

## **STRUCTURAL GEOLOGY and TECTONICS DIVISION**

### **Newsletter**

Volume 15, Number 1 March, 1996

#### **CHAIRPERSON'S MESSAGE**

Division activities at the annual meeting in New Orleans went smoothly, as usual. As co-convenor of our division symposium "Products and Processes of Continental Extension" which was held jointly with the Geophysics Division, I want to thank my co-convenor, John Geissman, and especially all of the speakers who made the symposium a success (please also see the symposium report later in this newsletter!). Bruno Vendeville, Martha Withjack, and Gloria Eisenstadt taught the division-sponsored short course this year, "Introduction to Experimental Modeling of Tectonic Processes," for which I heard nothing but praise. Well done, and thanks!

I would like to personally congratulate our 1995 division award winners. Student research awards went to Kurt Constenius (University of Arizona) and Tim Paulsen (University of Illinois). Their research proposals were selected from a pool of many very fine proposals; the choice was so difficult that the management board had to revote to select the two best! Because we have sufficient funds and continue to receive so many high quality student research grant proposals, we plan to continue making two student research awards awards in the future.

The Career Contribution Award went to B. Clark Burchfiel, who was both nominated and cited at the award ceremony by his close friend and long-time research collaborator, Greg Davis. Those present at the awards ceremony will not soon forget Greg's citation -- especially all those old slides of Clark with muttonchop sideburns! (There is absolutely no truth to the rumor that, while doing fieldwork in southern Nevada in the early 1970's, Clark moonlighted in Las Vegas as an Elvis impersonator).

No SG&T Best Paper Award was made in 1995 for lack of nominations. The dearth of nominations continued this year; I had only received 2 new nominations as of the deadline on February 1, 1996. This unfortunate situation stimulated considerable discussion among the division management board and Best Paper Award Committee chair Bill Dunne. At the management board meeting in New Orleans, we revised Best Paper Committee procedures to permit committee members to add nominations to those from the membership at large, but none of us particularly likes this solution. Therefore -- we have extended the Best Paper Award nomination deadline this year to April 12 to give you, the division members, additional time for your voices to be heard. Please take the time to cite that really great paper that you read in the last year of so, and mail (or e-mail) in a nomination to me (John Bartley, Department of Geology and Geophysics, University of Utah, Salt Lake City, UT 84112; [jbartley@mines.utah.edu](mailto:jbartley@mines.utah.edu)) or to Bill Dunne (Department of Geological Sciences, University of Tennessee, Knoxville, TN 37996-1410; [bill@yoda.gg.utk.edu](mailto:bill@yoda.gg.utk.edu)). Continuation of the award depends on your participation!

The Management Board also discussed a few other concerns. The number of structure-tectonics abstracts submitted for the New Orleans meeting was down significantly from the two previous years, but overall submissions and attendance also were down, presumably because of factors relating to geographic location of the meeting. However, division membership also is dwindling such that, although we still are the largest division of GSA, what used to be a large margin now is much smaller. Bigger is not necessarily better, but it is hard not to worry

about the meaning of shrinking membership! The Board will continue to serve the memberships' wishes and interests as well as it can, but if there is something that you wish that we were doing, please let a division officer know.

In response to suggestions from past Short Course Committee chair Rick

Allmendinger, the board also discussed revising the charge of the Short Course Committee to give it more autonomy than it has under current division bylaws. The selection of the short course has been an annual scramble, which we anticipate that the proposed bylaw revisions will mitigate considerably. Please look for, and vote on, these revisions when you receive your annual division ballot in the September "Newsletter".

Division treasurer Art Goldstein told the board that we have accumulated a modest financial surplus, and asked the board what we wanted to do with it. Many ideas were floated (everyone likes to spend money!), but two were particularly popular. First, at spring section meetings we want to restart the once-popular SG&T-sponsored evening poster-session/keg parties. All of us could remember what a good time we used to have at these, and we all were enthused by the idea of having them again.

I am able to pass this information on to you owing to the stalwart efforts of Greg Davis and Scott Paterson as "Newsletter" co-editors. Alas, Scott is taking a sabbatical next year from his duties at USC and at the same time stepping down as SG&T "Newsletter" co-editor. Scott and Greg have done a terrific job for which they have my enthusiastic personal thanks. Greg has agreed to continue as editor, and the Management Board is committed to providing Greg whatever help he needs to keep up the good work.

Finally, we are considering marking the year 2000 with a major division-sponsored conference to be held separately from the annual GSA section and national meetings. Our intention would be to examine, discuss, and promote a prospective scientific agenda for structural geology and tectonics for the 21st century. This plan is in its earliest "brainstorming" stages; if you have a good idea about what we should do, when, or how -- or about how we should go about deciding what to do! -- please pass it on to a Management Board member.

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## MINUTES, SG&T DIVISION MANAGEMENT BOARD MEETING

November 7, 1995 - New Orleans, LA

### ATTENDEES:

Ed Beutner (Chair), John Bartley (Vice Chair), Terry Pavlis (Second Vice Chair), Art Goldstein (Secretary-Treasurer), Rick Groshong, Dave Dunn, Sharon Mosher, George Davis, Steve Reynolds, Greg Davis, Bob Hatcher, Don Davidson (GSA Executive Director)

### 1. RESULTS OF ELECTION

Vicki Hansen (S.M.U.) has been elected Second Vice Chair for 1996. John Bartley assumes the duties as Division Chair and Terry Pavlis assumes the duties of Vice Chair.

### 2. REPORT OF SECRETARY-TREASURER

Division income exceeds expenses at a rate of between \$2,500 and \$3,500 per year. At the end of 1995, we will have a surplus of approximately \$10,000. Discussion of what to use these funds for resulted in a decision to 1) reinstate divisional receptions/poster sessions at sectional meetings with refreshments paid for with divisional funds; 2) purchase a computer to be used for a divisional WWW Home Page; and 3) continue to accumulate excess funds with

the goal of using these funds for some "spectacular" divisional event in the year 2000. Divisional membership stands at 1,360, compared with 1,535 in 1994 and 1,692 in 1993.

### 3. DISCUSSION OF DIVISIONAL NEWSLETTER

After an inquiry from the Board, Greg Davis reported that he and Co-Editor Scott Paterson do not believe that it is desirable at this time to replace the hard copy "Newsletter" with a version delivered electronically or with a substitute "publication" in a home-page format. It is their opinion that the "Newsletter" is a tangible benefit to Division membership and one that goes to all members; not all members currently have access to electronic mail although that situation is evolving rapidly. Looking for information in a home-page format is a proactive task, whereas the hard copy "Newsletter" arrives by mail and can be looked and read (or not read) at the convenience of the recipient. Greg and Scott both agree that some kinds of information could easily be transmitted to the membership electronically (see 4. below). Opinions from the membership regarding a hard copy vs. electronically-transmitted "Newsletter" are welcomed by the Editor and will be shared with the membership. [Addendum: Scott will soon be undertaking a year-long sabbatical leave and he has resigned from his Co-Editor's position following the March, 1996, issue. Comments should therefore be sent to Greg and/or John Bartley, the current Chairperson.] Greg and Scott's past efforts in editing the "Newsletter" were highly and unanimously praised by the Board.

### 4. DIVISIONAL WWW HOME PAGE

A decision was made to institute a divisional website with links through the GSA home page. John Bartley volunteered to initiate this project if the Division could provide him with a computer dedicated to this task. Submission forms for Career Contribution and Best Paper awards will be located here and will also be mailed on paper with the "Newsletter". Back copies of the "Newsletter" could be transmitted electronically. Other ideas about the content of this website should be directed to John.

### 5. DISCUSSION OF BEST PAPER AWARD COMMITTEE PROCEDURES

Steve Reynolds and Ed Beutner reported that the current system of nominations for "Best Paper" is not working. An insufficient number of nominations from division members prevented us from giving this award in 1995. After lengthy discussion, the Management Board decided that the future role of the committee and nomination procedures would be changed; see statement at the end of these minutes regarding changes mandated by the Board pending additional input from the membership.

### 6. SHORT COURSE - SYMPOSIUM COMMITTEE PROCEDURE

A change in by-laws, on which you are asked to vote, was discussed.

### 7. DIVISION SHORT COURSE FOR 1996 NATIONAL MEETING

John Bartley reported that the 1996 short course will be "Tectonic Geomorphology" and that he is actively seeking appropriate instructors.

### 8. DIVISIONAL SYMPOSIUM FOR 1996 NATIONAL MEETING

Terry Pavlis reported that the divisional symposium for 1996 will be "Intracontinental Orogenesis" and that potential symposium convenors are being contacted.

### 9. MERGER WITH G.S.A. GEOPHYSICS DIVISION

A proposal has been made that the SG&T Division merge with the Geophysics Division. Discussion was postponed pending the results of discussion by the Geophysics Management Board.

## 10. DIVISIONAL REPRESENTATIVE TO G.S.A. EXTERNAL AWARDS COMMITTEE

Art Snoke was nominated for this position.

### STRUCTURAL GEOLOGY AND TECTONICS "BEST PAPER AWARD": ARE WE MOVING IN THE RIGHT DIRECTION?

As reported elsewhere in this "Newsletter", the SG&T Best Paper Award was not presented in 1995 because an insufficient number of nominations was received. Nominations for this prestigious award come from you, members of the SG&T Division. Best Paper Award Committee members have been prevented in the past from making nominations to avoid the appearance of impropriety: it would be wrong for committee members to be voting on their own nominations. The Best Paper Award Committee recommends a single paper to the Management Board which usually accepts this recommendation. As long as a healthy pool of nominations flows to the committee, this process works quite well. However, last year the division membership collectively failed to submit nominations. Certainly, this cannot be because none of us have read really good papers published in the past 7 years. Rather, we all seem to feel that someone else will do the nominating or we are simply too busy to write a paragraph detailing why some publication is deserving of this award.

The Management Board of the division concludes that, because giving this award is one of the most important divisional activities, we cannot allow this situation to continue. Thus, we have altered the procedures by which nominations are made, reviewed by the committee, and winnowed down to a single award-winning paper. In addition to receiving nominations from the membership, Best Paper Award Committee members will also make their own nominations. They will then pass all nominations to the Division Management Board and will recommend what they believe to be the top 3 from this list, including a justification for their preferred choices. The ultimate decision will lie with the Management Board. Two other changes should further guarantee a healthy pool of nominations. The Best Paper Award Committee will be expanded from 3 members to 5 members and nominations for the award can be made electronically, through the divisional WWW Home Page after it is instituted. After thoughtful review, it was decided that the new procedures could still provide the impartiality needed in this process to avoid the appearance of an "old boys network" in which papers by friends of committee members were the only ones nominated.

We would like to hear from division members about these changes. Do they appear to be the correct thing to do? Do you believe that the process will remain fair? Do you have other ideas about how the process could be changed? We encourage you to submit your reactions to Management Board members or to the Divisional "Newsletter". In the meantime, the deadline for Best Paper nominations has been set back from February 1st to April 5th. Members can use a nomination form from past "Newsletters" or contact Greg Davis or me and we will fax you a copy.

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## NSF NEWS

Due to the federal budget problems, the government shutdowns and the Washington snow storms, during which we were basically locked out, we are at this writing (January 16) about a month behind where we should be. One consequence is that this will be a brief article, just giving you a status report as of mid-January and a prognosis of what is likely to happen in the next couple of months.

Before the shutdown, we had already received approximately 105 Tectonics Special Emphasis Area proposals, all submitted for the December 1 deadline. A few more are expected to be sent from the central proposal processing unit. Mike Mayhew and I had read and picked reviewers for about 30 of them. Mike is now dealing with his new responsibilities in the Education and Human Resources Program, but will help with reviewer assignments as time allows. The immediate problem for us is to read the remaining proposals and get the review requests in the mail in time to have sufficient reviews back from you for the panel meeting, scheduled for March 13-15. Whew..

We (NSF and the individual programs) do not yet have an appropriation for this fiscal year (which began October 1, 1995), and at this time are operating on a temporary "continuing resolution" (which restricts spending to a rate less than the one during the last fiscal year) and that is now set to expire on January 26. By the time you read this article, all this will be ancient history and we will have a budget for the remainder of the year, but right now things are pretty strange. All of us will be glad to get this fiscal year behind us. In the next issue we intend to review how the government goes about allocating money for research, and how NSF goes about distributing the allocated funds, but in the meanwhile, we've got some catching up to do! The following awards were made from the Tectonics Program during the period July 12, 1995-January 16, 1996. The list is artificially short, as a number of our recommendations for awards have languished in NSF's grants offices, due to the restrictions imposed (in addition to our customary lack of great speed in such matters). Congratulations to these (and to those who will receive awards soon)!

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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The following awards were made by NSF from the Tectonics Program for the period July 12, 1995 -January 16, 1996:

P.I. (Institution) Title

Birkeland (Univ. of Colorado, Boulder)

Origin and seismic potential of antisllope scarps in mountainous areas

Byrne (Univ. of Connecticut)

Evidence for changing plate motions in the Tertiary Shimanto Belt, Japan

Connelly (Univ. of Texas, Austin)

Tectonic processes, architecture and isotopic systematics of deep crustal levels:

Investigation of the Nagssugtoqidian orogen of West Greenland

Dokka (Louisiana State, Baton Rouge)

Mesozoic-Cenozoic tectonic evolution of the Mojave Desert, California

Duebendorfer (Northern Arizona Univ.)

COLLABORATIVE RESEARCH: Tectonic origin and development of an isotopically mixed crustal boundary zone: The Proterozoic Mojave-Yavapai boundary, SW U.S.

Fletcher (New Mexico Institute of Mining and Technology)

Crack-anticrack interaction in faulting

Gans (Univ. of California, Santa Barbara)

Petrologic evolution of the northern Eldorado Mountains, southern Nevada

Grunow (Ohio State Univ. Research Foundation)

Timing of West Gondwana assembly and connections to Laurentia: Tests from the Amazon craton  
Hodges (MIT)  
Tectonothermal effects of dynamic compensation in the Himalayas  
Hoffman (Harvard Univ.)  
Tectonic assembly of Gondwanaland, northern Namibia  
Hollister (Princeton Univ.)  
Tectonometamorphic evolution of the Great Himalayan Sequence of Bhutan  
Holm (Kent State Univ.)  
Tectonic setting, depth of emplacement, and unroofing history of the Middle Proterozoic Wolf River batholith and associated plutons, Wisconsin  
Hudleston (Univ. of Minnesota, Twin Cities)  
Shear zone geometry, strain and fabrics in high-grade rocks, northern Sweden  
Hudleston (Univ. of Minnesota, Twin Cities)  
Anisotropy and fold development in rocks  
Law (Virginia Polytechnic Institute and State Univ.)  
Analysis of magma flow and wall-rock deformation in plutons exposed at different structural levels in the White-Inyo Range: Implications for emplacement mechanisms of granitic plutons  
Mayer (Miami Univ.)  
COLLABORATIVE RESEARCH: Active tectonics of a young oblique-rifted continental margin, Loreto area, Baja California Sur, Mexico  
Patchett (Univ. of Arizona)  
Locating the source of clastics in the Canadian Cordilleran miogeocline: Nd isotopic and other approaches to Cordilleran and Innuitian sediments  
Samson (Syracuse Univ.)  
Tectonic setting and magmatic evolution of eastern Laurentian Late Paleozoic time: Constraints from high precision U-Pb dating of Alleghanian granites  
Stock (California Institute of Technology)  
Tectonic evolution of the Gulf of California and its margins (Partial funding for a GSA Penrose Conference)  
Teyssier (Univ. of Minnesota, Twin Cities)  
Structural and thermochronological constraints on the role of partial melting during late orogenic extension  
Umhoefer (Northern Arizona Univ.)  
RUI: COLLABORATIVE RESEARCH: Active tectonics of a young oblique-rifted margin, Loreto area, Baja California Sur, Mexico  
Wallin (Univ. of Nevada, Las Vegas)  
RUI: Origin of the Yreka terrane and the provenance of Sonoma  
Wright (Rice Univ.)  
Timing of deformation in the Early Mesozoic back-arc basin of the western U.S. Cordillera: Luning-Fencemaker fold and thrust belt

#### EDITOR'S NOTE

NSF proposal submitting policies  
In the last issue of the "Newsletter" Scott Paterson and I solicited comments from

Division members regarding NSF's new policies with respect to proposal submittal. Specifically we wondered if the new rule requiring rejected proposals to be held over a full year before being resubmitted might not seriously affect young academicians in their quests for tenure within the normal six to seven year limit. Only three or four Division members have written to us with brief comments on the new NSF policies, and none of them are among our junior Division members. The lack of comment either means that the new policies are deemed reasonable or, conversely, that individuals may feel at peril if they take public issue with the Foundation.

One correspondent believes that the new policies may be creating a greater diversity in proposed research areas and that prospective P.I.'s will just develop multiple proposals for submission so that they won't miss either of the two proposal deadlines each year. Another correspondent suggested the following: if a proposal is turned down because of some problems or unresolved issues that can be quickly remedied by a rapid rewrite, why not give the PI the option to resubmit the original proposal with an addendum that answers the problems or issues; it would be best if the addended proposal could be reconsidered by the original reviewers and panel either before or at the time of the next proposal deadline. An alternative suggestion would be for NSF to treat proposals from junior faculty members who are not yet tenured differently than those from more senior academicians; the junior P.I.'s would be allowed to resubmit their failed proposals six months later, rather than waiting the full year.

It is important to remember that proposal review policies for NSF apply to the entire organization. Any changes in proposal treatment would apply to all of NSF's scientific divisions, not just Earth Sciences. Perhaps Tom Wright could tell us in one of his future "Newsletter" columns how NSF's new rules seem to be affecting his program and the structural geologists and tectonicists submitting proposals to it.

Scott Paterson

On a different note, this issue of the "Newsletter" will be the last for my Co-Editor and colleague Scott Paterson. Scott will begin a one-year sabbatical leave in late Spring and has submitted his resignation as Co-Editor. He and I have enjoyed working together on the "Newsletter" since March, 1992, and I'd like to publically thank him for his sterling efforts on behalf of our Division during that time.

As usual, I'd like to encourage Division members and students in structure and tectonics to participate in the "Newsletter" by sending in your views and opinions to "Letters to the Editor", by contributing people-related news to the "Have You Heard ...?" column, by informing us of future conferences and meetings, and by submitting reviews of your favorite new book or items of interest to be included in the "Resource Bin" (our usual listing of non-profit materials that are likely to be of use to some of us in teaching or research endeavors). Suggestions for improvement of the "Newsletter" are always welcomed.

Appreciation is extended to Tom Wright, Eldridge Moores, Terry Pavlis, and Steve Schimmrich for their special contributions to this issue (apart from symposia and theme session summaries), and to my numerous colleagues who contributed news of Division members for the "Have You Heard ...?" column.

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LETTER TO THE EDITORS

Dear Editors:

## I Have a Dream: A Request for Input on a Planning Workshop for Revitalization of Field Geology

A lot of us in this business got into geology, at least in part, because of the opportunities for field work. With all of our fancy high-tech equipment these days we often tend to lose sight of that fact that geology is based on observations in the field. There is no more sobering way to have your hypothesis destroyed than to discover that that marvelous idea you had just evaporated when you walked over a hill and saw something unexpected.

Despite its importance, many people have moved away from doing basic field work. This results in large part because Deans, or for that matter Congressmen looking at agencies like the Geological Survey, see a tendency for "low productivity" of individuals who are heavily involved in activities that involve a lot of geologic mapping. I contend that this perception is absolutely correct -- field geologists typically are not very "productive" because their "product" is labor intensive and time consuming. I also contend, however, that most of this is our own fault because much of what we do is unbelievably inefficient. For example, how many of you, like me, have procrastinated for months because you needed to compile all of your field maps for this paper or that, but couldn't face the endless, tedious hours drawing lines, plotting symbols, and double checking all of this? I might add that I do all my maps on a computer these days, so it isn't simply a matter of using a computer to speed up the operation.

What is my point? Aside from basic physical limitations of walking from point A to B, a lot of the inefficiencies of field geology could be eliminated with some proper applications of technology. Why can't we make a simple, digital recording compass? Why can't we routinely use GPS to get exact locations, including a record of our traverses? (Note -- with properly georeferenced orientation data a geologic map becomes increasingly more a piece of data rather than a mixture of data and interpretation as it now is). Why can't we have a ruggedized field computer that could be used for routine mapping? Better yet, why not be able to display DEM's constructed from satellite images and be able to view that model from any vantage point the person wants -- i.e. show me the view in front of me at azimuth 280°, then "fly" upward to a vertical view? Why not record all our observations as digital images and place them in a real spatial data base rather than the endless piles of kodachrome slides which many of us now own.

The critical thing is that everything I just stated in the above paragraph exists in some form or another. Some of you are already using some of these things, but I firmly believe we need a unified approach with some common formats and some standard software/hardware packages. The problem, as with all things eventually, is that all of this costs money. If we want to apply this kind of technology to field problems, we can't live in the isolation of the "lonely field geologist wandering around the countryside". Geologists have traditionally been a solitary lot fighting over turf, but this is a situation where that simply won't work. Geophysicists long ago recognized the need to band together when equipment acquisition or manpower needs were too large for individual workers. Look at organizations like IRIS or UNAVCO for an example. In these organizations, expensive equipment is shared by numerous institutions. Could we do a similar thing in the Structure and Tectonics community by forming an organization?

If this idea interests you, please contact me. I am trying to assemble a list of names with some suggestions to put together a workshop addressing this problem. Since this is supposed to be a high-tech plan, please contact me by e-mail (tpavlis@geology.uno.edu). If you really



want to speak to a human call me (504-286-6797), but I have a mind like a sieve so without some electronic copy I may loose track of you. Please, no paper communication!

Terry Pavlis, Department of Geology and Geophysics  
University of New Orleans, New Orleans, Louisiana

## HEALTH ALERTS FOR FIELD SCIENTISTS: A CONTINUING SERIES

This is the fourth in a series of articles concerning possible disease-related health risks that field scientists may encounter. Previous editions of the "Newsletter" have treated Hantavirus pulmonary syndrome (March, 1994, 1995), coccidiomycosis (Valley fever) and Lyme disease (March, 1995); and malaria and plague (September, 1995). This issue's column is concerned with giardia (giardiasis) and dengue fever. The information cited below comes primarily from publications supplied by the Center for Disease Control and Prevention, Atlanta, Georgia, including the Center's "Health Information for International Travel 1994" (U. S. Dept. of Health and Human Services Publication No. [CDC] 94-8280, for sale by the Superintendent of Documents, U. S. Government Printing Office, [202] 783-3238).

International travelers can obtain current health information on specific countries from the CDC's automated travelers' hotline -- accessible from a touchtone phone, 24 hours-a-day, 7 days-a-week; the number is (404) 332-4559. It is recommended that you make your inquiry at least 6 weeks prior to departure.

Another reference of potential interest to field scientists working overseas is "Staying Healthy in Asia, Africa, and Latin America" by D. G. Schroeder, Moon Publications, Inc., P. O. Box 3040, Chico, CA 95927-3040, \$10.95 (paper, 180 p.). If microorganisms and their evolving interactions with humankind intrigue you, read "The Coming Plague (Newly Emerging Diseases in a World Out of Balance)" by Laurie Garrett, 1994, Penguin Books, 750 p. [ISBN 0 14 02.5091 3 (pbk.), \$14.95 US, \$19.99 Can.]. This marvelously researched but easily read book may just be the most fascinating -- and worrisome -- book you'll ever read! Now, on to giardia ...

### Giardia

Back from the field, or perhaps from a visit to a third-world country, and feeling that your GI track isn't behaving the way it should? Experiencing symptoms of diarrhea (with foul smelling, frothy stools [sorry ...]), weakness or malaise, abdominal cramps, abdominal bloating, nausea, flatulence, weight loss and uncommon fever? Then you should consider that you may be the victim of giardia (giardiasis), a waterborne parasitic disease that occurs worldwide. The culprit for this disease is the one-celled organism *Giardia lamblia*. It and *Cryptosporidium* are the most widespread intestinal parasites in the United States. *Giardia* is the cause of millions of infections worldwide. Although most cases of domestic giardia come from fecally contaminated municipal water supplies that are not adequately treated, field workers and international travelers are next at risk. A trip to Leningrad, Russia, is the surest way on the Eurasian continent for travelers to contract the disease. As parasitologist Dennis Juranek of the CDC reports in his summary "Giardiasis" (from which most of this information was taken) "hikers and campers risk infection every time they drink untreated raw water from a stream or river." Don't be enticed by sparkling clear water; it too may be contaminated.

*Giardia lamblia* occurs in two forms -- the active parasite (a trophozoite) and its dormant, egglike form -- a thickwalled cyst about 9 to 12 micrometers in diameter and 8 to 12 micrometers (.001 mm) in length. The infected person has somehow ingested 10 or more of

the cysts, usually from fecally contaminated water. Once in the stomach, acids and enzymes dissolve the outer wall of the cysts and free the parasites. They then attach themselves to the upper small intestine where they feed and reproduce by binary fission every 12 hours. (And how!) A single cyst reproducing at this rate will generate "more than 1 million parasites 10 days later" (D. Juranek), and more than one billion parasites soon thereafter. (Arghh...!) After some period of time, the trophozoite detaches itself from the intestinal lining and floats downward through the intestinal track. As it does so, it metamorphoses into its cyst-like form and is excreted back into the environment.

Most untreated cases of giardia persist for only one or two months ("only"?); no permanent damage to the intestinal track results from infection. Some infected people may have various symptoms listed above other than diarrhea, whereas in others episodes of diarrhea occur only every three or four days. Treatment of the disease, which can be identified (but not always easily) by laboratory examination of stool specimens, is relatively effective (>90%) by the prescribed drugs quinacrine (trade name: Atabrine) and metronidazole (trade name: Flagyl). Prevention is easier. Don't drink untreated stream or river waters and be cautious of urban water supplies in underdeveloped countries. If you must drink such water, boil it (100° C) for one minute or strain it through filters which block particles in the 1-3 micrometer range; ceramic filters (e.g. Katadyn) work best, but read their filtering specifications. Chemical filters using various iodine compounds can't be relied upon, according to the CDC, to kill all of the cysts. Chlorinated water will not always kill giardia cysts. Tincture of iodine (2%) can be effective if used in the following proportions (5 drops/quart or liter if clear; 10 drops if cold [ $<50^{\circ}$  F] or cloudy), mixed thoroughly, and allowed to stand for at least 30 minutes -- 60 minutes or overnight if the water is cold or turbid.

Dengue fever/dengue hemorrhagic fever

Bad news, folks, for those of you planning on fieldwork in tropical areas of the world. The incidence of dengue (pronounced den-gey -- rhymes with "key" -- or den-gay) fever, a mosquito-borne viral disease for which there is neither treatment nor cure, has increased dramatically over the past 25 years on a worldwide basis. The CDC reports that "there are now over 2 billion persons at risk of infection and millions of cases occur each year. ... It is anticipated that there will be increased dengue transmission in all tropical areas of the world during the next several years."

Closer to home, a dengue fever epidemic that began in 1994 is sweeping through Central America, Mexico, and the Caribbean. In the first 9 months of 1995, 35,000 cases of the fever were reported in these areas, as well as 545 cases of its more severe form, dengue hemorrhagic fever (DHF). Fortunately, the death rate from the fever is low with only 24 cases from the thousands of infections according to the Pan American Health Organization. Mexico reported 2500 of the 35,000 cases; an American visitor to Reynosa, 12 miles south of the border at McAllen, Texas, contracted the disease there. There are four dengue viruses transmitted to humans through the bite of Aedes mosquitoes (usually Aedes aegypti); infection from any one of the four does not immunize humans against the others.

Dengue fever has as its symptoms the sudden onset of high fever (up to 104° F.), severe frontal headache, and intense muscle and joint pain that has given the disease its nickname of "breakbone fever". The disease has an incubation period of three to 15 days, so that travelers may have returned home before its onset. Nausea and vomiting are common additional symptoms. After 2 to 4 days the fever vanishes, but a day later is likely to return. A rash appears on the torso 3 to 5 days after the initial fever and may spread across the body.

The palms of hands and soles of feet may become red and swollen. Symptoms gradually diminish, but the weakness that accompanies this disease may last for several weeks or longer. According to Schroeder (reference above) treatment is limited to bed rest, aspirin for fever, acetaminophen for headache, and fluids for rehydration. Symptoms in some lucky individuals are weak enough to be misdiagnosed as related to flu. DHF is a more serious form of the disease in which serious blood vessel damage can occur, and death can result. Children under the age of 15 who have had an earlier dengue infection seem to be at the greatest risk of DHF. The current spread of the disease is attributed by some experts as due to cutbacks in formerly successful mosquito abatement programs, and to shifts and growth in the human population. As with giardia, prevention is the key to staying healthy. The Aedes carrier is most active in the several hour periods after daybreak and before nightfall (except indoors or on overcast days when the mosquito doesn't "watch the clock"). Simple precautions can dramatically decrease the risk of infection. Wear light-colored protective clothing over your arms and legs, avoid scented soaps, and apply DEET (N,N diethylmethylbenzamide) repellent with concentrations equal to or more than 20%. Concentrations higher than 30% are not recommended by the CDC for direct application to the skin, particularly in children. In endemic or epidemic areas the use of bed nets and indoor aerosol insecticides is advised. G.D.

## BOOK REVIEW

"GEOLOGY OF WESTERN GONDWANA (2000-500 Ma),"

by Roland Trompette, translated by Albert V. Carozzi:

Balkema, Brookfield, 1994, 350 pp.

For anyone interested in the on-going discussions of the relationship between Gondwana and Laurentia (e.g. SWEAT hypothesis), this book is a major publication event. Trompette brings together for the first time, to my knowledge, the scattered and diverse geological data mainly on two continents, Africa and South America, that document the amalgamation from formerly separate land masses that constitute western Gondwana.

Trompette's book comes along at a good time. This work presents a first-time-ever synthesis of the geologic evidence for amalgamation of western Gondwana (Africa and South America and its subsequent suturing with eastern Gondwana (chiefly India, Australia and Antarctica). Trompette discusses five formerly separate cratons--Amazonia (now underlying Brazil, Venezuela, Surinam, Guyana, French Guiana); West Africa (now underlying Mali, Senegal, Algeria, Morocco, Ghana, Ivory Coast), Rio de la Plata (now beneath Brazil, Uruguay, Argentina); Kalahari (located in Botswana, Zimbabwe, South Africa); Congo-São Francisco (in Brazil, Cameroon, Nigeria, Zaire, Central African Republic, Angola, Zambia, Congo). He discusses seven specific orogenic belts of late Precambrian-early Paleozoic age, collectively comprising the "Pan-African-Braziliano" orogenic system. This division is, of course, somewhat arbitrary, as the belts are continuous with each other. The belts Trompette describes are: 1. Trans-Sahara from Ghana to the Hoggar massif; 2. West Congo-Araçuaí and Ribeira belts, which are located along the Atlantic margin of NE Brazil and its African conjugate margin; 3. the Brasília fold belt in central Brazil; 4. the Dom Feliciano-Kaoko-Gariép-Malmesbury of southern Brazil, Uruguay, Namibia, and South Africa; 5. the Damara of South Africa-Namibia; 6. the Oubanguide-Sergipe orogen of Congo-Zaire and east-central Brazil; and 7. a series of belts extending from Mauritania through central Brazil and Paraguay to the Sierras Pampeanas of Argentina. Trompette also presents an interesting scenario of

assembly of Gondwana starting about 650 Ma by early amalgamation of West Africa and Amazonia followed successively by addition of the Congo-São Francisco and Kalahari cratons, and finally at about 500 Ma the collision of West and East Gondwana.

We owe Albert V. Carozzi a large debt of gratitude for his excellent translation.

Nevertheless, this dense, compactly written, stratigraphically-oriented book is somewhat heavy going. Many may disagree with some of Trompette's conclusions. However, it is hard to overemphasize the book's value for present and future tectonic discussions. It's all here -- even the ophiolites, if you look hard! The reference list alone -- approximately 1400 entries in four languages (Portuguese, Spanish, French, English) -- should serve for years as a valuable research and teaching aid for any geologist interested in this vast and important region.

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### HAVE YOU HEARD ...?

Have you heard of the contribution of our Division membership to geological affairs of state? Eldridge Moores is currently president of the GSA, George Thompson is vice-president, and Dave Dunn is treasurer. All are Division members, as is Bob Hatcher, current president of the American Geological Institute. As are Pinar Yilmaz, past president of GSA's International Division, Jim Skehan, the current president and Ian Dalziel, that Division's vice-president. There must be truth in that old "T-shirt" adage that "tectonicists do it better!" Hmmm.... Hearty congratulations to John Suppe and Marylou Zoback (Geophysics Division) who are the latest earth scientists to be elected to the National Academy of Sciences; their elections become official in April.

As always, there are new faculty appointments to be announced, but the list is fairly short. Mark Fischer (Ph.D. from Penn State under adviser Terry Engelder) has left Exxon Production Research for a faculty position at Northern Illinois University. Another Mark -- Evans -- has moved north from Georgia Southern University to assume an Adjunct Professorship at the University of Pittsburgh (Johnston campus). John Oldow, in another south to north migration, has left Houston, Texas, to become the new Head of the Department of Geology and Geological Engineering at the University of Idaho in Pocatello. The faculty slot at Grand Valley State University, Allendale, Michigan, has been filled by the appointment of John Weber (Northwestern U. Ph.D. under Seth Stein), whose dissertation "New Madrid seismic zone deformation from repeat GPS surveys" sounds like cutting-edge neotectonics stuff. Within that zone lies Memphis, Tennessee, where Randel Tom Cox (Ph.D., Missouri at Columbia, adviser George Viele) has taken a temporary position at the University of Memphis. Linda Reinen and Eric Grosfils, a recently married couple with Ph.D.s from Brown University, began sharing a faculty appointment at Pomona College, southern California, last fall. Sounds like a super deal for Pomona!

Post-doctoral positions continue to be of importance in putting the talents of the younger doctoral generation to work, although cuts in research funding are taking their toll on the availability of such positions. John Suppe is certainly doing his share! Three new postdocs have arrived at Princeton in recent months to work with John: Delphine Rouby, a student of Peter Cobbold at University of Rennes, France, working on 3-D restorations; Pablol Kraemer from the University of Cordoba, Argentina, studying the structure of the Patagonian Andes; and Xin Wang, Institute of Oceanography, Chingdao, China, working on

the tectonics of China. Julie Newman (a recent Gautam Mitra Ph.D. at Rochester) has won a senior research position with M. Drury's group at Utrecht, The Netherlands; she'll be investigating mantle shear zones. Carole Simpson's much sought after post-doc position at Boston University has been filled by Jay Busch (Ph.D., '96, Univ. of Michigan); his advisers at UM were Eric Essene and Ben van der Pluijm. One post-doc position being advertised in the January 25th issue of "Nature" sounds like a lot to handle. The University of Reading, U.K., advertises a postdoctoral research fellowship in geophysics designed to undertake lab measurements of elastic and anelastic properties of rocks and sediments. Says the ad, "You will require considerable research expertise in laboratory geophysical measurement techniques (at pressures up to 70 MPa)." Talk about a high pressure job! (Some of us have problems working well at even 1 atmosphere.)

Miscellany that's come my way: John Craddock has won a much-deserved promotion to Associate Prof with tenure at Macalester College, where he's also been appointed Chair of his department. How's that for a mixed blessing? Petrology-tectonics-type Karl Wirth (a Cornell Ph.D, 1990) was also promoted at Macalester. Wiley has just published George Davis' and Steve Reynolds' book "Structural Geology of Rocks and Regions", the second edition of George's original popular text. As I've told George before, I've often been complimented for writing his first edition. I always tell the complimenter, "thanks, but it's not mine, it's by George Davis." (Well .... almost always. Please, George, forgive me.)

International news: The Geological Society of South Africa celebrated its 100th year with a Centennial Geocongress held in Johannesburg last April. Among members of our Division in attendance, Sam Bowring and Kevin Burke presented major lectures. Kevin was honored by being asked to deliver the 24th Alex L. Du Toit Memorial Lecture; his talk, "The African plate: its distinctive behavior over the past 30 million years," will be published in September in the GSSA's "Journal." The Structural Geology and Tectonics Division of the Geological Association of Canada has announced their choice for the 1994-1995 Best Paper Award, given annually to the best paper of the year by Canadian authors or dealing with Canadian structural geology and tectonics. This year's winner: a "JSG" paper entitled "Kinematics of rock flow and the interpretation of geological structures, with particular reference to shear zones"; its authors are Dazhi Jiang and Joseph Clancy White, both of the University of New Brunswick. The new executives of the SGTD are Chairman Alexander (Sandy) Cruden of the Erindale Campus, University of Toronto and a member of our Division, Treasurer Paula McKinnon, and Secretary Frank Fueten, both of Brock University, Ontario.

Sad notes: paleomagneticist Keith Runcorn, whose work in the 1950's lent credence to continental drift and helped lay the foundation for plate tectonics, has passed away. Is it any wonder after losing 525 employees last fall that despair reigns throughout some quarters of the U.S.G.S. these days? One of its members who survived the recent bloodletting writes that "the USGS is (1) technically back to work after the government shutdown, but without operating funds to do anything, and (2) morally and intellectually bankrupt after self disembowelment during the reduction-in-force." Matters could get worse! David Applegate, Director of AGI Government Affairs, reports in the January, 1996, issue of "Geotimes" that the Republican dominated Congress is now considering new legislation that would require the Department of the Interior to contract out ALL surveying and mapping activities to the private sector. Alaskan legislators, who have heard complaints from private Alaskan contractors that they are in competition with Interior Department agencies for aerial

surveys and other work, are strongly pushing such a bill. If you are opposed to such legislation, which could strip the USGS of some of its most important functions, you might consider writing Senator Frank Murkowski (R-Alaska) and Representative Don Young (R-Alaska) who head, respectively, the Senate Committee on Energy and Natural Resources and the House Resources Committee. How did that happen?

And finally, have you heard the news that we've all been waiting for? A Japanese professor, Yasumasa Kanada of Tokyo University, has proudly announced that he has calculated the most accurate value of  $\pi$  to date -- to 6,442,450,000 decimal places. Now, that's a lot of pi, no matter how you slice it!

G.D.

## INTERNATIONAL ASSOCIATION OF STRUCTURAL/TECTONIC GEOLOGISTS (IASTG)

Sue Treagus, IASTG Coordinator, has announced in the "International Newsletter 11" of the IASTG (JSG, v. 118, no. 1, p. I-V) that membership in the Association has now reached 1080+ since its founding five years ago. The Association's purpose is to foster international communication among structural and tectonic geologists worldwide. Membership is open, without mandatory fees or subscription to the "Journal of Structural Geology", although new members do receive an invitation to subscribe to the JSG at a reduced personal rate. A "Newsletter" for the Association is printed twice yearly in the JSG and contains a summary report on the IASTG, announcements of scientific meetings of interest to the members (usually with abstract deadlines), information on international structure/tectonics organizations, and reports of completed meetings or proposed research ventures. A "Membership Directory, 2nd Ed." in booklet form was mailed to members in April, 1995, free of charge.

Persons interested in joining the IASTG can do so by completing a membership form copied from the "International Newsletter 5", JSG, v. 15, no. 1, 1993, or by requesting a form from Coordinator Treagus (address below). Or, apply by email to: [iastg@man.ac.uk](mailto:iastg@man.ac.uk); send in your name, title, address, phone, fax and email numbers, plus a statement (<20 words) of your research interests. The email address can also be used to send in materials or non-commercial announcements for the "International Newsletter" (please use ASCII TEXT for attached files), or to report changes of address. An IASTG Homepage on the WWW provides a brief background on the Association and access to the most current "International Newsletter"; its URL (Uniform Resource Locator) is: <http://info.mcc.ac.uk/Geology/IASTG>.

Voluntary contributions in support of IASTG activities are most welcome and should be made payable to the "IASTG Fund", c/o S. H. Treagus, Dept. of Earth Sciences, Manchester University, Manchester, M13 9PL. U.K.; fax 44 161 275-3947; email: [iastg@man.ac.uk](mailto:iastg@man.ac.uk).

## ANNUAL MEETING SYMPOSIUM SUMMARIES

"Products and Processes of Continental Extension"

(co-sponsored by SG&T and Geophysics Divisions)

Conveners: John Bartley (University of Utah) and John Geissman (University of New Mexico)

The morning session of this all-Monday symposium focused on low-angle normal

faults, an issue that has sparked a controversy so spirited that Richard Kerr, in the news section of "Science" in a late November issue (11/24), featured Greg Davis and Roger Buck, two prominent protagonists in the debate who presented their views in the symposium. After a quarter of a century of field mapping and geophysical imaging of gently dipping normal faults, little doubt remains regarding their widespread occurrence. The still-lively debate now has shifted to whether low-angle normal faults nucleate at and/or are active at their present low dips and, if they are active at low dips, what physical conditions permit them to slip and whether or not they generate earthquakes.

Presentations by Greg Davis, Rick Liviccari, and Steve Reynolds summarized a plethora of observations from field structural studies, thermobarometry and thermochronology, seismic reflection imaging, and paleomagnetism that indicate that low-angle normal faults in the lower Colorado River trough - southern Arizona corridor were active and probably initiated with dips less than 20 to 30°. Brian Wernicke proposed a simple seismotectonic model that may account for the lack of large historic low-angle normal fault earthquakes. The model predicts that low-angle normal faults release fewer but larger magnitude earthquakes than high-angle normal faults, with the implication that large low-angle normal fault earthquakes may be intrinsically rare and are not, therefore, underrepresented in historic seismicity. Gary Axen overviewed field tests of isostatic "rolling hinge" models. The data suggest that such rolling hinges do exist and, in some cases, have led to appreciable tilting of normal faults into their present low-angle orientation. However, Axen concluded that the rolling hinge model cannot be applied universally and that field data continue to favor the existence of active low-angle normal faults.

A group of skeptics, all coincidentally from Lamont-Doherty Earth Observatory (!), presented their perspectives. Roger Buck examined two classes of proposed solutions to the mechanical problems of initiation of, and slip along low-angle normal faults. Stress-field reorientation by additional loads runs into trouble because loci of maximum reorientation support differential stresses too low to cause faulting. The argument that low-angle normal faults are energetically favored over high-angle faults because they require less stored elastic strain appears to break down when failure in response to flexural loads is included in the calculation. The gulf between some rock mechanists and a large cadre of field geologists seems as wide as ever!

Mark Anders and Stewart Wills, also of LDEO, then focussed attention on the Sevier Desert "reflector" of southwest Utah, a low-angle feature first seismically imaged during oil exploration 20 years ago. This group interprets the reflective horizon as an unconformity rather than an active extensional detachment, primarily based on a lack of microstructural evidence for the fault in drill cuttings. The reliability of microstructural observations of cuttings and the correlation of drill-hole depth to the seismic record section was challenged, and some regional-tectonic problems caused by discarding the detachment were raised. Few fans of the Sevier Desert detachment appear to have been converted. Nevertheless, the lack of direct structural evidence for a fault in the borehole at an appropriate depth is troubling and further work on the character of the Sevier Desert reflector is warranted.

The morning session ended with Julia Miller and Julio Friedman discussing the sedimentary and geomorphic characteristics of supradetachment basins, and Rick Groshong's presentation of quantitative methods for recovering strain magnitudes and detachment depths and geometries from analysis of shallow normal fault systems. The afternoon session turned to crustal and lithospheric structure and the relationships

between crustal extension and magmatism. Gene Humphreys discussed his provocative hypothesis for the origin of large areas of the Basin and Range province characterized by high-velocity upper mantle, relatively thin crust, and high surface elevation. He invokes extraction from the upper mantle of a high percentage of partial melt, leaving a high-velocity, low-density dunite-harzburgite residuum. The implication of a corresponding pattern of large volumes of mafic igneous rocks in the crust needs to be tested.

Randy Keller and Jill McCarthy reviewed geophysical studies of rift crustal structure and emphasized the great variation in the volume of magmatism, which is strongly expressed in the resulting crustal structure. Geologic studies of magmatism and extension discussion by Mai-Britt Shaw, Drew Coleman, John Bartley, and Jeff Karson revealed some common threads. Association of magmatism in time and space with crustal extension has a dramatic effect on tectonic style. A significant amount of dilation may result from igneous intrusion rather than by solid-state deformation and the style of the deformation is greatly affected. Close association of extension and magmatism in space does not validate the common assumption of their association in time and, therefore, thermal weakening of crust by magmatism need not have played a role in structural evolution -- even in rifts where igneous rocks of broadly similar age are abundant.

Clark Burchfiel, C. J. Northrup, and Leigh Royden concluded the symposium with field and theoretical studies of crustal extension within contractional belts. Clark presented recent observations of intricate relations among extensional, transcurrent, and contractional structures along the eastern margin of Tibetan Plateau. C. J. discussed evidence for extensional general shear of thrust nappes in the northern Scandinavian Caledonides during their emplacement. This type of strain field results in upper-crustal extension within the nappes even as they are being emplaced by thrusting, an apparent paradox that has recently been inferred in several mountain belts. Leigh presented numerical models of the interaction between lithospheric shortening and surface topography to account for the patterns of surface deformation (contractional and extensional), topography, and the progressive growth of mountain belts. The models indicate that a weak intracrustal decoupling zone is required for upper-crustal extension in a contractional orogen, and that extension is localized at steep topographic gradients at the orogen's margins.

The well-attended symposium illustrated the diversity of current research on extensional tectonics, and revealed fundamental problems that remain unsolved: the nature and mechanics of low-angle normal faults; an overall conceptual framework for relations between magmatism and crustal extension; and a full understanding of the significance of upper-crustal extension within contractional orogens. Impressive progress has been made in the last decade through the efforts of far more investigators than were directly represented in the symposium, and we hopefully will see similar progress in the future!

The conveners have initiated work on a GSA Special Paper that will include papers from most of the participants in the symposium.

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"25+ Years of Plate Tectonics: Where Do We Go From Here?"

Conveners: Terry Pavlis and Laura Serpa (University of New Orleans)

The idea for this symposium originated at the 1994 JTPC meeting in a discussion between us and the SG&T and Geophysics Division reps at that meeting. We all agreed that it



might be fun to run a special symposium at New Orleans because 25 years had passed since 1970, a watershed year when plate tectonics really became widely accepted by geologists. This occurred in large part through a series of landmark papers published around that time. Clearly plate tectonics *senso stricto* had really existed for several years by that time, but because of the "acceptance factor" we came up with the rather odd title of "25+ years..." for this symposium. Because of the timing we thought it would be appropriate to have retrospective and forward views from some of the people who were a major influence 25 years ago. There are a lot of people who fit that description, so we attempted to limit the group to a few speakers from a variety of subdisciplines whom we knew we could count on to give presentations that would be philosophical, crowd-pleasing, thought-provoking, and forward-looking. I think everyone who attended the sessions can agree that the group did a very nice job of fulfilling our wishes! Certainly the crowds at the sessions were a complement to the group--the only complaint we heard was that this session emptied some of the other concurrent sessions.

It is difficult to summarize in a few words what was said in this session but a few points were clearly memorable. Bill Dickinson, for example, gave a great summary of advances in sedimentary geology and surprised many by suggesting that we should abandon the term "orogeny" and "orogenesis" in geology because they are archaic remnants of vertical tectonics and the terms can be misleading because all plate tectonic processes can produce large vertical uplifts despite very different underlying causes. Dave Scholl then gave a great "confession of a sinner" description of how our views have changed on convergent margin systems. Eldridge Moores discussed how our knowledge of ophiolites and oceanic lithosphere has grown over the years, but that increasing evidence shows that oceanic crustal thickness has decreased through earth history; a factor that has many ramifications for sea-level variations and variations in erosional processes through time. Kevin Burke then returned attention to the continents with a thought provoking series of observations and discussions of a number of unusual topographic features on earth that have yet to be fully explained. Peter Coney discussed the great strides made in continental orogenesis using the plate tectonic paradigm and the philosophical pitfalls in applying strict rules to Precambrian systems where the rules may be different. Gary Ernst and Jack Bird addressed one of the key problems in tectonics; i.e. what is happening deep within the earth -- first with Gary's discussion of the origin of ultra-high- pressure metamorphic rocks and then Jack's discussion of materials that may be derived from as deep as the earth's core. Jack Oliver then moved to a more philosophical side and with his usual flare gave some great forecasts of where tectonics might be in the next 25 years -- one notable quote that was probably remembered by all was that new technological developments probably mean that the whole world would need to be "remapped" into a digital data base format! Finally, Tanya Atwater completed the session with an upbeat note that many recent technological developments, together with the accumulation of basic information, have made it possible to finally relate directly the marine plate tectonics record to on-land geology. She believes that there is a rich future in such tectonic endeavors.

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"Geology and Tectonics of the Caribbean Region"

Conveners: Hans Ave´ Lallemand and Jinny Sisson (Rice University) and Gren Draper (Florida International University)

Notwithstanding the demise of the Caribbean Basin Initiative proposed about a decade ago by our political leaders in Washington, interest in at least the geologic and tectonic aspects of the region appears to be flourishing and on the rise. In the last few years symposia dealing with the Caribbean were organized at almost every national meeting of one or the other earth science societies. Thus, it was not a surprise that the organizing committee for the 1995 Annual Meeting of the GSA in New Orleans thought it to be timely to have such a symposium too.

The reason for the interest in the Caribbean lithospheric plate may be the fact that it is a very special plate: it is very small; it has an unusually thick crust; and it has virtually no means to propel itself (no real subduction zone to pull it, nor a mid-oceanic ridge to push it). Many global-scale phenomena taking place along plate boundaries occur here in rather small areas and can be studied without extensive travel. And, of course, the beaches are great!

The symposium and the accompanying poster session were sponsored by the Society's International Division and had the blessing of the IGCP (Project 364: Caribbean Arcs and Ophiolites). This made it possible among other things to invite Manuel Iturralde-Vincent to participate and give us a masterful lecture on the latest model for the geology of Cuba. A historic review of the geology and plate tectonics of the Caribbean region (Gren Draper and Jim Pindell) was followed by characterizations of the Caribbean plate boundaries that included seismicity (Ray Russo), recent relative plate motions based on GPS data (Timothy Dixon), deformation in subduction zones (Casey Moore and others), and contrasting arc volcanism in the Lesser Antilles and Panama arcs (Mike Carr). The internal structure of the Caribbean plate was discussed by Stuart Hall. Subsequently, portions of the plate boundary were discussed in a geographic sequence starting in the northwest with the Cayman leaky transform (Eric Rosencrantz) and the fragmented Nicaraguan Rise (Andre Droxler) and following a clockwise loop through Cuba (see above). Then came treatment of the exotic allochthonous radiolarian cherts of the northeastern Greater Antilles and Lesser Antilles proving to everybody's(?) satisfaction that the Caribbean plate once was part of the Pacific Basin (Homer Montgomery). Then off to the southeastern corner where very large thrust displacements resulting from convergence between the Caribbean plate and the South American continent were proposed by Bert Bally and his students. The last talk dealt with the catastrophic deposits resulting from the bolide impact at the K/T boundary in the Yucatan Peninsula (Florentin Maurasse). The symposium was very successful in that it brought researchers with very different expertise together. It showed exciting new ventures and areas where new research is desperately needed.

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#### ANNUAL MEETING THEME SESSION SUMMARY

"Before the Gulf --

Paleozoic Tectonics of the Southern Margin of Laurentia"

Convener: George W. Viele (University of Missouri, Columbia)

This theme session addressed three major topics: the relationship of the Precordilleran terrane of Argentina to Laurentia; the nature of the Ouachita interior metamorphic belt of Texas; and the late Paleozoic closing of the Ouachita Ocean.

Several authors -- Astini and others, Hatcher, Krekeler and others, Thomas

-- reviewed the stratigraphic, petrologic, and paleontologic data linking the Precordilleran terrane of Argentina with Laurentia during the Early Cambrian and the subsequent rifting, drifting and docking of the Precordillera with Gondwana before the end of the Ordovician. Discussion continued, however, about the distance of Laurentia from Gondwana or indeed if they collided during the Ordovician. Did the Precordillera leave a wide spreading ocean behind the Ouachita embayment as it split away from Laurentia, or did it -- as Dalziel suggested during a question period -- remain attached to Laurentia via an oceanic plateau. He compared this model to the present-day linkage between the Falklands and Argentina.

Dix and others reported on an Ordovician clastic wedge in the Broken Bow uplift of Oklahoma and suggested that it was derived from the collided eastern margin of the Precordillera and Gondwana; this implies a narrow Ouachita ocean. Dickerson described complicated early Paleozoic interactions that occurred at the Marathon end of the Ouachitas between the Laurentian margin and a volcanic/sedimentary/metamorphic terrane (Gondwanan ?) to the south.

The symposium moved on to the closing of the Ouachita ocean. Three papers: Long and others, Carpenter and Long, and Gleason and others, dealt with the interior or Llanorian side of the Ouachita orogenic belt. New subsurface data and recent mapping in the Sierra Del Carmen of Mexico, coupled with isotopic analysis, indicated an early Paleozoic protolith for the Ouachita interior metamorphic belt, which was probably allochthonous to North America. Gleason's Sm-Nd data indicated the Mississippian tuffs of the Ouachitas came from a volcanic arc constructed on older continental basement (Grenvillian ?). Having different isotopic signatures, the Mississippian tuffs can no longer be attributed to the late Paleozoic subsurface volcanic rocks of the Sabine uplift. (Damn!)

Mars and Whiting and Thomas linked Mississippian stratigraphy and Carboniferous subsidence of the Black Warrior Basin to Ouachita collision events. Donovan reported on the Pennsylvanian structures of the Slick Hills of Oklahoma, which record northeast-southwest shortening directly athwart the direction of Ouachita shortening, an unsolved puzzle for geologists working in southeastern Oklahoma. Muehlberger reported on the complicated Ouachita structures in the Solitario region of the Big Bend region of Texas, and Viele reviewed the evidence for strain partitioning resulting from a southeastward direction of closing of the Ouachita ocean in Oklahoma and Arkansas. Lille finished the symposium by reviewing the gravity models of the Ouachitas and Carpathians and suggesting that both were "soft" collisions where less than 100 km of crustal shortening occurred after ocean closure.

Discussions about the opening phase of the Ouachita ocean and its relation to the Argentine Precordillera will continue in March at the South Central GSA meeting. I will argue for a wide and deep Ouachita ocean. Moreover, in the field, Ouachita aficionados will continue to explore the structure and stratigraphy associated with the late Paleozoic Ouachita collision, happily turning up new problems as old ones are solved -- or so we think!

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## STRUCTURAL GEOLOGY ON THE WEB

### The World-Wide Web

The World-Wide Web is a subdivision of the Internet, a vast network of interconnected computers which allows you to seamlessly access multimedia information (text, images, and binary files) from Web servers anywhere in the world. There are currently well over 100,000

active Web servers with more coming on-line each day.

To learn more about the Internet, the World-Wide Web, or netbrowser programs (I strongly recommend the program Netscape) which allow you to "surf" the Web, a visit to any library or bookstore will reveal dozens of books and tutorials for beginners. Two words of advise. First, don't waste your money purchasing books on how to construct your own Web pages. Once you learn to navigate the Web, you'll see that all of this information is available on-line (e.g. [http://www.yahoo.com/Computers\\_and\\_Internet/Internet/World\\_Wide\\_Web/](http://www.yahoo.com/Computers_and_Internet/Internet/World_Wide_Web/)). Secondly, don't bother with books containing lists of interesting Web sites to visit. The Web is a volatile place with sites literally appearing and disappearing overnight and such books are often obsolete by the time they're published. There are many Web search engines (e.g. <http://ugweb.cs.ualberta.ca/~mentor02/search/search-all.html>) which will allow you to find most sites quite easily.

#### Structural Geology Resources

To assist structural geologists in finding useful Web resources, I have created and currently maintain a Web site which contains many links to resources which may be of interest to structural geologists. The address for the Web page is:

<http://hercules.geology.uiuc.edu/~schimmri/geology/structure.html>

and the following is a brief outline of the different types of resources available from this site.

#### Data Sets and Bibliographies

There are several GIS-type data sets available on the Web which may be of interest to structural geologists. In addition, an increasing number of earth science journals are placing abstracts on-line and this trend should continue. Some researchers have placed bibliographies on Web sites covering, for example, the structural geology of the Andes (Rick Allmendinger, Cornell), faults, folds, and joints (Kenneth Cruikshank, Portland State), and fluid flow in rocks (Laurel Goodwin and Bill Haneberg, New Mexico Tech).

#### Computer Software

Many free and shareware computer programs are available over the Web if you know where to look. The Computer Oriented Geological Society (COGS) maintains an archive of MS-DOS and Macintosh programs for geologists, and Computers & Geosciences maintains a resource list for geological software and archives all programs published in their journal.

Structural geologists, of course, are interested in plotting and analyzing orientation data. Several stereonet and rose diagram plotting programs are freely available along with assorted programs for teaching (Rick Allmendinger, Cornell), finite element modeling (Peter Bird, UCLA), folding simulations (Ken Cruikshank, Portland State), and paleostress analysis (John Gephart, INSTOC and Andy Michael, USGS).

#### Commercial Products and Services

Several companies now have Web pages with on-line catalogs offering software, field equipment, and books of interest to structural geologists.

#### Organizations

In addition to the Web pages set up by large professional organizations such as GSA, AGU, and AAPG, many smaller organizations now have Web pages including the Canadian Tectonics Group, the Tectonic Studies Group, and the International Association of Structural/Tectonic Geologists. Most organizational Web pages maintain information about membership, upcoming meetings, and publications.

#### Research Information

A few research groups, which may be of interest to structural geologists, have set up their own Web pages. Information is available, for example, on the Active Tectonics Initiative, the Australian Geodynamics Cooperative Research Centre at CSIRO, and on salt tectonics research at the University of Texas in Austin.

#### Upcoming Meetings

GSA and AGU maintain Web pages with information about upcoming national meetings, including submitted abstracts, as well as information on Penrose and Chapman conferences.

#### Academic Groups

Several academic structural geology and tectonics groups maintain their own Web pages. Some good examples of these are Ben van der Pluijm's group at the University of Michigan, Dave Pollard's group at Stanford, and the faults and fluids group at New Mexico Tech. These types of Web pages can provide very useful up-to-date information for prospective students and other interested parties.

#### Structural Geologists

Finally, many structural geologists maintain individual Web pages with information about their research interests and projects, publications, and personal information. This resource is also very useful for prospective students and interested colleagues.

#### The Future of the Web

Expect the World-Wide Web to continue its exponential growth as an increasing number of people gain access to it. Along with this growth will be problems on how best to handle the increased traffic and controversial attempts to regulate access and proper use (such as the recently passed Telecommunications act).

I see three areas where the Web will continue to be of interest to structural geologists.

Instant access to information. Do you want to know what geology departments at other universities are teaching this semester? Need a colleague's e-mail address or want to see what research they've been doing lately? Want to read the abstract of a paper appearing in last July's issue of *Geology* when the library's closed? This information is all available with a few clicks of a mouse.

Secondly, I believe that the Web is still greatly underutilized, at least among geologists, for the purpose it was originally created in 1989 by CERN -- rapid dissemination of research information throughout the scientific community. The Web is an ideal repository for instantly accessible information. A published paper, for example, may have a Web site address showing interested parties where they may examine the orientation data used in stereographic projections, obtain directions to sampling localities, or download a program developed by the author.

Finally, the World-Wide Web has a tremendous potential as an aid in teaching geology. Many instructors already place course outlines, assignments, and grades (accessible with a password) on the Web. Beyond this, there are unlimited opportunities for developing tutorials and virtual fieldtrips for geology students in and out of the classroom.

A final caveat, Web surfing can become a very time-consuming addiction!

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Editor's note: This is the first in what, hopefully, will be a series of columns on the World Wide Web. Steven Schimmrich, a structural geology graduate student at the University of

Illinois in Urbana-Champaign, has (as mentioned above) put together a homepage of structural geology and tectonics resources available on the WWW. These resources include data sets, computer programs, and links to organizational and personal homepages related to structure and tectonics. Netbrowsers can access his homepage at the address given above.

## THE RESOURCE BIN

Graduate Student Research Grants, Colorado Scientific Society

The Colorado Scientific Society announces the availability of research grants for M.S and Ph.D. earth science students involved in field-oriented studies in Colorado and the Rocky Mountain region. Approximately eight grants will be awarded in the \$500-\$1000 range, and one grant is available for an engineering geology thesis or dissertation with no geographic specificity. Applications can be obtained from the Chairs of some departments or by request from: Chairman, Memorial Funds Committee, Colorado Scientific Society, P.O. Box 150495, Lakewood, CO 80215. Application deadline: April 15th.

## FUTURE MEETINGS, CONFERENCES, AND COURSES

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

1996

April 17-22: Tectonic evolution of the Gulf of California and its margins (GSA Penrose Conference): Loreto, Baja California Sur, Mexico. Contact: Paul Umhoefer, Dept. of Geology, Box 4099, Northern Arizona Univ., Flagstaff, AZ 86001; phone (520) 523-6464; fax (520) 523-9220; email: pju@nauvax.ucc.nau.edu

April 28-May 1: 11th Himalaya-Karakoram-Tibet International Workshop: Flagstaff, AZ; for details contact Allison Macfarlane, Dept. Geography & Earth Systems Science, George Mason Univ., Fairfax, VA 22030; phone (703) 993-1207; fax (703) 993-1216; email: amacfarl@osf1.gmu.edu

May 11-12: Forced (drape) folds and associated fractures (two-day meeting): London, England; contact: J. Cosgrove, Geology Dept., Imperial College, Prince Consort Road, London SW7 2BP, UK; fax (44) 0171-589-8544; e-mail, dsgorg@ic.ac.uk

May 19-22: Annual meeting, American Association of Petroleum Geologists: San Diego; for details contact AAPG Meetings; phone (918) 584-2555; fax (918) 584-0469.

May 20-24: Spring meeting, American Geophysical Union: Baltimore; for details contact AGU Meetings; phone (202) 939-3203. Abstract deadline is Feb. 29.

May 26-28: The ocean lithosphere & scientific drilling into the 21st century (symposium and workshop sponsored by ODO, InterRidge, IAVECI): WHOI, Woods Hole, MA; contact: Henry Dick, c/o Ms. May Reed, McLean Laboratory, WHOI, Woods Hole, MA 02543; email: mreed@whoi.edu. The symposium will review the present state of knowledge of the ocean lithosphere; the workshop will seek to establish goals and priorities for ocean lithosphere drilling from 1998 to 2003, and to begin planning for a new phase of drilling after 2003.

May 27-29: Joint annual meeting, Geological Association of Canada and Mineralogical Association of Canada: Winnipeg, Manitoba; for details contact G. S. Clark, General Chair, Dept. of Geol. Sci., Univ. of Manitoba, Winnipeg, Manitoba R3T 2N2; phone (204) 474-8857; fax (204) 261-7581.

June 30-July 4: Composition, structure, and dynamics of the earth's interior (AGU Gordon

Research Conference; Univ. R. I., co-sponsor): Plymouth State College, Plymouth, New Hampshire; contact G. Schubert, UCLA, Dept ESS, Box 951567, LA, CA 90095-1567; phone (310) 825-4577; fax (310) 825-2779; email: gschubert@mgnvax.ess.ucla.edu; www <http://artemis.ess.ucla.edu>

July 29-Aug. 2: Pan Pacific Hazards '96 (international conference): Vancouver, B. C.; contact Program Committee, Pan Pacific Hazards '96, U.B.C. Disaster Preparedness Resources Centre, 2206 East Mall, 4th Fl., Vancouver, V6T 1Z3; phone (604) 822-5518; fax (604) 822-6164; email: dprc@unixg.ubc.ca

July 29-Aug. 2: Proterozoic evolution in the North Atlantic realm: Goose Bay, Labrador; contact Charles Gower, Newfoundland Dept. of Nat. Resources, P. O. Box 8700, St. John's, Newfoundland, A1B 4J6; phone (709) 729-2118; fax (709) 792-3493; email: cfg@zeppo.geosurv.gov.nf.ca

August 4-14: 30th International Geological Congress: Beijing, China; for details contact Secretariat Bureau, 30th IGC, P. O. Box 823, Beijing 100037, PRC; phone: 86-1-832-7772; fax: 86-1-832-8928.

Sept. 3-7: Structure and properties of high strain zones in rocks (international conference and field trips): Verbania, Italy; organizers: E. H. Rutter & K. H. Brodie (Univ. of Manchester, UK) and A. Boriani and L. Burlini (Univ. of Milan, Italy); contact: L. Burlini, Centro di Studio Geodinamica, CNR Milano, via Botticelli, 23 -- 20133, Milano, Italy; fax: 39 2 70638681; email: Burlo@R10.terra.unami.it. 2nd Circular: 2/96; Abst. deadline: April 1, 1996.

Sept. 15-20: Deep seismic profiling of the continents (7th international symposium): Asilomar, CA; contact Simon Klemperer, Dept. of Geophysics, Stanford U., Stanford, CA 94305; phone (415) 725-7344; fax (415) 723-7344; email: klemp@pangea.stanford.edu.

Sept. 17-19: Third international symposium of Andean Geodynamics (ISAG 96): St. Malo, France; contact Denis Gapais, ISAG 96, Geosciences Rennes, Universite Rennes 1, 35042 Rennes Cedex, France; fax 33-99-28-61-00; email: isag96@seth.univ-rennes1.fr. Abst. deadline is April 1, 1996; official languages are French, English, and Spanish.

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

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

1997

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.

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.