase relations, for metamorphic rocks in the eastern Peninsular Ranges batholith (PRB) at several localities. Although exposures of partially melted and migmatitic rocks are restricted to the central portion of the batholith (in the SSPM pluton; 650-700°C, ~5 kb), eastern portions of the PRB expose deeper crustal levels (570±15°C; 4.5±0.9 kb) than previously expected. Rothstein suggested that offset on post-batholith faults may explain the complex pattern of exhumation in the eastern PRB.

Jeffrey Lee shed light on some of the post-batholith faults in northeastern Baja. Recent work by Lee and Meghan Miller in the southern Sierra Juarez has revealed important map relations and new geochronologic constraints on normal faults that cut a thick sequence of Miocene sedimentary and volcanic rocks. ⁴⁰Ar-³⁹Ar age data show that east-west extension and normal faulting took place along the western margin of the Gulf Extensional Province (GEP) between ~16 and 11 Ma (middle Miocene). Their study supports existing plate-tectonic models which suggest that extension in the GEP began during cessation of subduction of the Pacific plate or soon thereafter. Arturo Martin and Mario Rebolledo reported on their work in Pliocene sediments and pyroclastic deposits in the Puertecitos Volcanic Province, NE Baja California, which record fault-controlled sedimentation along the western margin of the Gulf of California transform-rift zone. Pliocene rocks are cut by younger strike-slip and normal faults that accommodated clockwise block rotation during late Pliocene or Quaternary time. Tim Melbourne presented paleomagnetic data from a 3.2-Ma volcanic tuff in the same area, which provide evidence for clockwise vertical-axis block rotation in a zone affected by NE-striking left-lateral strike-slip faults. These results, and recent work by Claudia Lewis, support the hypothesis that significant young NW-trending dextral shear strain is regionally accommodated by NE-striking sinistral faults in this part of the GEP. Thus the GEP experienced an important structural transition, from middle-late Miocene orthogonal extension and normal faulting (proto-gulf stage; Stock and Hodges, 1989) to Pliocene-Quaternary dextral strike-slip faulting and related clockwise block rotations. This change in structural style occurred when Pacific-North America relative plate motion stepped inboard from the Toscos-Abreojos fault to the modern Gulf of California, thereby transferring the Baja California Peninsula to the Pacific plate

John Holt presented preliminary paleomagnetic data from post-10-Ma, Mio-Pliocene marine sedimentary rocks in the Santa Rosalia basin, eastern Baja California Sur. At least three polarity zones are present in the Santa Rosalia section. Andy Stone and Paul Umhoefer presented results of ongoing research with Becky Dorsey in the Pliocene Loreto basin, located south of Santa Rosalia along the Gulf of California. Stone's work focused on structural and kinematic analysis of a complex fault array that cuts Pliocene sedimentary rocks in the SE part of the basin. The kinematics (E-W to ESE-WSW bulk extensional strain) and geometry of this fault array are similar to patterns predicted by analytical and experimental models of oblique continental rifting (Withjack and Jamison, 1986), thus providing one of the first positive field tests of the oblique-rifting model. Umhoefer discussed the timing of late Pliocene transtensional deformation in the Loreto basin, which is constrained by ^{40}Ar - ^{39}Ar dates on interbedded tuffs (dates by P. Renne).

Initiation of the basin at 3.4 Ma coincides with the onset of full Pacific North America plate motion within the Gulf of California.

The symposium concluded with talks on modern seismotectonics of the Mexicali-Imperial Valley (J. Javier Gonzalez) and the Peninsular Ranges of northern Baja California (Jose Frez). Seismic focal mechanisms in this part of the southern San Andreas fault system are mainly strike slip and normal in nature. The Mexicali-Imperial Valley has experienced significant seismic activity since 1987, with four notable earthquake swarms measured during 1993. Seismicity in this area is concentrated in two zones: (1) a seismic zone that connects the Cerro Prieto and Imperial faults; and (2) a diffuse zone in the central part of the valley that is bounded by the Sierra Cucapah, Cerro Centinela, and the Cerro Prieto volcano. The strongest activity in zone 2 was associated with the 1987 Cerro Prieto earthquake ($M = 5.4$). Seismicity in the Peninsular Ranges is strongly concentrated along the San Miguel fault system. This fault probably represents a significant seismic hazard; its northwestern continuation trends straight toward Tijuana. Although the Agua Blanca fault has experienced relatively little seismic activity in the last 20 years, a zone of diffuse seismicity is seen in the SE segment near its junction with the San Miguel fault. Gary Axen gave a short, unscheduled talk at the end of the session, to present late-breaking news about a moderate earthquake that shook Ensenada only hours earlier that day. The earthquake ($M = 4.8$) was located between the San Miguel and Tres Hermanos faults and felt in Ojos Negros, Ensenada, Tijuana, San Diego, Tecate, and Mexicali. Minor damage occurred in Ensenada.
[Summary condensed by the editors.]

"Phanerozoic Cordilleran Metamorphism: Distribution and Tectonic Implications"

Conveners: Phyllis Camilleri (Austin Peay State University, Clarksville, TN)

and David Miller (USGS, Menlo Park)

The purpose of the symposium was to bring together new developments on the nature and timing of Cordilleran metamorphism and its tectonic/structural implications and relation to plutonism. The symposium covered a wide range of topics and tectonic settings from southern Arizona to southern Alaska. A total of 17 papers were presented, 12 oral and 5 poster. Common themes among the papers were inverted metamorphic gradients and Mesozoic, in particular Cretaceous, metamorphism. Some brief highlights of the symposium follow.

From the Cordilleran fold and thrust belt, United States and Canada ...

S.L. Martinez [Swenson], S.M. Peacock, and S.J. Reynolds, presented evidence for an inverted textural, but not thermal, metamorphic gradient beneath Cretaceous thrust faults in the Granite Wash and Harquahala Mountains in west-central Arizona. They attribute metamorphism to thrusting and the inverted textural gradient (i.e., grain size increasing upwards) to "enhanced recrystallization and growth kinetics induced by increased strain and fluid flow near the thrust faults" -- a reminder that grain size is not a good indicator of metamorphic grade. Further north, in the hinterland of the Sevier fold-and-thrust belt, P. A. Camilleri, D. M. Miller, A.W. Snoke, and A. J. McGrew presented a summary of Mesozoic metamorphism in NE Nevada. They emphasized that there are two principle phases of metamorphism: regional-contact Late Jurassic metamorphism associated with pluton emplacement during minor crustal shortening and thickening, and Barrovian-style metamorphism that peaked in the Late Cretaceous and regionally affected the middle crust due to substantial tectonic thickening. On a more local basis, A. W. Snoke summarized the metamorphic history of the Ruby Mountains and East Humboldt Range, northeast Nevada. Three major metamorphic events affected these ranges -- Late Jurassic metamorphism related to pluton emplacement, Cretaceous related to tectonic thickening, and Tertiary to crustal extension. Additionally, M. T. Peters and A. J. McGrew presented thermobarometric data from the East Humboldt Range. Their data when coupled with thermochronology, indicate a Mesozoic clockwise P-T path with a period of partial decompression prior to mid-Tertiary "Basin and Range" extension. Nearby, in the Pequop Mountains-Wood Hills-Spruce Mountain-East Humboldt Range region, P. A. Camilleri documented a normal Barrovian metamorphic gradient (unmetamorphosed through kyanite/sillimanite zone) that can be attributed to tectonic burial in the footwall of a thrust fault. Peak metamorphism within the footwall is Late Cretaceous, but contrasts with metamorphism of similar age elsewhere in the Sevier hinterland which has been attributed to plutonism. In the southeast Canadian Cordilleran fold and thrust belt, M. Colpron, R. A. Price, and D. M. Carmichael presented metamorphic and structural data that suggest that emplacement of middle Jurassic plutons overlapped development of the Selkirk fan structure, and that the plutons were emplaced at shallow levels and then subsequently buried to deeper levels during thrusting and folding.

From terranes along the continental margin in the lower 48 United States ...

S. P. Rowe, H. W. Day, and C. W. Naeser presented new zircon fission track analyses that put new constraints on the post-metamorphic cooling history of terranes in the northern Sierra Nevada. Their data indicate that the terranes experienced protracted cooling near 200 °C from ~120- 142 Ma and also suggest that temperatures probably were not much in excess of 200 °C since 160 Ma. Also in the northern Sierra Nevada, T. J. Fagan and H. W. Day addressed the problem of whether Jurassic metamorphism of island arc fragments took place during volcanic construction of the arcs or during subsequent amalgamation of the terranes on the continental margin. They concluded that the pattern of metamorphism can be interpreted as due to either burial in the volcanic setting or granitic plutonism during terrane amalgamation, and that $^{40}\text{Ar}/^{39}\text{Ar}$ data may be required to determine tectonic setting during metamorphism. On a different theme, A. S. Yoshinobu and G. H. Girty addressed the space problem for emplacement of the Emigrant Gap pluton, northern Sierra Nevada, by geochemical analysis of contact metamorphic wall rocks. They concluded that elemental loss or mass transfer during contact metamorphism could be a possible space making mechanism for pluton emplacement.

M. C. Blake Jr., B. F. Cox, and D. H. Sorg discussed the Franciscan complex in the northern Diablo Range, northern California. They presented evidence that ductile thrust faulting in the complex was possibly contemporaneous with blueschist facies metamorphism in the upper part of the subduction zone, and that ductile faulting was followed by brittle deformation and melange development, probably as a result of transportation of subducted slabs back to the surface. R. B. Miller, S. R. Patterson, D. L. Whitney, and S. A. Bowring, presented a summary of isotopic, metamorphic, and structural data from the crystalline core of the north Cascades. Their data emphasize that metamorphism in the crystalline core is spatially associated with plutons and therefore domainal, but is also polyphase spanning ~96-45 Ma. J. L. Harvey and T. D. Hoisch discussed rim reaction relationships and phase equilibria constraints in sapphirine-bearing amphibolites of the Okanogan metamorphic core complex, Washington. Their data suggest an isothermal decompression path of ~10 to ~5 kb at ~750-800 °C, which may record initial extensional exhumation of the metamorphic core complex.

From terranes in Alaska and British Columbia ...

D. A. Brew, G. R. Himmelberg, A. B. Ford, and R. Loney synthesized information from the collage of metamorphic belts in southeast Alaska, concluding that they basically comprise three extensive plutonic-metamorphic complexes. The eastern and western complexes represent Late Cretaceous, moderate to high pressure metamorphism, interpreted to have resulted from continental collision, whereas the Late Jurassic and Early Cretaceous central complex represents low pressure arc related metamorphism. G. R. Himmelberg, D. A. Brew, and A. B. Ford documented a Late Cretaceous inverted Barrovian metamorphic gradient in the western metamorphic belt of the Coast Mountains plutonic-metamorphic complex near Juneau, Alaska. They attribute the metamorphic inversion to emplacement of the overlying "Great Tonalite Sill." M. E. Russmore and G. J. Woodsworth also documented a Cretaceous inverted metamorphic gradient in the Waddington thrust belt, Coast Mountains, British Columbia. They suggest that the source of heat for metamorphism may have been thrusting of part of an active mid-Cretaceous arc to the west over the Waddington thrust belt. J. B. Saleeby presented new isotopic data that indicate that the Taku-Alexander terrane boundary in the East Behm Canal-Nakat Inlet region, southeast Alaska, is topologically complex with inliers and outliers of respective terranes situated in positions that overlap the traditional terrane boundary both to the east and west. S. M. Debari discussed a crustal cross section through the mid-Jurassic Bonanza island arc, which is developed on Wrangellian basement on Vancouver Island, British Columbia. Debari presented evidence for partial melting of amphibolitic Wrangellian basement within deep levels of the arc and migration of partial melts to shallow levels of the arc.

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? A former teacher? A colleague? Someone whose writings changed your life? Take a moment and change that person'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. 1990 through 1994 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.

THE SEATTLE ANNUAL MEETING -- TECTONICALLY ACTIVE!

By now you've probably already decided if you're journeying to the Pacific Northwest this October for the Society's Annual Meeting. If you haven't, read on. The 1994 meeting is as structurally and tectonically oriented as any meeting in recent memory. Full meeting details and registration forms were presented in the June issue of *GSA Today*, but to make your life easier here is a listing (hopefully complete) of theme sessions, symposia, and special courses that represent a cornucopia of scientific goodies for Division members. Something for everyone!

The Division Symposium: "New frontiers in active tectonics" (George Davis & B. Minster)

Division Short Courses:

"Computer-aided plate tectonic modeling techniques" (Christopher R. Scotese and Malcolm I. Ross)

"GPS geodesy and active tectonics" (Michael G. Bevis and Charles M. Meertens)

Other Symposia:

"Keynote symposium: birth and death of a plate" (G. W. Bergantz and K. C. Creager)

"Plate motion and displacement partitioning in the Circum-Pacific orogenic belts" (Basil Tikoff, Christian Teyssier, and John Oldow)

"Tectonic geomorphology, depositional processes, and the depositional record (D. W. Burbank)

"The Dreiss symposium: recent trends in studies of coupled hydrodynamic, tectonic, and thermal processes" (Mark Person and Ken Belitz)

"Cataclysms and catastrophes: the planetary perspective" (Odette B. James)

Other Short Courses:

"Computer mapping at your desk that really works" (Russel A. Ambroziak, Grant R. Woodwell, and Christine A. Cook)

"GIS and the geosciences" (Richard L. Bedell, Jr.)

Theme Sessions:

"Tectonics and landforms around the Pacific Rim" (A. L. Bloom and Thomas Dunne)

"Phase transformations: mechanisms and kinetics of mineral reactions (Bradley Hacker and Steven R. Bohlen)

"Magmatic evolution of Circum-Pacific arc systems" (Robert J. Stern)

"Geologic mapping of terrestrial planets: use (and abuse?) of remotely sensed data" (George E. McGill)

"Scientific results of the continental drilling program: Creede caldera, Newark rift system, Manson impact structure" (P. M. Bethke, D. V. Kent, P. E. Olsen, D. J. Roddy)

"Teaching structural geology" (Jan Tullis; sponsors: our Division and the NAGT)

"Quantitative analysis of joints and faults: new approaches to field, laboratory, and modeling studies of rocks fracture" (Michael R. Gross)

"Cascadia subduction zone" (Harvey Kelsey, Robert Schuster, and Brian Atwater)

"Cascadia convergent margin: forearc tectonics" (J. Casey Moore and Roy Hyndman)

"Puget Sound-Georgia Strait region: 140 million years of tectonics" (J. W. H. Monger and Samuel Y. Johnson)

"Tilt vs. translation and the Late Cretaceous tectonics of western North America" (George Gehrels and Bob Butler)

"Baja British Columbia: evaluation of large-scale northward transport of the northern Cordillera in Late Cretaceous to Early tertiary time" (Paul Umhoefer, & Ted Irving)

"Convergent and transform processes at the leading edge of the northern Pacific rim" (Sarah Roeske, Jinny Sisson, and Terry Pavlis)

"Geophysical studies of the continental margin, western North America" (W. D. Mooney)

"Late Mesozoic basins in the North American Cordillera: constraints on terrane accretion and translation" (J. B. Mahoney, John Garver, Ralph Hagerud)

"Birth and Life of an island arc a leading edge -- the geologic development of Japan" (Tim Byrne and Asahiko Taira)

"Active arc-continent collision in Taiwan" (Neil Lundberg, Louis Teng, Donald Fisher, and Jean Crespi)

"Geologic evolution of the Tian Shan orogenic system" (Stephen Graham and An Yin)

"Rheological and structural evolution of contractional orogenic belts" (Phyllis Camilleri)

"Dating deformation" (William J. Dunlap and Jerry F. MacLoughlin)

"Precambrian and Phanerozoic terrane accretion: contrasts and similarities" (Kent C. Condie and Peter J. Coney)

"Precambrian orogens: tectonic setting and crustal architecture" (Ben A. van der Pluijm and Timothy M. Kusky)

FUTURE MEETINGS, CONFERENCES, AND COURSES

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

1994

Oct. 3-5: Geological conference of Jordan and the Middle East (mtng., field trip): Amman, Jordan [sponsor: Jordanian Geologists Assoc. and Arab Geologists Assoc.; contact Dept. of Geology, University of Jordan; registration fee, \$75; field trip, \$150].

Oct. 15-17: Geology and biology of the Caribbean (meeting): Kingston, Jamaica [contact Trevor Jackson, Dept. of Geology, Univ. of the West Indies, Kingston 7; phone (809) 927-2728; fax (809) 927-1640].

Oct. 21-23: LIRA Workshop on the Ross orogen: crustal structure and tectonic significance: Dallas, Texas (see *GSA Today*).

Oct. 24-27: Annual GSA meeting: Seattle, Washington. Call GSA Meetings Department @ (800) 472-1988 or (303) 447-2020 for information.

Nov. 1-2: Basin modelling (conference): London [sponsor: Petroleum Group, Geological Society; contact: phone (44) 71-287-1433; fax (44) 71-439-8975].

Nov. 7-11: International symposium on the Cenozoic tectonics and volcanism of Mexico: Puerto Vallarta, Jalisco (see *GSA Today*).

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].

Dec. 7-8: Tectonic evolution of Southeast Asia: London (see *GSA Today*).

1995

March 27-29: Structural geology in reservoir characterization (conference): London [sponsor: Petroleum Group, Geological Society; contact: phone (44) 71-287-1433; fax (44) 71-439- 8975].

April 3-7: Geological Society of South Africa Centennial Geocongress: Johannesburg

April 10-13: Geology and ore deposits of the North American Cordillera (symposium and field trips): Reno/Sparks, Nev. (see *GSA Today*).

August 28-Sept. 1: Tectonics and metallogeny of early Precambrian orogenic belts (international meeting): Montreal, Canada (see *GSA Today*).

October 17-21: Alluvial fans: processes, forms, controls, facies models, and use in basin analysis (SEPM Research Conference): Death Valley, California, T.C. Blair and J.G. McPherson, conveners [contact Myra Rogers, SEPM, P.O. Box 4756, Tulsa, OK 74159; phone (918) 743-9765; fax (918) 743-2498].

1996

April/May: Forced (drape) folds and associated fractures (two-day meeting): London, England [conveners: J. Cosgrove and M. S. Ameen, Imperial College, Prince Consort Road, London SW7 2BP, UK; phone (44) 071-589-5111, x-5616; fax (44) 071-225-8544; e-mail, dsgeorg@ic.ac.uk]. Posters and oral presentations invited; preliminary registration deadline was 31 August, 1994.