

## STRUCTURAL GEOLOGY and TECTONICS DIVISION

*Newsletter*

**Volume 15, Number 2 September, 1996**

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*We would appreciate hearing your thoughts concerning the web version of the Division Newsletter. Please forward any comments/suggestions to Scott Wilkerson, DePauw University at: [mswilke@depauw.edu](mailto:mswilke@depauw.edu).*

### **CHAIRPERSON'S MESSAGE**

As Chair of a GSA division, I recently received a letter from Don Davidson, GSA's Executive Director, expressing grave concern about waning membership in all of GSA's divisions. Membership in GSA has changed little in recent years, but membership in its constituent divisions has decreased by 26% since 1990. I am particularly chagrined to note that membership in our division fell by even more than this society-wide average, declining from 2139 to 1363, i.e., nearly 30%, in that interval.

This said, we are still one of the largest, and probably are the most diverse, among the divisions of GSA. Volunteered contributions to the national meeting in structure and tectonics still constitute 10-15% of the society's total technical program. However, it bothers me greatly that, apparently, fewer and fewer of those contributors consider it worthwhile to be members of the division.

I emphatically do not believe that structural geology and tectonics have been either weakened or rendered less important by recent changes in the priorities in science or federal funding. Virtually every branch of geology touches on and interacts with aspects of structural geology and tectonics. For instance, I see no reason that recent increased emphasis on phenomena that are "younger and shallower," or increased emphasis in the federal government on funding of research with immediate practical applications, should leave our disciplines behind. If this really has hurt SG&T Division's membership (and I am not convinced that it has), then I believe that the problem is more one of perception than of reality.

I note that this drop in division membership is happening at an unpropitious time. To achieve a more efficient, economical, and responsive planning process, GSA's Program Committee and Joint Technical Program Committee recently have turned over increasing authority to division leaders. These committees are responsible for strategic and tactical aspects, respectively, of planning and assembling the scientific content and organization of the annual national meeting. Few, if any, tasks of the society are more central to achieving its mission. As division

membership declines, the people planning the national meeting are that much less representative of the membership as a whole and the society risks setting priorities and making decisions that are out of touch with real and perceived needs and priorities of its membership. This seems to me a recipe for disaster.

Which brings me to the point: Why *are* our division members not renewing their memberships? Is it that we are not providing services that are useful? Have we failed to represent our members' interests adequately to the society, and/or to the community at large? Or is it something else and, if so, what? And, above all, what might we do about it?

The SG&T management board needs answers to these questions for it to have any chance of remedying the problem. Therefore, I ask that anyone who sees this "Newsletter" who has even partial answers to my questions contact either me or another board member. My own contact information follows; that for other board members can be found in last fall's issue of this "Newsletter", or on the division's new Worldwide Web home page (the URL is <http://www-personal.umich.edu/~vdpluijm/gsasgtpage.htm> ).

Please let the board know what you think! This is an important issue that I believe we must address promptly and vigorously, or risk serious long-term consequences.

**John Bartley**, Dept. of Geology & Geophysics, Univ. Utah, Salt Lake City, UT 84112; phone (801) 581-6553; fax (801) 581-7065; email: [jmbartle@cc.utah.edu](mailto:jmbartle@cc.utah.edu)

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## **ANNOUNCING THE DIVISION'S NEW WWW HOME PAGE!**

Our Division now has a homepage on the Web! Over the summer, the Structural Geology and Tectonics Division created its homepage. Nothing too fancy (except for the occasional subliminal message), but hopefully informative to our members. Our address is:

<http://www-personal.umich.edu/~vdpluijm/gsasgtpage.htm>

It can also be reached through the GSA's homepage (<http://www.geosociety.org/index.htm>.) under its "Divisions" link. On the page you will find information about the Division and its officers, events sponsored by the Division, a Newsletter archive, upcoming meetings, and a host of links that might be of interest to the SG&T community. Like any Web project, this page will be continually updated and modified, largely based on your contributions and responses. Use of the page will further evolve over the next year, as we decide to make more extensive use of the Web for Division business. For now, if you have any comments on, or useful additions to the page, please tell me ([vdpluijm@umich.edu](mailto:vdpluijm@umich.edu)). Also, don't hesitate to give me your feedback on failing links and slow connections. I look forward to hearing from you.

**Ben van der Pluijm**, Dept. of Geological Sciences, University of Michigan, Ann Arbor, MI 48109-1063; phone (313) 764-1435; [vdpluijm@umich.edu](mailto:vdpluijm@umich.edu)

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## **BIOGRAPHIES OF CANDIDATES FOR DIVISION OFFICES**

The 1996 Nominating Committee of the Division has selected the following candidates for Division offices for 1996-1997:

**For Chair (one candidate):**

**Terry Pavlis:** Terry 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 a 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.

**For First Vice-Chair (one candidate):**

**Vicki L. Hansen:** Degrees: B.A. 1980, Carleton College; M.S. 1983, University of Montana; Ph.D., 1987, UCLA. Positions: Associate Professor, Southern Methodist University, 1992-Present; Assistant Professor (SMU) 1988-1992. Honors: Sigma Xi Outstanding Research Award 1992-93; Graduate Woman of the Year Award, UCLA 1987. Service: GSA Committee on Penrose Conferences, 1993-95; Chair, 1994; NSF Polar Earth Sciences Program, Panel Member for Proposal Review, 1994; NASA Lunar and Planetary Geoscience Review Panel, 1993-1996; Scientific Program Committee, Venus II - Geology, Geophysics, Atmospheric and Solar Wind Environment, 1994-1996; Geology Editorial Board, 1990-1992. Associations: American Association of University Women; AGU; GSA; GAC; IASTG; National Association of Geology Teachers; Sigma Xi.

Vicki's professional interests include the development of L-S tectonites, the tectonic evolution of the North American Cordillera, the evolution of transpressional convergent margins, the formation of "intra-continent" mountain belts, Archean and Proterozoic tectonism, supercontinent assembly, and the structural and tectonic evolution of Venus. Her research has been supported with grants from GSA, NASA, NSF, the PRF of the American Chemical Society, and Sigma Xi. With her husband, John Goodge, she shares the joys and challenges of juggling two small children and two fulfilling careers.

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

**Tim Byrne:** Tim received his Ph.D. degree from the University of California, Santa Cruz, spent a year as a COCORP post-doc at Cornell University, and several years as an Assistant Professor at Brown University. He is presently an Associate Professor in the Department of Geology and Geophysics at the University of Connecticut. Tim is also presently serving on the Editorial Advisory Board of "The Island Arc" (the official journal of the Geological Society of Japan). His research interests have focused on the spatial and temporal evolution of accretionary prisms, with research topics ranging from the study of the deformation of partly lithified sediments in Alaska and Japan to the arc-continent collision in Taiwan. Most recently, his research has concentrated on understanding the geological consequences of changing plate motions along the Tertiary convergent plate boundary in SW Japan.

**Bill Dunne:** Bill received his B.S. degree in 1977, and Ph.D. in 1980, from Bristol University, England. He served as Assistant Professor at West Virginia University from 1980-1986, Associate Professor from 1986-1995 at West Virginia University and the University of Tennessee, and Professor from 1995 to the present at Tennessee. In 1996 he was designated Hall Professor at UT. Previous GSA service includes being a member and chair of the SG&T Division Best Paper Award Committee, co-organizer of yearly fieldtrips for Appalachian Tectonic Studies Group, and co-organizer of SEGSA meeting in Knoxville in 1995.

Bill's research interests include examining the micro- and mesoscale contributions to deformation in blind foreland thrust belts, particularly the central Appalachians. These problems include wrestling with filtering small tectonic deformations from lithification, persuading separate outcrops to give a regional picture, and constructing cross sections where many of the important structures are smaller than the scale of the sections. Also, orthogonal fracture patterns, their characterization, and their origin continue to be a nagging curiosity. When not doing service and research, Bill has a strong commitment to education and has been fortunate enough to receive a University of Tennessee Excellence in Teaching Award and to be selected to serve as a University Teaching Mentor for graduate students.

**Stephen Marshak:** Steve is currently Associate Professor of geology at the University of Illinois, Urbana. He received a B.S. from Cornell University, an M.S. from the University of Arizona, and a Ph.D. from Columbia University. His current research interests include: Precambrian tectonics of Brazil, tectonics of continental interiors, structure of fold-thrust belts (particularly their map-view curves), and rock-water interaction during cleavage and vein formation. He has carried out field-research projects on six continents. Currently, Steve teaches graduate and undergraduate courses in structural geology, tectonics, and field geology, as well as in introductory geology (to a class of 700). He has won the highest awards offered by the University of Illinois for excellence in teaching. Steve has co-authored two textbooks ("Basic Methods of Structural Geology", Prentice-Hall 1988; "Earth Structure - An Introduction to Structural Geology and Tectonics for Students", Wm. C. Brown, 1997). During the past year he served as the Chair of the Short Course Committee for the Structural Geology and Tectonics Division. He is also an associate editor of "GEOLOGY", a structural geology editor for the AGI "Glossary of Geology", and is the lead organizer of an upcoming GSA Penrose Conference on "Continental-Interior Tectonics."

**For Secretary-Treasurer (one candidate):**

**Arthur G. Goldstein:** Art 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.

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## **NSF NEWS**

NSF's role in earth science research funding can be thought of as having two basic functions. One is to promote the field, identify new or emerging trends in research, highlight or advertise the developing research opportunities, and to try to secure the funds required to make them become realities. The other main category is to take whatever funds are in fact parceled out to the

Earth Sciences Division and allocate them in a fair and effective way to maximize their input on the geological community and the science it does. In the last few issues of this "Newsletter" these articles have focused on the former (e.g., the Active Tectonics special emphasis area), and the need for more community input into the policies and politics of science funding, so perhaps it is time to talk about how the decisions are reached on the proposals we receive.

In general, decisions on proposals are made by heavy reliance on "peer review", that is, what knowledgeable and unbiased colleagues think of the proposed work, including the general significance of the anticipated result, the likelihood of a successful outcome, and reasonable costs. Beyond this, many people have only a vague idea of what actually happens to proposals once they are submitted. Our internal procedures also change from time to time as well. In this "Newsletter" issue I'll outline the systems now in use and in future issues go into more detail on specific steps along the way. The reason I think this will be useful is that research funding is projected to be very tight for the near future, and it is a good idea for proposers to know what the processes of evaluation, ranking and funding are in such a competitive climate. From a more selfish motive, it hopefully will hinder the growth and spread of such beliefs as: "One low-ranked review and your proposal is sunk"; or, "It doesn't matter what the (pick one: mail or panel) says, if the (other one: mail or panel) doesn't like your proposal, its toast". Finally, because no system is perfect, by going through the nitty gritty of our version of proposal review with the community, you may be able to spot the weak points and make suggestions on how to improve the system. Currently there are the following "regular" programs in the Earth Sciences Division, meaning that they have been established for some time, have an annual budget, and are projected to continue for the near future at least.

These are:

Tectonics

Geophysics

Petrology and Geochemistry

Hydrology Sciences

Geology and Paleontology

Instrumentation and Facilities

Continental Dynamics

Education and Human Resources

Each of these programs is described in a small pamphlet "Earth Sciences Research at the National Science Foundation", Program Announcement NSF 96-50, and each has proposal deadlines in June 1 and December 1 of each year. Additionally, there are some more ephemeral "programs" that have separate program announcements with their own submittal deadlines.

These include Active Tectonics, CSEDI, Environmental Geochemistry and Biogeochemistry, CAREER etc. A proposal to be sent to the Earth Sciences Division should reference the announcement number it is responding to, and must follow guidelines (cover page information, page length, format etc) specified in that announcement. Once all this has been sorted out, by you and your business office, 20 copies are sent to the "Proposal Processing Unit" at NSF. The Proposal Processing Unit is next to the mail room in the basement of NSF. There, incoming proposals are unpacked, checked for non-compliance of things like page lengths, too small font size, etc, or missing NSF forms. If it passes muster, the proposal is assigned a unique proposal number, and is sent to the Division. If it doesn't, it is put aside and a message is sent to the Division, saying it will be returned unless we come down and look at it and sort out the problem. If the proposal has really violated the rules it will be returned, but more often some

miscommunication has caused the problem and it can be sorted out without being returned (for example, the proposal actually complies with the requirements of a special program, but incorrectly references another program on the title page.)

Once safely in our office, someone quickly scans the cover page to see which program the proposal was addressed to, the title and summary to see if this makes sense, and assigns it to either the program it was addressed to, or the one it has the best chance in. This sounds crude, and errors of assignment are made, but when we are receiving literally hundreds of proposals at a time, they need to be dealt with quickly. After assignment, program support staff get busy and enter titles, PIs and other information about each proposal into the computer. Program staff meanwhile begin reading each proposal and thinking about suitable reviewers. Cases of incorrect program assignment are spotted and corrected at this stage. The ideal reviewer is one who is very knowledgeable about the subject of the proposal, hasn't worked with the proposer, and has no reason to be unfair in providing a review. It takes several weeks before all proposals have been read and a suite of reviewers chosen for each. As the choices are made, the support staff enters the reviewers names into the computer and assembling the brown envelopes soliciting reviews. A complete set of proposals is also mailed to the panel.

About 3 1/2 months after the deadline, the panel meets to consider the proposals. Before that, the program staff reads the returned reviews in preparation for the panel meeting, and the overall scores are averaged to make up a "best to worst" mail review average list. Just before the panel meets, the members give us their "straw" scores, which we average and put in order from high to low. When the panel meets, we start discussing proposals that are high on either the panel's initial ordering or on the mail list. This is to help focus the panel's time on the stronger proposals; the panel is not bound by their preliminary or "straw" scores. After each discussion, a vote is taken, and a panel summary is prepared. By the end of the panel meeting, far more proposals have been discussed than there is money to fund, but typically over a third of the proposals are not discussed by the panel. The panel agrees on their preferred order of funding priority for all the proposals they discuss before leaving town.

Then, we sit down with our budget and start making decisions, taking into consideration the mail reviews, the panel input and our own evaluation. The final list resembles each of these, but follows none of them exactly. Thus, some proposals that we personally favor do not wind up in the funding range if the mail and panel reviews are not supportive. The relative importance of the various inputs varies on a case by case basis. This is especially true in the "gray area" for proposals close to the funding cut-off line. Finally, in typical government fashion, program officers do not make the final decision. We forward our "recommendations" to the Division Director of Earth Science, who then reads our justification and explanations for the actions we are proposing. If they concur, the paper work is sent on to a grants officer, who is the one to formally make the award.

This is a quick outline of how the review is conducted, and in the next several articles we will highlight some of the steps that you as proposers and reviewers should be familiar with. Listed below are the awards from the Tectonics Division made between mid-January and mid-July.

Congratulations to the PI's.

**Tom Wright**, Program Director, Tectonics Division, Fax: (703) 306-0382 and 306-0202; email:

[twright@nsf.gov](mailto:twright@nsf.gov)

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**Tectonics Program Awards From 1/16/96 - 7/15/96**

**P.I. (Institution) Title**

Axen (University of California, Los Angeles)

COLLABORATIVE RESEARCH: Integrated Structural and Fluid Inclusion Study of Rolling Hinges and Low-Angle Normal Faults in Metamorphic Core Complexes

Bartley (University of Utah)

COLLABORATIVE RESEARCH: Integrated Structural and Fluid Inclusion Study of Rolling Hinges and Low-Angle Normal Faults in Metamorphic Core Complexes

Bodnar (Virginia Polytechnic Institute & State University)

Fluid Inclusions as Recorders of Tectonic History

Brandon (Yale University)

Conference on "Exhumation Processes: Normal Faulting Ductile Flow, and Erosion"

Chamberlain (University of Wyoming)

Proterozoic Tectonic History of the Southern Trans-Hudson Orogen

Faulds (University of Iowa)

COLLABORATIVE RESEARCH: Massive Crustal Reorganization in an Extensional Orogen: A Three-Dimensional Perspective from the Colorado River Extensional Corridor

Glazner (University of North Carolina, Chapel Hill)

Age, Deformation, and Significance of the Independence Dike Swarm, California

Jacobson (Iowa State University)

Relative Roles of Late Cretaceous-Early Tertiary Versus Middle Tertiary Extension in Southeastern California and Southwestern Arizona

Lee (University of California, Santa Barbara)

Geometry and Timing of Gneiss Dome Formation, Southern Tibet, China

Mahoney (University of Wisconsin, Eau Claire)

RUI: A Crucial Test of Large Scale Terrane Translation: Examination of Albian-Cenomanian Conglomerates along the Intermontane/Insular Superterrane Boundary, Southwestern British Columbia

Metcalf (University of Nevada, Las Vegas)

RUI: Testing Models of Early Paleozoic Ophiolite Genesis: Trinity Terrane, CA

Miller (Vanderbilt University)

COLLABORATIVE RESEARCH: Massive Crustal Reorganization in an Extensional Orogen: A Three Dimensional Perspective from the Colorado River Extensional Corridor

Schweickert (University of Nevada, Reno)  
Mesozoic Intra-Arc Detachment Faulting in Western Nevada and Eastern California

Silverstone (University of New Mexico)  
COLLABORATIVE RESEARCH: Integrated Structural and Fluid-Inclusion Study of Rolling Hinges and Low-Angle Normal Faults in Metamorphic Core Complexes

Twiss (University of California, Davis)  
COLLABORATIVE RESEARCH: Investigation of the Kinematics of Brittle Deformation Expressed Through Patterns of Seismic P and T Axes and Fault Slickenlines using Micropolar Theory

Unruh (William Lettis & Associates)  
COLLABORATIVE RESEARCH: Investigation of the Kinematics of Brittle Deformation Expressed Through Patterns of Seismic P and T Axes and Fault Slickenlines using Micropolar Theory

Willett (Pennsylvania State University, University Park)  
Geomorphic and Geodynamic Feedback During Orogenesis  
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#### **Active Tectonics Program from 1/16/96 - 7/15/96**

Burchfiel (Massachusetts Institute of Technology)  
Active Strain in Bulgaria, its Evolution and Position within the Middle East-Balkan Zone of Intracontinental Deformation

Fisher (Pennsylvania State University, University Park)  
The Effect of Subducting Seafloor Roughness on Forearc Kinematics, Pacific Coast, Costa Rica  
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#### **SG&T'S STUDENT RESEARCH GRANT WINNERS**

Each year the Structural Geology and Tectonics Division participates in GSA's Research Grants program. This is done by awarding funds to a graduate student or students whose applications to the Society for structural or tectonics research funding are deemed exemplary. For second year in a row two students will have their research and travel to the Annual Meeting supported in part by Division funds; they are **Mark Hemphill-Haley** (U. of Oregon) and **Olivier Vanderhaeghe** (U. of Minnesota). Mark and Olivier were selected by the Management Board of the Division from a number of candidates forwarded to the Board by the Society. The runners-up for Division support, all included in GSA's "Outstanding Mention" honor group are **Laurent Godin** (Carleton

U.), **Britt Norlander**, U.of Minnesota (Twin Cities), **Bruce Randall Tufts** (U. of Arizona) and **Chris Willoughby** (U. of Nevada -- Reno).

Mark Hemphill-Haley's Ph.D. project is entitled "Investigation of geometry, mode of displacement and activity of faults within the Cascadia back-arc region of central Oregon"; this research will be conducted under the supervision of **Ray Weldon**, **Gene Humphreys**, and **Katharine Cashman**. Mark is a M.S. graduate from Humboldt State U. and was a professional geologist before entering Oregon. He will focus his attention on several faults within the Central Oregon Tectonic Zone in order to provide quantitative estimates of their timing, displacement and kinematics. With this information he hopes to better understand the zone's tectonic role in transferring a component of dextral motion between the Pacific and North American plates from Basin-Range areas into intra- and back-arc regions of Cascadia.

The Shuswap metamorphic core complex of British Columbia is the dissertation area of Olivier Vanderhaeghe who will study "The role of partial melting during late-orogenic collapse" under the guidance of **Christian Teyssier**. Olivier is a native of France whose interests in melt migration in felsic rocks, and the mechanical (extensional) collapse of thickened crust led him to the Shuswap complex. He will combine fieldwork there with isotopic dating (U-Pb, Ar-Ar) in order to investigate possible genetic links between crustal partial melting following orogenic contraction and late-orogenic gravitational collapse of the thickened crust.

The Division wants to congratulate both students for the excellence of their proposals to GSA, wishes them the best of success in completing their dissertation research projects, and hopes that they will be in attendance at our business and awards meeting this fall in Denver. Division members who have received prior Division-sponsored research grants since their inception in 1986, include **Mary Hubbard**, **Mark Anders**, **Cameron Davidson**, **Karl Mueller**, **Christopher Hedlund**, **Jonathan Lewis**, and **Timothy Paulsen**.

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## "HAVE YOU HEARD ... ?"

Have you heard (or read) the latest news from the American Geological Institute concerning student enrollments and degrees granted in 1994-1995 by U. S. and Canadian geoscience departments? The March, 1996 "Geotimes" presents the result of AGI's most recent polling of 426 such departments. Given the present climate for geoscience employment, the results of the AGI poll seem both surprising and, to a degree, foreboding. Surprising, at least to me, is that all levels of geoscience major enrollments increased in 1994-95 from the previous academic year. Undergrad enrollments were up by 3.2% to a total of 20,682. M.S and Ph.D. enrollments, 4969 and 3862 students respectively, increased 11.2% and 12.4% over the previous year. All degrees granted in the '94-95 year totaled 5479 (up 8.6%), with the following breakdown: BA/BS, 3586; MA/MS, 1238; and Ph.D., 557. The foreboding part of these numbers is, of course, where are the jobs for such numbers of graduating students? The changing nature of earth science education and the inherent responsibilities of geoscience departments to counsel their students truthfully regarding employment opportunities are topics that in my opinion deserves more discussion in academic circles than they appear to be getting. Craig Jones, writing in the "Opinion" section of this "Newsletter" thoughtfully expresses such concerns; the opinions of others on these matters for presentation in this divisional publication are encouraged. Incidentally, the complete AGI

survey is available; AGI's phone (703) 379-2480; fax (703) 379-7563; email: [afargas@jei.umd.edu](mailto:afargas@jei.umd.edu).

With spring academic faculty recruiting over, it is always a pleasure to announce success stories in academic hiring. It's been a fine year, with more new appointments than any year in the recent past. Let's look from west to east (obviously a Los Angeles perspective) at newly filled academic positions. To begin we have to look so far west that those of you on the East Coast will think of the Far East! Oregon Stater **Hiroyuki Tautsumi** (Ph.D., '96) has taken a position as assistant professor of geology at Kochi University in the city of that name on Shikoku Island, Japan. Fellow Beaver **Gary Huftile** (Ph.D. at Oregon State U., '92 and most recently a post-doc with **Bob Yeats**) is Australia-bound, with an assistant professorship (structure and geophysics) at Queensland University of Technology in Brisbane. Two tenure-track positions have been filled in southern California, both by geologists who enter their new jobs with considerable post-Ph.D. research experiences. **Brad Hacker** (a **John Christie** Ph.D. from UCLA in '88) will begin teaching (met. petrology) at U.C. Santa Barbara in the fall; Brad has had post-doc work with **An Yin** at UCLA and **Gary Ernst** at Stanford, where he became a Research Associate. Following a somewhat parallel professional path, **Jim Dolan** (a **Casey Moore** Ph.D. from U.C. Santa Cruz in '88) will inaugurate in the fall a program in paleoseismology and neotectonics at USC; Jim has post-doc experience at LDEO, with the USGS, and with **Kerry Sieh** at Cal Tech before becoming a Research Scientist there and, later, at USC.

Looking eastward, the faculty opening (with petrologic focus) at Colorado State University has been filled by **Jerry Magloughlin** (Minnesota, Twin Cities, Ph.D., '93 with advisers **Peter Huddleston** and **Larry Edwards**), again after a period of post-doctoral research (U. of Michigan). Two other Minnesotans, **Basil Tikhoff** and **David Kirschner**, both **Christian Teyssier** advisees (Ph.D.s, '94), will also join new faculty ranks. Tikhoff travels to at Rice University in Houston in 1997, and Kirschner starts a new position with Washington University in St. Louis this fall. Wisconsin (Madison) has hired **Michele Cooke** (Stanford Ph.D., '96; **David Pollard**, adviser) for a tenure-track Assistant Professorship. **David Green** (Ph.D. under **Rich Schweickert** at U. Nevada - Reno, and post-doc with **Cal Stevens** at San Jose State U.) begins an Assistant Professorship in the Geology and Geography Department at Denison University. Northwest Missouri State U. has added **Joe Reese** (Ph.D., UT-Austin, '95) to its tenure-track faculty; Reese travels to Maryville from Pocatello, where he had been a lecturer at Idaho State for two years. Southern Illinois University, Carbondale, has appointed tectonic geomorphologist **Nicholas Pinter** to an Assistant Professorship beginning this fall. Pinter received his Ph.D. from UCSB in '92 (**Edward Keller**, adviser) and has been a Researcher at Yale working with **Mark Brandon**. We are clearly seeing a trend in the filling of entry-level academic positions. Want more evidence?

On the East Coast, **Sandra Wyld**, a Stanford Ph.D. ('91) and a Lecturer at Rice U. is the new Assistant Prof at the University of Georgia. The Department of Earth Sciences at Boston U. has hired **Drew Coleman** (a **Sam Bowring** MIT post-doc) for a tenure-track Assistant Professorship in petrology with tectonic leanings. Across town, **Declan De Paor** begins an appointment as Lecturer at Harvard in September. Of the 14 new faculty appointments announced here, 11 of the appointees have had post-Ph.D. research (or teaching) experience. With so many applicants for each faculty position that currently becomes available, it is clear that the broadening experience of post-doctoral research makes candidates who have it look particularly attractive to search committees.

So, what kinds of post-doc opportunities have we heard about since the last "Newsletter"? At Boston U., **Clyde (CJ) Northrup**, a **Clark Burchfiel** Ph.D. in '96 at MIT, is **Carol Simpson's** new post-doc. **Joe Allen**, a former **Bill Thomas** student at Kentucky, is spending a year at Tennessee (Knoxville) in order to work with **Bob Hatcher** on a Phanerozoic reactivated Precambrian shear zone in Colorado. **Claudia Lewis**, a former student of **Joann Stock** at Cal Tech and recently returned from a Fullbright postdoc in Spain, has accepted a postdoctoral position at Los Alamos. Cal Tech again: beginning a stint there as a post-doctoral scholar in geology is **Andrew Meigs**, a **Doug Burbank** Ph.D. from USC in '95; **Joann Stock**, **Kerry Sieh**, and **Brian Wernicke** are his sponsors. **Julia Morgan** has accepted a post-doc position at the University of Hawaii, and **Steve Getty** (Ph.D. at Brown U. with **Peter Gromet** and former post-docs with **Jane Selverstone** at Harvard and **Don DePaolo** at Berkeley) has a new research affiliation with the U. of New Mexico in Albuquerque.

Jobs elsewhere? News from the oilpatch! **Tomas Zapata** who finished his Ph.D. with **Rick Allmendinger** at Cornell last December will join YPF S.A., the privatized former Argentine national oil company, in July. Two 1996 graduates from Stanford's program in Structure/Active Tectonics/Geomechanics have taken jobs in the industry. **Manuel Willemse** (Ph.D. with advisers **Atila Aydin** and **David Pollard**) will join Shell -- The Netherlands as a senior geologist/engineer. **Sneha Dholakia**, a MS graduate (same advisers plus **Mark Zoback**) is an Amoco, Houston, hire as structural geologist. Across town, Shell Research Lab, Houston, has selected **Hongxing Ge** (Ph.D., '96, UT-Austin) from over 200 applicants to fill an EOS-advertised position in salt tectonics. Ge's UT advisers were **Sharon Mosher** and **Martin Jackson**.

Hats off (!) to Exxon Production Research of Houston, which continues to be a dominant industry force in hiring some outstanding recent Ph.D.s. Included among them, and in alphabetical order: **Stefan Boettcher** (Ph.D., '96, UT-Austin), a **Sharon Mosher** and **Mark Cloos** advisee; **Jay Busch** (Ph.D., '96, Michigan), whose advisers at UM were **Eric Essene** and **Ben van der Pluijm**; **Tim Davis**, a former **Bob Hatcher** student at Tennessee (Knoxville) who was with the North Carolina Survey; **Ted Doughty** (Ph.D., '95, from Queen's U. under advisers **Ray Price** and **Dugald Carmichael**); **Ken Fowler** -- a **Scott Paterson** advisee who completed his degree this past summer at the U. So Cal; and **Martha House** -- an MIT Ph.D (adviser **Kip Hodges**) and a **Brian Wernicke** post-doc. It's of interest (I think) that at least four of the above new EPR hires -- Boettcher, Busch, Doughty, and Fowler -- had dissertations involving metamorphic and/or plutonic igneous rocks, which is certainly a testament to EPR's openmindedness about its search for talent. Other news from Houston: last fall **Albert W. (Bert) Bally** received a Special Commendation Award from the Society of Exploration Geophysicists. While on the subject of awards and honors, **Mark Harrison** of UCLA has been honored with AGU's 1995 N. L. Bowen Award "for his contributions to -- and his strategic application of -- argon 40/39 geochronology." **Jan Tullis** (Brown U.) is a newly elected Fellow of the AGU, **Eldridge Moores** (U.C. Davis), our outgoing Society prexy, was the recent recipient of an D.Sc. (honoris causa) from the College of Wooster, and **Dan Holm** (Kent State) has received a prestigious NSF Career Award with its attendant research funding.

**Art Sylvester** (UCSB) is a recent recipient of a 1995-1996 Fulbright Award. Last, but foremost, SPECIAL kudos to my long-time-ago grad student office mate, **Win Means** of SUNY-Albany, who is our Division's 1996 Career Contribution Awardee. I always did think that someday he'd amount to something! By the way, a Washington DC spy spied Win and Division officer **Vicki Hansen** (SMU) videotaping something for the Smithsonian's Rock Deformation kiosk in its new Earth Science Hall. According to my informant, Vicki's performance showed real promise for a

career in showbiz, but that Win should be counseled not (as we say in LA-LA-land) to give up his day job.

Have you heard the latest news from British Columbia? It's mixed. The Geological Survey of Canada - Vancouver is leaving its 28 year-long home in the Sun Tower on Pender St. for a new location in Vancouver, not to Victoria as in earlier controversial GSC plans. That's the good news! The bad news for GSC Vancouver is that **Jim Monger** has taken early retirement from the GSC, but fortunately will continue an affiliation with the Survey in an emeritus status. Jim has had no equal in his plate tectonic syntheses of the Canadian Cordillera -- syntheses that began in 1971 with, of all things, a metamorphic map of the Cordillera (Monger and Hutchinson) and a paper (Monger and Ross) on the puzzling distribution patterns in western Canada of Late Paleozoic fusulinids. Next came Monger, Souther and Gabrielse (1972) -- the first treatise on the plate tectonic evolution of the Canadian Cordillera, and one followed by a 24 year-long torrent of torrid papers on terrestrial tectonics.

Jim was honored by his Survey colleagues at a testimonial dinner in Vancouver in early May. A month later in Calgary he received the R. J. W. Douglas Medal from the Canadian Society of Petroleum Geologists, awarded for outstanding contributions to the geology of sedimentary rocks in Canada. (Douglas pioneered the study of Canada's Cordilleran thrust and fold belt and, among other things, produced the first modern geological map of Canada.) Jim and his wife Jackie are building a house on Saltspring Island in the Straits of Georgia, but commutes to the mainland will be frequent. In addition to completing a neotectonic map compilation for the GSC, Jim -- as Adjunct Professor Monger -- will teach a course on Cordilleran geology at Simon Fraser U. next Spring and will start soon the writing of a text on the same topic. I'd love to audit the course and I can hardly wait for the book!

About 1700 miles east of Vancouver and at nearly the same latitude comes word from Madison, Wisconsin, that **Cam Craddock** has also retired, ending an academic career that began in 1956 at Minnesota and from 1967 on was based at Wisconsin. Cam's research on a great variety of topics has been truly international (including numerous northern areas in the contiguous US, Alaska, Spitzbergen, and various Gondwanan lands including Antarctica) and has ranged across the geologic column from the Archean to the Cenozoic. Most of us associate Cam with his pioneering studies in Antarctica where he helped lay the logistical and scientific foundation for geologic studies on that continent. It's perfectly fitting that the second highest peak in that cold land, Mt. Craddock at 15,300+ feet in the Ellsworth Mountains, bears his name. During his 40 year-long academic career, Cam served as the principal adviser to about 90 students (~ 60 MS and 30 Ph.D.), a record that few academicians can match. It seems, therefore, entirely fitting that Cam's retirement party was organized by 18 students in his last Wyoming field course and held at the Ten Sleep Saloon!

From the academic world comes good news of promotions and tenure decisions. I know I'll have missed some, but Cornell and Michigan have, respectively, elevated **Rick Allmendinger** and **Ben van der Pluijm** to Full Prof (or should it be Profs?). Several tenure decisions have recently been made. New Mexico Tech in Socorro has granted tenure to **Laurel Goodwin** this past academic year and in addition, as a happy bonus, awarded her Tech's Distinguished Teaching Award. **Mark Brandon** has joined the tenured ranks at Yale, as has new Associate Professor **Susanne Janecke** at Utah State. Sadly, our division has lost a senior member. **Lincoln Page**, a Fellow of the Society and a member since 1944, passed away last January in Melvin Village, New Hampshire. Page, who received his Ph.D. from Minnesota in 1937, was an Adjunct Professor at the University of New Hampshire.

Last March (3/18), "U.S. News and World Report" published an extensive ranking of "America's Best Graduate Schools". Its ranking of the top 5 programs in "tectonics/structure": (1) MIT; (2) Stanford; (3) Cal Tech; (4, tie) Arizona and Princeton. Let's take a moment and analyze this ... MIT and Cal Tech are the "Beavers" (can you believe it?), and Arizona and Princeton are the "Wildcats" and "Tigers" respectively. Is all this just coincidence? And what is Stanford? The "Tree"! (can you believe it?) -- a highly inappropriate moniker if you're between two beavers! On the other hand, Stanford is also the "Cardinal" (the scarlet bird), not a bad moniker if you have two cats below you.

Incidentally, Arizona calls its football team the "Desert Swarm", which brings me to a recent article entitled "Desert Storm" in Lamont-Doherty's "LDEO News" (Spring). Have you heard that extensional detachment faults may not exist? **Mark Anders** and **Nicholas Christie-Blick** express their view in the article that not only is the Sevier Desert "detachment fault" not a fault, but that the entire concept of originally shallow-dipping detachment faults is in question. "If it [the Sevier Desert seismic reflection] is not a fault, as we believe, a whole class of faults may have to be discarded," says Anders. "A decade and a half of work may be based on a house of cards," adds Christie-Blick. Cards? If so, it's a really bad deal for those of us who've eaten lunch on those damn things for the past 15 years or more! (I know, I know. I should be more detached about such comments -- but I'm not inclined to let them slide.)

Random active tectonic thoughts: On Feb. 17, an unanticipated 8.2 Mw thrust earthquake occurred in a convergent zone near Biak Island, north of Irian Jaya (formerly western New Guinea). Seismologists report ("EOS", 4/23/96) that its focal depth was shallow (18 km) and the dip of the causative thrust fault was only 4°! So much for those who have argued around campfires that shallow, subhorizontal thrust faults may not be capable of generating large magnitude earthquakes. East of the February epicenter and Papua New Guinea lies the island of New Britain, where the city of Rabaul sits within a restless caldera. Two of five volcanoes in the caldera, Vulcan and Tavurvur, lie opposite each other on the caldera margin and were at times simultaneously active for a year or so through early 1996. Needless to say, the twin eruptions have made the citizenry of nearby ash-sprinkled Rabaul nervous. That may explain why an "EOS" advertisement earlier this year for two positions at the Rabaul Volcanological Observatory described those positions as "challenging". I'll say! The Observatory, the ad goes on to state, is seeking "two energetic and forward-looking geoscientists ... to join the volcanological team based at Rabaul." "Energetic and forward-looking" --- sounds like the athletic skills one needs when one is running like hell from the latest eruption of either Vulcan and Tavurvur. Be safe guys!

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## BOOK REVIEWS

### "MICROTECTONICS"

**C. W. Passchier and R. A. J. Trouw,**

**Springer-Verlag, Berlin, 1996, 289 p., ISBN 3-540-58713-6, \$39**

This is a gem of a book! It's going to provide a stimulating text for what I hope will be many new courses and seminars, for beginning mappers and others, on what we know and what we think

about the microstructure and microfabric of metamorphic rocks. The book is a reasonable size for a semester course (not too thick), and remarkably low in price considering the numerous photomicrographs. It's strikingly original throughout, yet authoritative. And its pleasingly practical. It's a book *by* field workers *for* field workers, mostly. I have used it once as a course text already, with good results, even though I had nowhere near the 100-200 thin-sections the authors recommend. I think the book could be used effectively with *zero* thin sections at hand, because it carries so many good pictures between its covers.

For me, structural geology went off-course a little (by which I mean away from the work of interpreting rock geometries historically and mechanically) during the period of preoccupation with finite strain. Then Durney and Ramsay brought us back to looking at *process* as opposed to *state*, in their 1973 work on fibers, as Ramsay and others had done in the Scottish Highlands earlier, in the pioneering work on overprinting structures. This new book by Passchier and Trouw is very much in the *process* mainstream, and it does a better job than many books in integrating the geometrical theory of flow with the development of structure.

An early chapter goes over flow and deformation theory, in a way that makes it accessible to anyone who tries. All fifteen line drawings in the chapter are fresh. None are cut-and-paste from other work. For me, this is one mark of a superior book, or at least of authors who have digested a story and then told it again, in their own way. All the way through, the material of this book is pre-chewed and pre-digested, and unappetizing as this may sound, it's what all us learners need (including, of course, Passchier and Trouw).

Later chapters cover deformation processes, foliations and lineations, and crystallographic fabrics. Then there's a chapter devoted entirely to shear zones (ductile mainly), and one on dilation sites, including fibrous veins and strain fringes. A chapter of special contemporary interest is devoted to the microstructures of porphyroblasts and reaction rims. It finished with a meaty section on how one tries to establish the relative ages of intervals of mineral growth and deformation. In this chapter and throughout the book, I was impressed by the authors' deft touch when dealing with controversial matters. The reader is made aware of controversy and ambiguities in our present state of understanding, but not tangled-up or depressed too much. The authors give their best judgments, acknowledge uncertainty, and provide plenty of unobtrusive references for those wishing to dive in.

There's a novel chapter on "Natural Microgauges" where the authors summarize the kinds of small-scale things we can measure in deformed rocks that lead to numbers (e.g. "strain gauges", "vorticity gauges", "differential stress gauges"). Some will find these discussions too brief to be useful, but I think including them, even in such abbreviated form, was a good decision. Better than allowing the book to get too fat or skipping those subjects altogether. Another novel chapter treats "Special Techniques" (e.g. cathodoluminescence, scanning electron-microscopy, U-stage measurements, analog modelling). Again, the treatments are highly abbreviated, but worthwhile. Finally, there is a useful chapter on collecting and sectioning samples for microstructural study, and a chapter containing 11 photomicrographs that the reader is invited to interpret, as a graduation exam. The authors' own interpretations follow. The book finished with a glossary of more than 300 terms and a reference list of more than 300 entries.

When I took the graduation exam, I scored only about 70% right. So, cheerfully back to the book again, to open my eyes some more. (I agreed with Passchier and Trouw when I read their answers.) There's no pain in continued study of a book like this, that separates fact from inference so meticulously, that's so well-illustrated, and that teaches you something worthwhile, and worth transmitting to others.

If a superior review needs to point out flaws as well as good points in a book, I get a C again.  
Sorry Greg.

**Win Means**, Department of Geology Sciences, SUNY at Albany, Albany, N.Y. 12222

*Editor's note:* This is a gem of a review! Win gets an A.

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## **"STRUCTURAL GEOLOGY OF ROCKS AND REGIONS" (2nd ed.)**

**George H. Davis and Stephen J. Reynolds**

**Wiley & Sons, 1996, 776 p., ISBN 0-471-52621-5**

For those of us who teach undergraduate Structural Geology, the appearance of the revised text by George Davis and Steve Reynolds is much welcomed. Davis' first book, "Structural Geology of Rocks and Regions", which was published in 1984, was an excellent addition to the array of texts available for teaching undergraduates, but was lacking in some regards. The text was unique in its whimsical and humorous approach, most obviously seen in the figures. Few of us will forget the surprise at seeing a geologic map of a pepperoni pizza (with cross section) or the comic strip of the beer can experiment. The book did an excellent job of conveying Davis' enthusiasm and love of structural geology, and was quite up to date on many topics. Most significantly, the book was readable and undergraduates found the material quite accessible. Whereas some of us may disagree on the weaknesses, I found the inclusion of much lab manual material to be more of a distraction than a help. The material was not presented in such a way as to negate the need for a true lab manual or extensive handouts in lab and could have been replaced with more coverage of topics one would normally expect in a text. Chapter 3 of the original book, "Descriptive Analysis", was given over entirely to lab topics, occupying a full 50 pages of the book -- over 10%. Further, traditional lab topics appeared in other places in the text, such as techniques for determining fold axis orientation in the chapter on folds. Together with slight treatment of subjects such as microstructures and the origin of similar folds (included in the chapter on foliation and lineation), this imbalance made the text less than ideal from the instructor perspective. I used the book for two years before abandoning it for other books, none of which had the correct balance between readability for undergraduates and completeness of coverage.

Happily, the revised edition of Davis' text comes as close to the proper balance as one could expect and should be used by many of us for quite some time. The differences between the original and the new text are immediately apparent, the most obvious of which is the inclusion of Steve Reynolds as a co-author. Reynolds' contributions are apparent in the text as the reader commonly is alerted to differences of opinion between the two authors. Davis' humor is still present along with the pepperoni pizza map and other favorite cartoon figures. The coverage is much better than the original and, as a result, the new version is approximately 50% longer than the first edition. Other obvious differences address the original juxtaposition of lab and lecture topics. Three major divisions in the new book contrast with only two originally. The third part of the new book concerns "Descriptive Analysis" and can be viewed as a mini lab manual. This section consumes over 100 pages of the book, and is a more complete coverage than was presented originally. Topics covered in this section include geologic maps, field notes, nature of

contacts, primary structures, orientations of planes and lines, cross sections, structural contour maps, orthographic and stereographic techniques and other useful subjects. The inclusion of this material in the final section of the book gives it the feel of an appendix. Whereas I like the treatment of the material presented by Davis and Reynolds, I still find it necessary to use either a separate lab manual or give extensive handouts in lab. I would never suggest, however, that the final section of Davis and Reynolds be omitted as the writing and figures are so clear as to lead one to assign this material as a first reading followed by reading in other lab material. Nor would I suggest that the section be expanded to provide a true lab manual. As far as I am concerned the treatment is exactly as I would like it.

The other two sections of the book have been similarly changed. As in the first edition, these sections are titled "Fundamentals" and "Structures ". Beyond this similarity lie numerous obvious differences. The original six chapters in the first section included "Descriptive Analysis" and "Plate Tectonics", both of which are still in the second edition although moved to more appropriate locations in the book. A new and much welcome addition is a separate chapter on "Deformation Mechanisms and Microstructures". I am especially happy with this new chapter as it gives a thorough treatment of the subject in a manner understandable to undergraduates. The treatment is thorough and Davis' whimsy is also present. For example, concepts of crystal lattice defects are enhanced by a figure of a parking lot with cars, bad parking jobs, cows, motorcycles and shopping carts and the instruction to the reader to identify vacancies, point defects, interstitial atoms and impurities. Also much welcome is the inclusion of deformation maps, but presented in a simple way which most undergraduates can understand. Also well done in this chapter is the necessary inclusion of numerous photographs of rock textures at the hand sample scale, as well as thin sections, SEM and TEM. I have to note that this is the very best treatment of this subject I have seen in a text. Additional changes I like are the omission of two original chapters in the "Structures" section dealing with contacts and primary structures. Both topics have been slimmed down and moved to the new section concerned with "Descriptive Analysis". There is also a new section covering "Shear Zones and Progressive Deformations" that I like a lot.

I used this new book last Spring in my undergraduate Structural Geology course and was 100% satisfied. The students read the book (at least I think they did !) in large part because of the humor and clever figures. This keeps them interested and deals in part with the boredom of reading technical literature. As I have noted, the coverage is also excellent making it much easier to integrate the book with lectures. I have never used a book which covers so many of the same topics I discuss in class. However, another major plus for this book is the quality of the writing. From the standpoint of technical prose, this book is superior to anything I have seen. The authors deserve considerable credit for presenting material with language, sentence structure and wording which makes it a pleasure to read this book. In summary, I can find little to criticize in this text. Of course, there are things I would like to see changed, omitted or included, but I would be picking nits to mention them specifically as they are minor in comparison to the advantages of the new book by Davis and Reynolds. I strongly encourage all of you who teach undergraduates to give this revised work your most careful consideration, being reasonably sure that you will be as pleased with it as I have been.

**Arthur Goldstein**, Dept. of Geology, Colgate University

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## **"ROGUE ASTEROIDS AND DOOMSDAY COMETS: THE SEARCH FOR THE MILLION MEGATON MENACE THAT THREATENS LIFE ON EARTH"**

**Duncan Steele**

**Wiley & Sons, 1995, 308 p., ISBN 0-471-30824-2, \$24.95**

From "Newsweek" and "TIME" to "Science", from "Earth" to "Geotimes", you can't escape them -- the ever more common articles in all levels of printed media about the future danger of asteroid and comet impact with planet Earth. And no wonder! As we learn more about the collision 65 mya of a 10+ km-wide visitor from outer space at Chicxulub on the Yucatan peninsula (there may be a few who still doubt this scenario), we are staggered by the numbers: an impacting velocity of 15-20 km/sec (33,500-44,650 mph); an energy release upon impact of a 100 million megatons of TNT equivalent; a resulting impact structure perhaps 310 km wide; and an impact generated melt with a volume of ca 20,000 km<sup>3</sup> (Cygan et al., EOS, v. 77, no. 21, p. 197, 1999)! Certainly a relatively rare occurrence for planet Earth, but NASA as recently as 1993 has estimated that Earth's orbit may be crossed by as many as 4000 asteroids with diameters > ca 1 km (although only 150 or so have been identified to date). Asteroid 1994XM1 missed us by only 100,000 km (62,000 miles) on Dec. 9, 1994, and in late April of this year, Asteroid 1996JA1, perhaps a third of a mile across and traveling at about 58,000 mph missed Earth by only 280,000 miles. Had it hit us, says "TIME" magazine on June 3rd, its blast effects would have been in the range of 3,000 to 12,000 megatons, perhaps equivalent to all of the planet's nuclear weapons exploding in one place at the same time.

This brings us to Duncan Steel's fascinating book on "Rogue Asteroids and Doomsday Comets." Steel, an Australian astronomer with affiliations at the University of Adelaide and the Anglo-Australian Observatory, is the director of one of Earth's very few asteroid and comet search programs. His book recounts evidence for past impacts (including the above ground 10-20 megaton disintegration of an object 50-100 m in diameter at Tunguska in 1908) and the likely frequency of impacts by objects of varying size (e.g., one impact per 100,000 years by 1 km+ objects). According to Steel, the threshold energy for inducing a global "Cosmic Winter" that could last for months to years -- 100,000 to one million megatons -- can result from the collision with earth at 20-25 km/sec of a 1-2 km-sized impactor. Special attention is paid by astronomer Steel to where asteroids with earth-crossing orbits come from and how periodic main phases of asteroid and comet encounters can be explained. The Taurid Complex meteor showers that visit Earth four times each year may have resulted, Steel argues, from the near-earth fragmentation of a large comet about 5000 years ago. He goes on to speculate (without strong conviction) that spectacular meteor showers and Tunguska-like impacts at that time might have been the stimulus for initial construction of Stonehenge and the earliest Egyptian pyramids. Other chapters in the book deal with the role of the atmosphere in shielding Earth (not much for objects > 100 m in diameter), the detection of Earth-approaching asteroids, and defensive strategies that might be developed to avoid Earth's collision with them. From its laudatory foreword by Arthur C. Clarke to its addended epilogue treating the 1994 Shoemaker-Levy 9 cometary impacts on Jupiter, this is a delightful book -- even given Steel's ominous conclusion that it is not a question of if the Earth will be cataclysmically struck by a comet or asteroid, but only when! (Hopefully, not before the Christmas holidays ...)

**Greg Davis**

For more information on NEO's (near-earth objects, i.e. comets and asteroids) look for "The Near-Earth Object home page": [http://cfa-www.harvard.edu/cfa/ps/NEO/The NEOPage.html](http://cfa-www.harvard.edu/cfa/ps/NEO/The%20NEOPage.html).

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## ANNOUNCEMENTS

**Gerhard Oertel's** new book "Stress and Deformation: A Handbook on Tensors in Geology" (Oxford University Press, New York, 1966) contains several text errors. Gerhard will send an "Errata" sheet to anyone requesting it from him. He is with the Department of Earth and Space Sciences, University of California at Los Angeles, Los Angeles, CA 90025; his email address is [oertel@ess.ucla.edu](mailto:oertel@ess.ucla.edu).

**Warren Hamilton** has resigned his emeritus Pecora Fellowship with the U. S. Geological Survey and is now an Adjunct Professor in the Department of Geophysics, Colorado School of Mines, Golden, CO 80401; his email address, [whamilto@mines.edu](mailto:whamilto@mines.edu).

The 1997 annual meeting of the American Association of Petroleum Geologists in Dallas (April 6-9) will feature five special structure sessions that will be of interest to many Division members. The sessions:

Geometry and interpretation of compressional and strike-slip structures;

Geometry and interpretation of extensional and diapiric structures;

Geometry and interpretation of reactivated structures;

Numerical and physical structural modeling;

Coupled tectonics and sedimentation.

Unfortunately, the abstract deadline is September 16, which will probably predate delivery of this "Newsletter" (abstract information and forms are published in the April issue of the "AAPG Bulletin"). **John Wickham** (U. Texas, Arlington) is the AAPG oral session chair; his phone: (817) 272-2987; email: [wickham@uta.edu](mailto:wickham@uta.edu).

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## OPINIONS

### **On: NSF proposal submitting policies and the changing roles of junior faculty**

I see in the latest Structure and Tectonics "Newsletter" that you had not heard from a junior person about the 1 year cooling off period for NSF proposals. I'm not entirely sure if I qualify for "junior" these days (as a research associate I'm out of the traditional pipeline), but I certainly have opinions about NSF proposals as that is where my paycheck comes from.

When I first heard about this policy, I was (like many others) pretty annoyed. There is often a strong urge to get up off the horse that threw you and resubmit that proposal again --especially if you think that the reviews or panel misunderstood what you were saying, or assigned you some level of ignorance that seemed impossible (like hearing, say, that "the PI fails to address the impact of gravity pointing towards the center of the Earth in his use of a clinometer to measure dips").

However, as time has worn on, I've felt that by and large this NSF policy is not a bad idea.

Usually I now get my reviews just about the time I need to prepare new proposals -- the time for really thinking through what was wrong is far too short. Without a far more streamlined paper

pusher, it seems wise to delay proposal resubmissions until the PI can really think through what went wrong. (Of course, the program director has the right to hold on to proposals he or the panel think are worthy, although the \$\$\$s weren't there that round -- perhaps we should ask Tom Wright to discuss how he deals with that option?).

As for this hurting junior faculty, I think this is true -- but those who are hurt the most are the ones who need to give their research plans some serious thought. If you only have one idea to push for funding (as some narrow PhDs do), you are probably going to get hammered down the road regardless. In these instances, I think having a proposal schedule when the PI's cannot immediately resubmit their favorite idea is a good thing -- it might force them to come up with something new. Or collaborate with other faculty. Both are good things for young faculty -- the quickest death for such persons is to get on a very narrow track and have no interaction elsewhere.

The real problems facing junior faculty have little to do with NSF. Earth science in schools is shifting from being a major-graduate sort of operation (where the main reason for being is to produce new geologists) to a General-Ed sort of department. Earth science is fundamental to a load of public policy issues -- it, therefore, makes sense to try and teach nearly all students something sensible so that they can understand these issues without being bulldozed down the road. Despite this shift, tenured faculty, who remember when there was an insatiable appetite for geology BS, MS, and PhDs, tend to put the screws on junior faculty to produce graduates, especially those with advanced degrees where association with a particular faculty member is more obvious. This is forcing young faculty to try and gather moneys to support these kind of students (and recruit them) even in circumstances where they personally feel that the utility of that degree for the individuals involved is minimal. Obviously there will continue to be a need for MS and PhD graduates, but nowhere near the numbers of the past, at least for awhile. In fact, it seems reasonable to suggest that some thought be given to the post-PhD transition if we want to continue graduate education much at all. The blinders many faculty wear to non-geological careers using a geology degree cripple some students -- there ARE other careers, careers in public policy, information management, and other fields where a solid background in solving earth science problems is an asset. Many of us do not know of these options and to some degree geology has suffered as these positions have been filled by other fields with less qualified graduates. It is difficult to be aware of the possibilities. I suppose GSA has some information on this matter, but I think some effort needs to be made to get such information into the hands of faculty -- especially young faculty, many of whom have had no careers outside academia. Once a real career path is again established for advanced degrees, it might be possible to return to judging young faculty on their students. Right now it is a crushing load to not only maintain excellence in research but to find the resources to support students and help them make their way professionally.

**Craig Jones**, CIRES, University of Colorado at Boulder, Boulder, CO 80309-0216; (303) 492-6994; [cjones@mantle.colorado.edu](mailto:cjones@mantle.colorado.edu)  
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**On: Fault-bend fold modeling -- "faddish modelmania"?**

Procrustean Structural Modeling

At the AAPG Annual Meeting in San Diego, California (May 1<sup>9</sup>-22), a debate was held on "Structural styles of transform margins: transpression vs. crustal shortening" and moderated by Cliff Ando (Exxon Production Research). Panel members were Kris Meisling (Mobil Research), Jay Namson (Consultant), Bob Powell (USGS) and myself (Don Stone, Consultant). After a brief introduction by Cliff Ando, each panel member presented a 10-minute summary statement illustrated with viewgraphs. This was followed by a period of questions and answers among the panel, and then the debate was opened to audience participation.

Kris Meisling reviewed such topics as terminology, the difference between separation and slip, strain partitioning, horizontal rotation, and detached vs. penetrating structure. Jay Namson presented and discussed his regional transect across the San Andreas fault showing multiple deep detachments and emphasizing his concepts of strain partitioning and the dips of faults at depth. Bob Powell discussed temporal and spatial interactions between strike-slip and contractional deformation with emphasis on the magnitude and timing of displacement along the San Andreas fault and their plate tectonic implications.

My presentation was more data-specific and confrontational. ... I presented evidence to show that the regional fault-bend fold (FBF) interpretations of Lost Hills anticline in the western San Joaquin basin (Medwedeff, AAPG Bull., Jan., 1989) and the Pitas Point anticline in the Santa Barbara Channel (Shaw et al., AAPG Bull., May, 1994; Shaw and Suppe, GSA Bull., May, 1994) were not supported by the subsurface data base. I began by reading a whimsical poem entitled "The fault-bend fold model: a Procrustean\* bed". To wit:

*Fault-bend models everywhere  
with kink-bands by the score.  
They're spreading like a virus,  
they're marching through the door.*

*There seems no way to stop them,  
not even with the truth.  
They capture every structure,  
and dodge the best disproof.*

I believe, along with many knowledgeable California geologists, that the structural style in California's deep basins is fundamentally thick-skinned; that most low-angle thrusts clearly identified in borehole and reflection seismic data within these basins are, more often than not, shallow manifestations of deeper, steeply dipping wrench (oblique slip) zones of the dextral San Andreas (e.g., Lost Hills/Kettleman Hills/Coalinga trend) or sinistral Transverse Range (e.g., Rincon, Pitas Point, and Oak Ridge trends) systems. The FBF interpretation of the Lost Hills and Pitas Point structures are sophistic, internally inconsistent, and indicate either a neglect or dismissal of critical subsurface data. However, this is not the place to catalogue these errors and omissions in interpretation. Some of these errors and omissions are challenged in John Wickham's paper on the Lost Hills anticline (JSG, Sept., 1995), and in my "Discussion" (AAPG Bull., May, 1996) of the Shaw et al. and Shaw and Suppe papers on "axial surface mapping" (citing the Pitas Point trend).

There is more at stake here than just a difference of opinion about structural interpretation. Professional geologists who prepare a scientific paper have the obligation to carefully examine and integrate all of the available data pertinent to their thesis. The 85 year-old, 40 km-long Lost Hills anticlinal oil field has been penetrated by nearly 2000 wells and is crossed by numerous

seismic surveys (both P-wave and S-wave data) and cannot be adequately characterized by a single seismic profile (which does not image the deep structure) and a single structural cross-section (using only 7 shallow, crestal wells and one deep basinal well ...). Using a single cross-section as a basis for quantitative structural interpretation of this giant oil field is like characterizing 200 km<sup>2</sup> of thrust terrain based on a single traverse through the Wyoming thrust belt. The absence of any structural contour maps to show three-dimensional structure leaves the interpretation deplorably incomplete. And in spite of these shortcomings, the protagonists of the FBF model in California have claimed "rigorous" documentation."

Structural geologists seem to have entered a period of faddish modelmania stimulated by the chimerical kink-band method of analysis of smooth-curve, fault-related folds. This is not a good thing in my view. At the debate, one participant stated that structural interpretation would be unscientific without these models. I believe the opposite is more likely the case. Insistence on fitting limited data to a preconceived model falls more within the meaning of "unscientific" than does insistence on vigorous collection and integration of accurate data before attempting an interpretation.

G. K. Gilbert (Am. Jour. Sci., v. 31, 1886) astutely observed that: "In testing of hypotheses lies the prime difference between the investigator and the theorist. The one seeks diligently for the facts which may overthrow his tentative theory, the other closes his eyes to these and searches only for those (facts) which will sustain it (his theory);" and, "The man who can produce but one hypothesis cherishes and champions that one as his own, and is blind to its faults. With such men, the testing of alternative hypotheses is accomplished only through controversy. Crucial observations are warped by prejudice, and the triumph of truth is delayed."

When an FBF protagonist came up after the debate and accused me of being "data-driven," I thanked him profusely, for this is surely the ultimate compliment. W. D. Braumbaugh (The Leading Edge, Dec., 1994) put the problem in perspective when he described geologic interpretation as "the art of suggesting what is most likely, always with a very incomplete data set."

**Donald S. Stone**, Consultant, 6178 South Lakeview St., Littleton, CO 80120; phone and fax (303) 797-6308; email: [don.stone@rmag.org](mailto:don.stone@rmag.org)

\* *Editor's note:* Procrustes was a mythical Greek robber who forced his captives to fit certain beds by either amputating or stretching their limbs. Hence, a "Procrustean bed" is according to "Webster's New Collegiate Dictionary" (G. & C. Merriam Co., 1975) "a scheme or pattern into which someone or something is arbitrarily forced."

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## **On: Fault-bend fold modeling -- "truth"**

Don Stone's discussion consists of four main parts: (1) a synopsis of the AAPG debate; (2) assertions on the true nature of certain folds in California; (3) an accusation that my 1989 AAPG Bulletin paper on Lost Hills anticline is, in effect, fraudulent; and (4) a discussion of the proper role of theory in geologic science. I did not attend the AAPG debate and feel a discussion of California folds is more appropriate in a refereed journal, thus I will not discuss items 1 and 2. However, I feel obliged to rebut item 3, even though my study of Lost Hills was done almost ten years ago and published more than seven years ago. In addition, I will discuss the role of models in science.

## Truth at Lost Hills

Stone suggests that I neglected or dismissed unspecified "critical subsurface data" in order to sustain the fault-bend fold interpretation. I take umbrage at this suggestion. In this, and in other studies, I have consistently striven to both obtain and reveal all relevant data.

Stone claims that a single structural cross section cannot adequately characterize the entire Lost Hills anticline. I agree. But my purpose was not to document the 3D geometry of the fold. My purpose was to determine the kinematic development of Lost Hills anticline and, by example, explicate the process of growth fault-bend folding. I focused my study at Southeast Lost Hills because this recent extension of the original field had the highest-quality well and seismic data. I did examine numerous other seismic lines and well data at Lost Hills. Though these data are older than, and inferior in quality to, the Southeast Lost Hills data, they do show the structure to be cylindrical. In particular the growth asymmetry remains constant along the length of the fold. As for the "nearly 2,000 wells", most of them are drilled on the fold crest and TD in Miocene or younger formations. Many were drilled before the advent of electric logging. To my knowledge, none of these data directly sample the deep structure. The deepest well in the field is the Mobil Williamson 33-11 which terminated at 11,553 feet in the Late Cretaceous Moreno. This well is located near the center of the fold and does not directly constrain my section, which is along the SE plunge. Thus, although limited in scope, I believe that my paper advanced the scientific understanding both of Lost Hills anticline specifically and compressional growth folds in general. Quite the opposite of concealing data, my paper clearly separates data from interpretation in two ways. First, the uninterpreted seismic data are presented (courtesy of Texaco, USA). Second, the method by which the model was (1) derived from qualitative aspects of the data and (2) subsequently and quantitatively applied to the data is documented in detail. Presenting the data and the method separately allows readers to judge for themselves. Thus, if I am guilty of cutting the legs from the data set to fit into the fault-bend fold bed, then I did so in plain view.

## Data, Models, and Truth

Along with his classical Greek counterparts, Stone seeks the "truth" and is frustrated by "Procrustean" modelers. Science blossomed during the Enlightenment which gave us Empiricism and Rationalism as alternate avenues to truth. The former seeks truth in experience, the later through reason. Science's great success is due to a balanced merger of these two approaches. Stone seems to object to the use of models to extrapolate from "accurate data". I contend that such modeling is a necessary aspect of science. Testing a scientific hypothesis (model) involves confirming or negating specific predictions with new data which are independent of the data set on which the hypothesis is based. Thus to be scientific, a structural interpretation must make specific predictions which are beyond the scope of the original data. Predictions necessarily depend on both data and reason (e.g. models, assumptions). Furthermore, the added-value of an interpretation is proportional to the degree to which it predicts beyond available data.

Consider two examples: a structure map based on 2,000 wells and a fault-bend fold cross section based on seven wells. The map has a clear empirical basis. The cross section is more model based. However, both make assumptions on the stratal continuity, nature, and degree of secondary folding between wells. From these assumptions, the map makes specific predictions about the fold geometry within the map area. If, as is likely, there are small faults and minor folds not sampled by the well data, or if the interpolation method is inaccurate, the map will error in detail but is still a useful description of the world. In addition to stratal continuity, the cross

section relies on assumptions of the mechanical origin of the fold and thus is more likely to be wrong in part. However, the cross section also predicts much more: the fold's geometry away from and beneath the data; its kinematic development; and tectonic implications. These predictions provide geologic insight and expose the interpretation to a variety of approaches for corroboration or rejection. Clearly more risk. Clearly more gain.

**Donald A. Medwedeff**, ARCO Exploration and Production Technology, 2300 W. Plano Parkway, Plano, TX 75075; email: [dmedwed@is.arco.com](mailto:dmedwed@is.arco.com)  
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## THEME SESSION SUMMARY (NEW ORLEANS, 1996)

### "Tectonic geomorphology and paleoseismology in intraplate tectonic setting"

**Conveners: Dorothy Merritts (Franklin & Marshall College) and Eugene Schweig (U. S. Geological Survey/Memphis University Center for Earthquake Research and Information)**

This session examined recent advances in application of geomorphology and paleoseismology to the assessment of tectonic activity and seismic hazard analysis in intraplate tectonic settings. Landforms analyzed for tectonic information generally have included fault-bounded mountain fronts, offset stream channels, and uplifted coastlines along active plate margins. Recently, many have begun to extract geomorphic information regarding tectonic and seismologic processes from low-relief, intraplate settings where historic examples of large earthquakes are common, but faults rarely rupture the surface. A clear example is the New Madrid seismic zone, central USA, which had several large earthquakes, as well as hundreds to thousands of smaller events, in 1811-1812. Presentations in this session included one example from the eastern USA, 13 examples from the central USA, and one example from Idaho. The final presentation focused on southern California; although the work was not in an intraplate tectonic setting, the results are relevant to the types of research used in intraplate areas.

**Ron Marple** and **Pradeep Talwani** began the session with compelling topographic, magnetic, stratigraphic, and structural data which suggest the existence of a 600-km-long, strike-slip fault that crosses the Coastal Plain from South Carolina to Virginia. The next three talks summarized subsurface and structural evidence of deformation in the central USA. **J. Odum, W. Stephenson, and co-authors** presented a structural model for coseismic deformation during an 1812 New Madrid earthquake. Their model integrates seismic reflection evidence of a reverse fault with geomorphic evidence of warping and changes in the bed of the Mississippi River that occurred during the earthquake. **J. Harris, E. Woolery, and co-workers** examined a shallow seismic reflection profile above the same reverse fault (Reelfoot scarp) and dug a trench across the structure; they concluded that as the deep fault reaches the surface, Quaternary deformation -- including folding, warping, and faulting--has been distributed over a wide area. **T. Hesterberg, D. Merritts, and co-authors** used statistical methods to analyze topographic data from stream networks in the area characterized by Harris et al as dominated by widespread coseismic deformation (Lake County uplift area). Hesterberg et al concluded that the pattern of surface deformation is similar to that predicted from modeling of a reverse fault at a left-stepping bend in the New Madrid fault, and that stream channel gradients are excellent indicators of recent surface deformation.

**W. Autin, D. McCraw, and others** completed detailed geologic and geomorphic mapping of Quaternary deposits along the enigmatic Bootheel Lineament, and discussed their conclusion that the structure appears to correlate with depositional patterns, and thus is active. **M. Guccione** and **R. Van Arsdale** examined the response of the St. Francis River to deformation across the New Madrid seismic zone, and showed that the river has been deformed at least four times during the Holocene Epoch, most recently during the 1811-1812 earthquakes. **R. Cox** further demonstrated the sensitivity of rivers to coseismic deformation in the New Madrid seismic zone, and in particular the value of stream patterns to analysis of regional deformation fields. **J. Vaughn** presented results of topographic and pedologic analysis of the historically aseismic Big Creek fault zone in southeast Arkansas, and demonstrated that the structure has been active during the Quaternary Period.

Two talks presented evidence of liquefaction in the New Madrid seismic zone. **Y. Li, J. Craven, and others** took advantage of sand boils induced by artesian flow during the 1993 Mississippi River floods to determine whether or not it is possible to distinguish between earthquake-induced and flood-induced deposits. Fortunately, the distinguishing criteria are many, and the two types of deposits can be identified in the geologic record, as demonstrated by the next speaker, **J. Craven**. Craven presented archaeological and paleoseismologic evidence from a site with extensive liquefaction, and concluded that a large earthquake occurred in the New Madrid seismic zone before the 1811-1812 earthquakes, sometime after 1400-1670 A. D..

**M. Ellis** and **E. Schweig** used three-dimensional boundary element modeling to test different rupture scenarios for the series of 1811-1812 New Madrid seismic zone earthquakes. The best-fitting rupture scenario is consistent with the following: deformation along part of the Bootheel lineament; widespread surface deformation above the reverse fault at Reelfoot scarp; and a recurrence interval >300 years. **E. Schweig, M. Tuttle, and others** then followed by posing the difficult question of how recurrence intervals of 300 years or so could occur in an intraplate, low-relief area. The authors demonstrate that, given modern-day strain rates in the region, the ~300-600 year recurrence intervals are similar to those based on historical seismicity and the results of deformation modeling.

The next three talks addressed areas outside the New Madrid seismic zone, and illustrated the potential for paleoseismic studies to assess seismic hazards throughout intraplate areas. **M. Tuttle, K. Dyer-Williams, and N. Barstow** completed a thorough and detailed analysis of dozens of sites along the Clarendon-Linden fault system in western New York state, where a M 5.3 earthquake occurred in 1929, and concluded that no large earthquake has occurred in the area in the past 12,000 years. **G. Fraser, T. Thompson, and others** concluded that tectonic deformation has occurred, however, in the Wabash Valley, midwestern USA (Illinois and Indiana), based on depositional patterns from late Tertiary to Holocene time. **S. Olig, A. Gorton, and others** used detailed analyses of trench exposures to develop one of the most extensive records of surface faulting available, spanning more than 200 thousand years. An important result of their work is the identification of temporal clusters of earthquakes, as well as variations in long-term faulting that are as great as an order of magnitude.

The final talk, presented by **N. Brozovic, D. Burbank, and others**, presented new insights on the use of topographic data to extract tectonic information from the landscape. These workers used digital elevation models (30-m resolution) of the 500-meter high Wheeler Ridge, which is an active anticlinal structure in the Transverse Ranges of California. Even though the geometry and timing of deformation are fairly simple and clear for this example, topographic data alone were insufficient to derive clear constraints on structural and topographic evolution of the ridge.

The authors urged caution to those working using inverse methods in areas where deformation is not as simple or clear.

**Dorothy Merritts**, Geosciences Department, Franklin & Marshall College, Lancaster, PA 17604-3003; (717) 291-4133; [D\\_Merritts@Acad.FandM.edu](mailto:D_Merritts@Acad.FandM.edu)

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## **SEARCHING THE WORLD-WIDE WEB**

**Steven H. Schimmrich**

Department of Geology, University of Illinois, Urbana, Illinois 61801; [s-schim@uiuc.edu](mailto:s-schim@uiuc.edu)

### **The World-Wide Web**

In the March 1996 "Newsletter" I discussed the availability of structural geology resources on the world-wide web. I would now like to address the more general question of how to find resources, geological and otherwise, on the web.

In January 1994, there were a little more than 600 web sites on the Internet. This grew to over 10,000 one year later, and in January 1996 there were approximately 100,000 web sites in existence (<http://www.mit.edu:8001/people/mkgray/net/>). Keep in mind that a single web site (such as <http://www.students.uiuc.edu/>) may have thousands of individual web pages on it. One popular world-wide web database (<http://www.lycos.com/>) lists well over 50 million individual web page addresses on the Internet!

Obviously, with this large volume of material, it's not enough to simply "surf" the web when you're looking for useful information. One needs to develop strategies for efficiently searching the web and the easiest place to start a search is in a virtual library.

### **Virtual Libraries**

Virtual libraries, technically known as hierarchical subject guides, are collections of links to individual web pages organized by category. One of the most comprehensive and best-known collections is that maintained by Yahoo (<http://www.yahoo.com/>) which lists thousands of different resources on the web. Virtual libraries are quick and easy to use but the quantity and quality of the listed resources may vary considerably. Other virtual libraries besides Yahoo are Planet Earth ([http://www.nosc.mil/planet\\_earth/info.html](http://www.nosc.mil/planet_earth/info.html)), the World-Wide Web Virtual Library (<http://www.w3.org/pub/DataSources/bySubject/Overview.html>), and the TradeWave Galaxy (<http://galaxy.einet.net/galaxy.html>).

If you can't find what you're looking for in a virtual library, it may be necessary to take a more aggressive approach and actively search the web for information.

### **Search Engines**

Search engines feature searchable databases of world-wide web resources. These databases are automatically compiled by programs called spiders or robots which constantly roam the web collecting information. Search engines vary in quality according to the size of their database and the frequency with which it's updated. Different engines also provide different user interfaces and search options which may directly affect their ease of use and the number of resources they find.

A typical, and quite good, search engine is Lycos (<http://www.lycos.com/>). Lycos (named for the Lycosidae, a family of hunting spiders) allows you to easily search a database of over 50 million

web pages for key words and returns a list of links to web pages which contain those words. A large listing of the different search engines for the world-wide web is found at <http://www.geocities.com/TheTropics/3579/search.html> and reviews of many popular search engines are given at <http://www.cnet.com/Content/Reviews/Compare/Search/index.html>.

### **Metasearch Engines**

With the increase in the number of search engines for the world-wide web came the development of the metasearch engine. A metasearch engine doesn't search the web directly for resources but rather searches the databases compiled by other search engines. A typical metasearch engine is the MetaCrawler (<http://metacrawler.cs.washington.edu:8080/>) which searches nine different search engine and virtual library databases: Alta Vista (<http://www.altavista.digital.com/>), Excite (<http://www.excite.com/>), Galaxy (<http://galaxy.einet.net/www/www.html>), InfoSeek (<http://www.infoseek.com/>), Inktomi (<http://inktomi.berkeley.edu/>), Lycos (<http://www.lycos.com/>), Open Text (<http://www.opentext.com/>), WebCrawler (<http://www.webcrawler.com/>), and Yahoo (<http://www.yahoo.com/>). Other popular metasearch engines are Savvy Search (<http://www.cs.colostate.edu/~dreiling/smartform.html>), the Starting Point (<http://www.stpt.com/>), and the Internet Sleuth (<http://www.isleuth.com/>).

To learn more about the advantages and disadvantages of the different search engines on the web, there's useful information at <http://www.hamline.edu/library/links/comparisons.html> and Alexander Lebedev, a physics professor at Moscow State University, wrote an online essay about the best search engines for locating scientific information on the web at <http://www.chem.msu.su/eng/comparison.html>.

### **Specialized Directories**

In addition to virtual libraries, which provide links to all types of resources, there are many more specialized directories on the web. An example of one which would be of interest to most geologists is a list of Online Resources for Earth Scientists (ORES) located at <http://www.csn.net/~bthoen/ores/index.html>. Another resource I often find quite useful is an alphabetical listing of world-wide web pages for over 3000 colleges and universities around the world at <http://www.mit.edu:8001/people/cdemello/univ.html>. Space precludes me from mentioning many others but a quick look at the resources listed under Yahoo's "Reference" category will yield hundreds more that you may wish to examine.

### **Web Searching Tips**

When using search engines to locate resources on the web, pay particular attention to your search terms. Avoid general terms like "geology" since a typical search engine like Lycos will return almost 28,000 documents with this word. The word "rock" would be even worse with over 88,000 documents returned, most of which will refer to rock music. Most of the search engines will allow some form of boolean expressions with your search terms and let you search for "rock and metamorphic", for example. An obvious, but commonly ignored piece of advice is to simply read the instructions for performing searches given with each search engine since they often differ in detail. In the MetaCrawler metasearch engine, for example, searching for the phrase "structural geology" entails placing it in parentheses while the WebCrawler search engine requires you to place the keyword "adj" between "structural" and "geology" for it to be treated as a phrase.

When searching for resources on the world-wide web, it's sometimes useful to understand exactly how a URL address for an individual web page is formed. A web page is simply a file which has embedded commands, called tags, which instruct your web browser program how to display the information presented within that file. Web pages are written in a simple language called HTML (hypertext markup language) and are transferred across the web by HTTP (hypertext transfer protocol) servers (if this is all hopelessly confusing to you, try reading some of the excellent online world-wide web tutorials listed in Yahoo's virtual library). Suppose an HTML file called *structure.html* is located on the HTTP server at *www.geology.uiuc.edu* (an address denoting a cluster of workstations in the geology department at the University of Illinois). If this file is physically located in the *geology* directory of an account belonging to user *schimmri* (my username on these machines), the web page's URL address will then be <http://www.geology.uiuc.edu/~schimmri/geology/structure.html>.

How can this information help you? Suppose someone told you about a great site for structural geology resources at URL *http://www.geology.uiuc.edu/~schimmri/geology/structural.html*. When you attempt to connect to this address, however, you get an error message reading "404 Not Found- The requested URL /~schimmri/geology/structural.html was not found on this server." What now? One trick is to reenter the URL but leave off the last part of the address corresponding to the HTML filename. Connecting to *http://www.geology.uiuc.edu/~schimmri/geology/* will display the files present in the *geology* directory and reveal that the correct filename is *structure.html* and not *structural.html*. Also keep in mind that directory and file names in URL addresses are almost always case sensitive.

Finally, if you're looking for the web site of a large organization, and don't know the URL address, you can sometimes fake it. The standard format of a URL address for a web site is *http://www.name.domain/* where *name* is the name of the organization and *domain* is most often either *edu* for educational institutions, *gov* for governmental agencies, or *com* for commercial sites. For example, the University of California at Los Angeles web site is located at <http://www.ucla.edu/>, the United States Geological Survey is <http://www.usgs.gov/>, and the Microsoft Corporation web site is at <http://www.microsoft.com/>.

While the world-wide web is a wonderful resource for obtaining information about almost any subject imaginable, it's always worth keeping in mind the fact that if the above search techniques fail to yield any resources on a specific topic, it may simply be easier to find information the "old-fashioned way" by visiting your local library.

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## THE RESOURCE BIN

### "Landslide News"

For those of you interested in aspects of landslide research, this "Resource Bin" announcement should make your day! The Japanese Landslide Society and the Disaster Prevention Research Institute of Kyoto University are offering their international newsletter "Landslide News" **free of charge** to "overseas libraries of universities and offices with active landslide researchers, engineers and administrators" . "Landslide News" is a very high-quality slick paper publication replete with crisp black and white photos and outstanding 2-color graphics. The 40 page December 1995 issue (No. 9) carried contributions concerning mass-wasting phenomena in Japan, Columbia, Switzerland, Canada, the Canary Islands, Indonesia and the U.S., as well as

news from landslide research organizations, and news and reports of landslide topic-related meetings. The purpose of the publication is to foster international information exchange and cooperation for landslide research and landslide disaster reduction. Requests from librarians for the publication should be made on an application form that is available in acceptable photocopy from "Newsletter" editor Davis or from the Secretary General of "Landslide News", Kyoji Sassa ([sassa@scl.kyoto-u.ac.jp](mailto:sassa@scl.kyoto-u.ac.jp); fax: +81-774-325597; <http://www.dpri.kyoto-u.ac.jp/>).

### **USGS Fact Sheets on Reducing Earthquake Losses**

As a product of research sponsored by the National Earthquake Hazard Reduction Program (NEHRP), the USGS has prepared a series of color-illustrated fact sheets that highlight a wide range of earthquake loss mitigation activities. The series, available at no cost, includes the following titles: "The Los Angeles Dam Story" (7180); "Speeding Earthquake Disaster Relief" (7181); "Averting Surprises in the Pacific Northwest" (7182); "The Mississippi Valley -- 'Whole Lotta Shakin' Goin' On'" (7183); "Utah Braces for the Future" (7184); "Pay a Little Now, or a Lot Later" (7185); "Building Safer Structures" (7187); "Saving Lives Through Better Design Standards" (7188); "Southern Californians Cope With Earthquakes" (# ?).

Copies of the sheets are available by mail, fax (without illustrations), or homepage as follows: mail: Earthquake Information Hotline, U. S. Geological Survey, MS 977, 345 Middlefield Road, Menlo Park, CA 94025; fax: dial (703) 648-4888, press button 4, and request sheets by fax numbers listed above, or contact Fax Server @ 1-800-usa-maps (1-800-872-6277); homepage: <http://quake.wr.usgs.gov/QUAKES/FactSheets>.

### **Map: "Earthquakes in California and Nevada"**

This gloriously colored topographic map prepared by the USGS depicts the epicenters of 300,000 earthquakes in Nevada and California since 1836, with special depiction of the 49 events with magnitudes of 6.5 or larger. Map is priced at \$12 for a paper copy, or \$22 for a laminated copy (price includes shipping cost). It is available by mail only from: Earthquake Maps, U. S. Geological Survey, Box 25046, Federal Center, MS 967, Denver, CO 80225. Orders must include the name and number of the map as follows: "Earthquakes in California and Nevada; Open-File Report 94-647" and be accompanied by a check or money order payable to DOI/USGS.

### **Color slides from space: the JPL/NASA collection**

Although the "Resource Bin" is a directory of not-for-profit earth science resources of interest to Division members, the colored space slide sets described below are so inexpensive that the profit motive for their distributor, Finley Holiday Films, can't be very great. Finley-Holiday offers a wide variety of 20- and 40-count 35 mm slide sets by NASA, JPL, the USGS, and the Space Telescope Science Institute (Hubble images) that are all in the public domain. The prices for 20- and 40-slide sets housed in vue-file sleeves are only \$8.95 and \$15.95 respectively. Among the former sets are those of Earth (JPL-4, 1987), Jupiter (JPL-8, 1986), Viking Explores Mars (JPL-9, 1986), Saturn (JPL-11, 1987), Voyager at Neptune (and Triton; JPL-17, 1989), Magellan at Venus (JPL-18, 1991), Galileo Mission to Jupiter (JPL-20, 1995), Earth-SIR-C/X Imaging Radar (JPL-21, 1995), and three Hubble Space Telescope sets (HST20-3 and 20-5, 1994; HST20-6, 1995).

40-slide sets include the Venus Magellan Mission (JPL40-1, 1993), the Jupiter Galileo Mission (JPL40-2, 1995), and Mars, the planet (USGS-1, 1995). Most of the slide sets are accompanied by printed fact sheets. To order or request additional information such as tax (if applicable) and shipping charges contact Finley-Holiday Films, 12607 E. Philadelphia St., Whittier, CA 90601; phone (800) 345-6707; fax (310) 693-4756.

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## **TWO MAPS, SAME AREA**

The two maps shown in a figure elsewhere in this "Newsletter" are from the southeastern quarter of the 1:24,000 USGS Macedonia Quadrangle, Georgia and North Carolina. Map A carries a 1988 date of production; Map B dates from 1966. Most of us would, I am sure, prefer using the earlier map version for field mapping because of its significantly better definition of topography. Bob Hatcher has drawn attention to these two versions of the same Appalachian area as examples of the degradation of some recently published USGS topographic maps when compared with older editions. This would seem to be a serious, but unnecessary problem. Why, one must wonder, should recontouring of elevational data lead to such oversimplifications of topography? Bob has called this problem of topo map degradation to the attention of USGS Director Gordon Eaton; perhaps you'd like to add your voice to his with other examples. The "Newsletter" would be pleased to publish such examples if you'll send them in.

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## **EDITORIAL NOTE**

This "Newsletter" is your publication and its success in no small part relies upon contributions from Division members. Personal opinions and comments on topics of interest to the Division are always welcome. The professional and technical opinions of Craig Jones, Don Stone, and Don Medwedeff in this issue are fine examples of such contributions. Special thanks to Tom Wright and Steve Schimmrich for their continuing columns, to Win Means and Art Goldstein for book reviews, and to the more than three dozen Division members who supplied information for this issue. Students now have a special forum for their opinions in "THE RAP COLUMN." Please keep us informed about career changes by you or others for the "HAVE YOU HEARD ... ?" column, send us announcements of forthcoming special events, and let us know of not-for-profit offerings for the "RESOURCE BIN". Your comments on "Newsletter" content and suggestions for other types of material or articles that you would find useful in future issues are especially valuable. The deadline for inclusion of materials in the next issue is January 20, 1996. Please send lengthy items on a Mac diskette if possible ("Word 5.1" is preferred), or transmit via direct email or as a Eudora/Fetch attachment (Microsoft Mac Word preferred), or simply fax for shorter items.

**Greg Davis**, Department of Earth Sciences, University of Southern California, Los Angeles, CA 90089-0740; phone (213) 740-6726; fax (213) 740-8801; email: [gdavis@usc.edu](mailto:gdavis@usc.edu)

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## 1996 ANNUAL MEETING -- DENVER

### Three Division-sponsored Short Courses!

#### 1. "Geomorphic Expression of Active Tectonics" (Co-sponsor: Quaternary Geology and Geomorphology Division)

Saturday and Sunday, October 26 and 27. This combination course and field trip will present the principles and tools of tectonic geomorphology, including: Quaternary stratigraphy, surficial processes and landforms, and their application in identifying, characterizing, and quantifying the nature and rate of tectonic deformation. Instructors: **Frank J. Pazzaglia**, Univ. of New Mexico, and **Nicholas Pinter**, University of Illinois, Carbondale. Fee: \$325 (students, \$305). Pre-registration deadline is Sept. 20. For more information see "GSA Today", June issue, or contact **Edna Collis**, GSA, (303) 447-2020, ext. 134.

#### 2. "How to Do Anything with Mohr Circles (Except Fry an Egg): A Short Course for Tense Structural Geologists (whoops! editor's dyslexic error) -- A Short Course About Tensors for Structural Geologists"

Saturday, October 26, and Sunday, October 27, 1-5 PM. Back by popular demand! This course is a hands-on exercise in which participants will make their way through a course workbook with the help of the instructor. It is intended for those who have little or no understanding of second-order tensors, which abound in structural geology. Instructor: **Winthrop D. Means**, State University of New York at Albany. Fee: \$195 (students, \$175). Pre-registration deadline is Sept. 20. For more information see "GSA Today", June issue, or contact **Edna Collis**, GSA, (303) 447-2020, ext. 134.

#### 3. "Applications of GPS in the Earth Sciences" (Co-sponsor: University NAVSTAR Consortium [UNAVCO], Boulder)

Sunday, October 27. This course focuses on the application of GPS to rapid point positioning and the integration of the data into Geographical Information Systems (GIS). It will provide an introductory overview of the essential technical and organizational aspects of GPS positioning. A "hands-on" approach with a range of GPS receivers from hand-held to field survey receivers will be emphasized. Instructors: **Charles M. Meertens**, UNAVCO and University of Utah, and **Roland Burgmann**, University of California at Davis. Pre-registration deadline is Sept. 20. For more information see "GSA Today", June issue, or contact **Edna Collis**, GSA, (303) 447-2020, ext. 134.

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### SG&T Division-sponsored Symposium

#### "Active Tectonics of Intra-continental Mountain Belts with Implications for Ancient Systems"

Monday, October 28, afternoon. Organizers: **Michael Hamburger**, Indiana University; **Richard Allmendinger**, Cornell University; and **Terry Pavlis**, University of New Orleans.

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**Other Symposia (S) and Theme Sessions (TS) of Special Interest (bold names = SG&T Division member in 1995)**

"Linkages among dynamic processes of oceans, continents, and atmosphere" (**E. Zen** and K. Prestegard, conveners; S)

"Tectonic development of the Southern Rocky Mountains" (E. Nelson; S)

"Recent advances in plate tectonics -- what students should know" (**B. Tewksbury**; S)

"Seismic investigations along the western margin and Cordillera of North America: Tectonic implications" (G. R. Keller and A. Levander; S)

"Tectonic evolution of the Urals and surrounding basins" (**J. Knapp**, H. Echtler, and A. Peres-Estaun; S)

"Paleozoic and Mesozoic tectonic history of central Asia" (M. Hendrix and D. Rowley; TS)

"Tectonic evolution of the Urals and surrounding basins" (**J. Knapp**, H. Echtler, and A. Peres-Estaun; TS)

"Neotectonics of the northern Caribbean plate-boundary zone" (W. McCann; TS)

"Appalachian and Cordilleran melanges: comparisons and contrasts" (S. Pollock; TS)

"Laramide sedimentation and tectonics in the Rocky Mountains" (**E. Erslev** and R. Flores; TS)

"History of recurrent basement faulting in cratonic North America and its orogenic margins" (C. Schmidt, **D. Stone**, and **W. Thomas**; TS)

"Geologic and hydrologic studies of fluid flow in faults" (**G. Gray**; TS)

"Evaluation of the Neogene strain field in the southeastern Great Basin: Roles of faults, folds, and magmatism" (**R. Scott** and **E. Anderson**; TS)

"Neogene and Quaternary geology of the Yucca Mountain region, Nevada, and its relevance to long-term nuclear waste isolation" (D. O'Leary and J. Whitney; TS)

"Seismic investigations along the western margin and Cordillera of North America: Data and earth models" (G. Fuis and R. Clowes; TS)

"Cenozoic uplift of the western United States" (P. Morgan and **C. Chase**; TS)

"Precambrian lithosphere I: Proterozoic tectonics -- modification of Archean cratons and additions of juvenile crust" (K. Chamberlain and R. Frost; TS)

"Precambrian lithosphere II: Mid-Proterozoic magmatism and tectonics of western North America" (C. Frost and M. **Nyman**, TS)

"Precambrian lithosphere III: Middle crustal processes" (**K. Karlstrom** and M. Williams; TS)

"Volcanism, tectonism, and sedimentation in the Rio Grande Rift and its margins in New Mexico and Colorado" (D. Sawyer and R. Thompson; TS)

"When plates and people collide -- teaching about human-tectonics interactions" (**B. Tewksbury**; TS)

**Editor's note:** Division member conveners of the symposia and theme sessions listed above are encouraged to submit summaries of their session to the March, 1997 "Newsletter" by January 15th. Please send your summaries on a Mac diskette (Word 5.1 preferred), if possible, or transmit

via email ([gdavis@usc.edu](mailto:gdavis@usc.edu)). Conciseness is encouraged; it may be necessary to edit or condense your summary somewhat if space limitations so demand .

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## **FUTURE MEETINGS, CONFERENCES, AND COURSES**

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

### **1996**

Oct. 9-13: Exhumation processes: normal faulting, ductile flow, and erosion (international GSA Penrose Conference): Orthodox Academy of Greece, Crete, Greece; contact M. T. Brandon, Dept. of Geology and Geophysics, Yale Univ, P.O. Box 208109, New Haven, CT 06520-8109; phone (203) 432-3135; fax (203) 432-3134; email: [mark.brandon@yale.edu](mailto:mark.brandon@yale.edu)

Oct. 18-20: Geological correlation of ophiolites and volcanic arcs in the circum-Caribbean region (IGCP Project 364) : Cuba; contact Grenville Draper, Dept. of Geology, Florida International Univ., Miami, FL 33199; phone (305) 348-3087; fax (305) 348-3877; email: [drapr@servax.fiu.edu](mailto:drapr@servax.fiu.edu)

Nov. 9-10: Aspects of Triassic-Jurassic rift basin geoscience: Dinosaur State Park, Rocky Hill, Connecticut; contact Peter LeTourneau, Lamont-Doherty Earth Observatory, P. O. Box 1000, Palisades, NY 10964-8000; phone (914) 359-2900; fax (914) 365-8154; email: [letour@ldeo.columbia.edu](mailto:letour@ldeo.columbia.edu).

Nov. 14-16: Seismic hazards in the Las Vegas region (conference, field trip): U. Nevada, Las Vegas; sponsored by U. Nevada (Reno & Las Vegas), Nevada Bureau of Mines and Geology, AEG; contact Jim Werle, Conference Coordinator, c/o Converse Consultants SW, 731 Pilot Rd., Suite H, Las Vegas 89119; phone (702) 269-8336; fax (702) 269- 8353; email: [converse@enet.net](mailto:converse@enet.net). Topics of special interest to Division members include: tectonic models, seismicity, earthquake history, and seismogenic faults of the Las Vegas area. Abst. deadline has passed; registration from Sept. 1-Nov. 1.

### **1997**

Feb. 10-14: Terrane dynamics '97 (international conference): Christchurch, New Zealand; contact Secretary, Terrane dynamics '97, Dept. of Geological Sciences, Univ. of Canterbury, Private Bag 4800, Christchurch; phone +64-3-3667001, ext. 7779; fax +64-3-3642769; email: [j.bradshaw@geol.canterbury.ac.nz](mailto:j.bradshaw@geol.canterbury.ac.nz).

March 5-6: Continental transpressional and transtensional tectonics (international meeting): London, U.K.; contact R. Holdsworth, Dept. of Geol. Sciences, Univ. of Durham, Durham DH1 3LE, U.K.; fax 0191 374 2510; email: [R.E.Holdsworth@durham.ac.uk](mailto:R.E.Holdsworth@durham.ac.uk). A forum for discussion of recent advances in modern and ancient continental transtensional and transpressional zones. Abst. deadline: Sept. 30, 1996; papers: March 6, 1997.

April 14-18: Plumes, plates and mineralization (international meeting): Pretoria, South Africa; contact S. de Waal; phone (012) 4202454; fax (012) 433430; email: [ppm97@scientia.up.ac.za](mailto:ppm97@scientia.up.ac.za). Topics to be treated will include anorogenic magmatism; plumes and mineralization; superplumes; large igneous provinces; plate reconstructions; bipolar mantle convection; related African topics.

June 22-25: Tectonics, stratigraphy and petroleum systems of Borneo (international workshop): Brunei Dar es Salam; sponsored by Dept. of Petroleum Geoscience, Universiti Brunei Dar es Salam; contact J. W. Granath, Concoco Inc., 600 North Dairy Ashford, Houston, 77069-6651; phone (713) 293-6695; fax (713) 293-1333.

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## **Election of Officers for Structural Geology and Tectonics Division**

### **1996-1997 Ballot**

Chair (vote for one candidate):

**Terry Pavlis** [ ]

**Write In** \_\_\_\_\_ [ ]

First Vice-Chair (vote for one candidate):

**Vickie Hansen** [ ]

**Write In** \_\_\_\_\_ [ ]

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

**Tim Byrne** [ ]

**Bill Dunne** [ ]

**Stephen Marshak** [ ]

**Write In** \_\_\_\_\_ [ ]

For Secretary-Treasurer (vote for one candidate)

**Arthur G. Goldstein** [ ]

**Write In** \_\_\_\_\_ [ ]

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## **Structural Geology and Tectonics Division**

### **BEST PAPER AWARD NOMINATION**

This award is given annually for a published work (paper, book, or map) of exceptional distinction that clearly advances the science of structural geology or tectonics. Papers eligible for the award must have been published within five years prior to the year of the award. Hence,

papers published during the years 1992-1996 inclusive are eligible for the 1997 award. The Best Paper Award is not limited to members of the Division or the Society, and awardees may be single or multiple authors, with no restrictions as to nationality, citizenship, publisher, or publishing agency.

Name of publication (full citation of author[s], title, date publisher):

Statement in support of nomination (particularly comment on the exception achievement or significance of the publication; supporting material such as letters, published discussions, or reviews may be included; attach additional page if necessary):

Name and address of nominator:

Mail to: Terry Pavlis Deadline for nominations:  
Department of Geology and Geophysics February 1, 1997  
University of New Orleans  
New Orleans, LA 70148; fax (504) 286-7396  
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## **Geological Society of America Structural Geology and Tectonics Division**

### **CAREER CONTRIBUTION AWARD NOMINATION**

This award will be given for the tenth time in 1997. It is given to an individual who throughout his/her career has made numerous distinguished contributions that have clearly advanced the science of structural geology or tectonics. Nominees need not be citizens or residents of the United States, and membership in the Geological Society of America is not required. The Career Contribution Award cannot be given posthumously, unless the decision to give it was made before the death of the awardee. Past recipients are:

1988: John Handin 1991: Clint D. A. Dahlstrom 1994: Richard P. Nickelsen  
1989: John Rodgers 1992: John Crowell 1995: B. C. Burchfiel  
1990: John Ramsay 1993: Ben Page 1996: Winthrop D. Means

Name of nominee, present institutional affiliation and address:

Summary statement of nominee's major career contributions to the science of structural geology or tectonics (attach additional page if necessary):

Selected key published works of the nominee (attach additional page):

Name and address of nominator:

Mail to: Terry Pavlis Deadline for nominations:  
Department of Geology and Geophysics February 1, 1997  
University of New Orleans  
New Orleans, LA 70148; fax (504) 286-7396  
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