Chair’s Message –

Greetings to all SGT members. I would like to start this note by thanking all who participated in and volunteered to make the Seattle GSA meeting a success. The Division was strongly represented, as usual, with over 30 topical and disciplinary sessions. Martha Withjack and I scheduled hundreds of abstracts, and I apologize for any overlapping, conflicting sessions. Having observed first-hand what a difficult job it is to schedule so many sessions in so little time, I will never again complain “how could they schedule these two sessions at the same time?!?” At the SGT board meeting we thanked the outgoing board members and welcomed new ones. Many thanks are due to Martha Withjack for excellent leadership as chair of the Division last year, and to Laurel Goodwin for her many contributions as past chair. Thanks also to Peter Vrolijk for continuing as secretary-treasurer, web master Kevin Smart, and newsletter editors Barabaras John and Sheffels, without whom our communications would not get done. We welcome Dave Lageson as First Vice-Chair and John Geissman as Second Vice-Chair. I would especially like to recognize all those who volunteer on committees and accomplish the important work of the Division. We thank outgoing members Jan Tullis (Career Contribution award committee), Rick Law and Paul Umhoefer (Best Paper award committee), and Dave Lageson (Short Course committee). On the Career Contribution award committee, Don Fisher and Shankar Mitra are continuing members, and Casey Moore joins the committee. On the Best Paper Award committee, Harold Tobin, Frank Pazzaglia, Kip Hodges, and Bruno Vendeville are continuing members, and we welcome new committee members Tracy Rushmer and Nancye Dawers. Timothy Wawrzyniec joins Basil Tikoff, Claudia Lewis, Randy Marrett and John Geissman on the Short Course committee, where Basil liked it so much he agreed to stay on! Please get involved, the Division exists because of and for its members. We need volunteers yearly for the management board, Short Course, CCA and BPA committees. If you would like to volunteer or nominate a colleague, please contact me. Also, this year we will be reviewing and possibly revising our bylaws to be sure that management board and committee practices are up-to-date and work smoothly. Proposed changes will be submitted to the Division membership for a vote. If you would like to be involved with our bylaws review—especially if you were a past board or committee member—please contact me: <schmer@cc.wwu.edu>.

The Division business meeting in Seattle was well attended, and of course the reception afterward was a big hit. We all enjoyed honoring Greg Davis with this year’s Career Contribution Award and hearing Greg’s long-time partner in Cordilleran tectonics, Clark Burchfiel, regale us with tales and photos of Greg’s long and distinguished field career. I consider it my good fortune to have been able to spend time in the field with both Greg and Clark and to learn from their vast
experience. The Best Paper award went to Jerome Lavé and Jean-Phillipe Avouac for their paper “Active folding of fluvial terraces across the Siwaliks Hills, Himalayas of central Nepal”, published in 2000 in JGR. Student research awards went to Christopher A. Berg (University of Texas, Austin) for his proposal entitled "Calculating Strain Rates from Curvature of Inclusion Trails in Garnet Porphyroblasts: an Example From Passo del Sole, Central Swiss Alps", and Sara E. Bier (Pennsylvania State University) "Timing and Kinematics of Deformation of the Kahltna Assemblage: Evidence for Accretion of the Talkeetna superterrane". SGT was well represented at the Society awards ceremony: Clark Burchfiel gave the Presidential address, and Sharon Mosher received the GSA Distinguished Service Award. Congratulations to all of you!

The JTPC committee is already busy organizing special sessions for the next Annual Meeting in Denver. This promises to be an interesting and exciting meeting, with over 20 special sessions proposed on topics ranging from grain-scale processes in metamorphic rocks to mountain belt-scale tectonics and lithospheric evolution. SGT will cosponsor (with NAGT) a short course on “Teaching Structural Geology”, and there will undoubtedly be several field trips of interest to Division members. Another meeting of interest to SGT members includes the Backbone of the Americas meeting, April 3-7 2006, in Mendoza, Argentina. Although this meeting is more than a year away, Division members are needed to form program committees to organize this meeting.

The Division has seen significant savings from our transition to an electronic newsletter. We plan to use the surplus to support more student research awards and to provide more support for students to attend field trips and short courses. Encourage your students to apply for these awards!

Some recent events concern us and warrant comment in this newsletter:

The recent decision to close the Department of Geology and Geophysics at the University of Connecticut concerns us all, especially since two of our Division members, Tim Byrne and Jean Crespi, were highly valued members of that department. The university administration cited lowered interest in majors, budget cuts, and a critical program review as the reasons for the decision. The eight faculty members will be reassigned to other science departments. Although at first glance this news is disturbing, the plan is that geosciences will become part of a stronger, more interdisciplinary research and learning venture. The university is in the midst of a major renovation both to buildings and its academic plan and is taking this opportunity to create a program in “environmental sustainability” by reorganizing and integrating environmental programs at UConn, including strengthening connections of geology and geophysics with other programs. We hope that there will be more opportunities, not fewer, for geoscience research and learning at UConn in the future, and wish the best for our colleagues in that department.

In this, an election year, it is hard to be far from the sights and sounds of politics, even when you are in the field, or overseas, where many people seemingly pay more attention to US politics than we do. Earth science plays a very important role in governmental policymaking, and all geoscientists can have important inputs to lawmakers on issues that affect public health and safety, including land use and zoning, climate change policy, education funding and fairness, and the general science literacy among the public and our public servants. As we fall further behind in science education and overall science funding compared to other developed countries, we need to reiterate the importance of science, in particular integrated earth science, for our future health, economic well-being, and living standards. Furthermore, we need to make sure the data and conclusions of earth scientists and the science community are being represented fairly in the media and in reports to lawmakers and other branches of government. The Union of Concerned Scientists recently issued a report entitled “Scientific Integrity in Policymaking: An Investigation into the Bush Administration’s Misuse of Science”, available at <www.uscsusa.org>. The report details numerous instances of censorship and distortion of research findings at Federal research agencies related to issues involving climate change, air quality, and forest science, among others, and documents these abuses as an unprecedented pattern of behavior compared to previous administrations. In a related problem, the Office of Management and Budget proposes to remove federal scientists and those funded by government agencies from peer review science panels, while, in an Orwellian
twist, allowing only scientists employed or funded by the regulated industries to serve as reviewers (unless there is direct financial conflict of interest). Another potential impact of Administration policy on geoscience information and First Amendment rights relates to a September ruling of the Office of Foreign Assets Control (OFAC) of the Dept. of Treasury, to forbid editorial services (such as copy editing) to authors of publications from embargoed countries such as Libya, Iran, Iraq, Cuba, and Sudan. A clarification stated that volunteer peer review was allowed, but “substantive or artistic alterations and enhancements” and collaboration with authors in those countries was not, and editing services provided by the publishing society were also forbidden. The American Chemical Society (ACS) had issued a moratorium on publishing papers authored by scientists from these countries, but recently ended that moratorium. The ACS, together with other scientific publishers, has formed a litigation task force in case legal challenge to the OFAC ruling becomes necessary.

Now is the time to call or write your congressperson, senator, or local governmental officials and comment on these or any other geoscience-related issues. Communicate the importance of this issue to the public. Volunteer for a local or state, or national campaign, either for a candidate or for a ballot initiative or measure. Make sure that knowledgeable earth science views are represented in your community and in the media.

Wishing you a productive year, and hope to see you at a section meeting or in Denver.

- Liz Schermer

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A CONFERENCE IN HONOUR OF DR. PHILIP SIMONY
(Professor Emeritus, University of Calgary)

‘FROM FORELANDS TO CORE ZONES:
TECTONIC EVOLUTION OF OROGENIC BELTS’
JUNE 17-20 (UNIVERSITY OF CALGARY)
FIELDTRIP JUNE 20-23 (SOUTHERN BRITISH COLUMBIA)

see <www.geo.ucalgary.ca/simony.htm>

ABSTRACT SUBMISSION AND EARLY REGISTRATION DEADLINE APRIL 15, 2004

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Calling all Division members -
Volunteers/nominations are needed for SG&T 2nd Vice-Chair and Secretary/Treasurer.
Deadline - April 15. Contact Liz Schermer: <schermer@cc.wwu.edu>
IMPORTANT REMINDERS !!!!

NSF will return proposals without review that do not separately address both merit review criteria within the Project Summary <http://www.geo.nsf.gov/cgi-bin/geo/announce.pl?div=ear>

NSF EAR policy is that investigators must wait one year before resubmitting a proposal.

Research Frontiers in Appalachian Geology: A pre-EarthScope (US Array) Workshop sponsored by National Science Foundation

The US Array component of Earthscope “will dramatically improve the seismic imaging of the continental lithosphere and deeper mantle and will integrate these images to unresolved issues of continental structure, evolution and dynamics” <www.Earthscope.org>. Towards this vision, a workshop is planned to provide an open forum for all earth scientists to collaboratively formulate new research goals involving the natural laboratory provided by the Appalachian Orogen.

Although the workshop is open to all, the attendance will be limited to approximately 50 individuals, including graduate students and agency representatives. This will enable timely and explicit formulation of science themes that can take advantage of EarthScope facilities, especially the US Array component. The workshop steering committee includes A.K. Sinha (Virginia Tech) <pitlab@vt.edu>, J.F. Read (Virginia Tech), Art Goldstein (Colgate University), and Larry Brown (Cornell University) and will oversee the development of the workshop agenda. The reports from the sessions will lead to a consensus set of recommendations for advancing research opportunities in the Appalachian region. These recommendations will constitute the final workshop report to NSF.

GEOLOGICAL SOCIETY OF AMERICA
STRUCTURAL GEOLOGY AND TECTONICS
CAREER CONTRIBUTION AWARD

Gregory A. Davis
(Citation by B. Clark Burchfiel)

Greg and I first met as undergraduates at Stanford where he graduated with a BSc in 1956 and MSc in 1957 then deserted the “Farm” to migrate across the bay to UC Berkeley where he received his PhD in 1961. His early work followed from his dissertation studies in the Klamath Mountains on a detailed study of the Caribou Mountain pluton, westward thrusting within the Klamaths, and the metamorphic and granitic history of the Klamaths. From this early work came several very important syntheses, perhaps the most important of which was the tectonic correlation of units between the Klamaths and the Sierra Nevada in 1969 which influenced all our thinking about Paleozoic and Mesozoic accretion tectonics of the Cordilleran orogen. In the early 1960’s, Greg and I began work in the Cordilleran thrust belt along the east side of the orogen and began to think about
how his work in the Klamaths related to the thrust belt in Nevada, Utah and California. From this joint effort came a synthesis paper with a troubled history, “The two sided nature of the Cordilleran orogen and its tectonic implications.”

The early 1960’s and 1970’s were a great time for our cooperation, and in my opinion were some of the happiest and most productive times for both of us. Two papers on the interpretation of the evolution of the Cordilleran orogen in 1972 and 1975, the paper on the Garlock fault as an intracontinental transform structure in 1972, the comparison of the Mesozoic Cordillera with the modern analog in the Andes in 1976, and the Mesozoic construction of the Cordilleran collage in 1978, where Greg put forth an interpretation of doubling of the orogen by strike slip faulting the NW Cascades and adjacent Canada, were published. Our work together continued for about ten years when he began his now classic studies of extensional tectonism in the southern Colorado River area.

His first papers on the extensional system came out in 1979. This work followed on the heels of earlier work of Dick Armstrong, Ernie Anderson, and John Profit who had begun to recognize the presence of Cenozoic extension on low-angle normal faults. The late 1970’s were a time of great debate about the existence of low-angle normal faults and related core complex formation, but in my opinion, it was the very careful mapping and attention to detail of Greg and his students working in the Colorado River terrain that documented and clarified the existence, magnitude and importance of these structures in a series of papers from 1979 to the early 1990’s. His two papers with Gordon Lister on the nature of detachment faults and core complex formation in 1988 and 1989 are classics that still are required reading.

In 1987 Greg began work to document large magnitude extensional tectonism in China north of Beijing with his colleague Zheng Yadong. Subsequently Greg and Yadong moved west into Inner Mongolia where published maps suggested important Early Cretaceous extensional structures were present but unrecognized; now documented and shown to have developed within a few million years of major crustal shortening. This work has fully opened the floodgates for widespread extensional tectonics in China, but the extent and relation of this extension to plate boundaries has been very challenging in explaining its tectonic origin. What makes this work so important is not just the major contribution to Chinese tectonics, but the fact that it is very difficult to explain the tectonic setting of Early Cretaceous extension and core complex formation more than 1000 km removed from any major plate boundary. These studies break new ground and are producing results that are challenging all our concepts for the dynamics of large magnitude extensional faulting.

Greg’s work of more than 40 years has had enormous global impact on structure and tectonics from well-documented field studies to geodynamic analysis. It is only fitting that he is the 2003 recipient of the SG&T Career Contribution Award.

Response by Gregory A. Davis

This award is a dream come unexpectedly true. I am extremely grateful to the Division, to GSA, and to those who nominated me for making it happen. My review of the 15 Career awardees who have preceded me leaves me feeling appropriately humbled to be included amongst them and happily aware that one of them was my teacher — Ben Page at Stanford, another my grad office roommate at Berkeley — Win Means, and still another, my oldest friend and longest interacting colleague — Clark Burchfiel. My need to respond to Clark's overly kind citation has prompted my analysis of how this honor may have came about. Hopefully, in part, because of moderate intelligence and, in earlier years, strong legs. However, of no lesser importance in my being here today has been the influence of, and interactions with, others. My father, Rodney Davis, a Portland fireman, started the process by encouraging in many ways a 10 year-old boy to develop his budding interests in geology-rich Oregon. I cherish those memories. Later came my association with superb geologists, some of whom profoundly influenced my education, and others who worked with me as research colleagues over the years. Ben Page, my undergrad structure professor, and Lionel Weiss, with his pioneering work in structural analysis at Berkeley and before, were the most influential contributors to my education. Subsequently, much of my
tectonics research has been co-authored with stellar individuals who either deserve a Career award in their own right — Jim Monger, Gordon Lister, and Darrel Cowan lead that list — or, in the case of my citationist, have already won it.

Another factor contributing to my presence here today is simply repeated good luck! I had wanted to conduct Ph.D. research in northeastern Oregon but was informed by a professor at another university that the area in question was his. I therefore turned to my second choice, the Klamath Mountains of northern California. It was pure serendipity! Doctoral and subsequent field studies there led to my rediscovery (long after the forgotten work of Oscar Hershey in ca. 1905) of major Mesozoic west-directed thrust faulting.

In 1964, Clark and I began Mohave Desert mapping in the east-directed foreland thrust belt and pondered over the divergent thrust geometry of the Cordilleran orogen. We submitted a "two-sided orogen" paper in the mid-1960's to *Science*, but it was twice rejected as unsubstantiated. Although later published in the obscure proceedings of the 1968 IGC meeting in Prague (ended abruptly by the Russian invasion), its core ideas led us to *American Journal of Science* papers in 1972 and 1975 on possible plate origins of the US Cordillera. The Klamaths and their fault-bounded counterparts in the northern Sierra Nevada also provided fodder for early tectonic correlations between Canada and the US within what we now call the accreted terranes. A 1978 gray literature paper co-authored with Jim Monger and Clark on this Cordilleran "collage" remains one of my favorites.

It was more good fortune that I was introduced in 1975 to the Whipple Mountains of southeastern California by a San Diego State master's student, Ann Terry. Her discovery of enigmatic subhorizontal faulting in that range led to a decade-long USC field and petrologic effort there with my colleague Lawford Anderson, a dozen of our students and, later, Gordon Lister. In 1981, Brian Wernicke, a USC undergrad then at MIT, published in *Nature* a conceptual breakthrough on the nature of low-angle normal faults and the "metamorphic core complexes" of George Davis and Peter Coney that contained them. Our understanding of continental crustal extension would never again be viewed in conservative ways, and evolves still.

My recognition on a one-day fieldtrip north of Beijing in 1985, of a Whipple-like core complex underlying the Great Wall was continuing good luck and led to research in China that continues to this day. Again, collaboration with others, among them Peking University's Zheng Yadong and Qian Xianglin, and Arizona's George Gehrels, has provided new insights into the complex Mesozoic mountain systems of northern China. My appointment, since 2000, as a Guest Professor at Beijing's China University of Geosciences is a most welcome one and greatly aids this research.

I must close this response with mention of the many students, some 45 or so, who trusted me to be their graduate adviser at USC. They sometimes found me over-demanding, but, I hope, always fair to them and interested in their projects. They, too, have contributed in many different ways to who and where I am this day, and I collectively thank them for that. It's very clear that my appreciation for this award is owed to many.

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**Geological Society of America**

**Structural Geology and Tectonics Division 2003 Best Paper Award**

*J. Lavé and J. P. Avouac*

*(Citation by John Suppe)*

The 2000 *Journal of Geophysical Research* paper (v.105, B3, p.5735-5770), by Lavé and Avouac on active folding of terraces in the Siwalik Hills of Nepal is in a word, breathtaking. It not only is an exquisite study of folding of fluvial terraces but it succeeds markedly at the very point at which much effort in active tectonics
stumbles—it convincingly and quantitatively connects the geomorphic deformation to the active subsurface structure. But they do not stop with the local structure; they go on to provide deep insight into the large-scale tectonics and seismic cycle across the entire Himalayas.

Lavé and Avouac surveyed the deformed terraces and surface structure on long reaches of several Siwalik rivers in the field, augmented with sophisticated analysis of digital elevation models and remote sensing, providing a convincing model of the deep subsurface structure above the Main Frontal thrust and convincing regional uplift profiles for dated Holocene terraces. They then cleverly linked the deep structure and dated uplift profiles to provide two estimates of slip rates on the Main Frontal thrust, taking into account the evolving fluvial system, including bedrock incision, sinuosity and changes in base level. The result is a constrained Holocene slip rate on the Main Frontal thrust of $20.4 \pm 1.5$ mm/y. Remarkably this rate on a single fault accounts for the entire current shortening of the Himalayas, which they argue has fundamental implications for the larger current mechanical behavior of the mountain belt and leads to a stimulating model of the seismic cycle of the Himalayas, which has excited much interest.

It is impressive that these two geological renaissance men, Jérôme Lavé from Grenoble and Jean-Philippe Avouac from Caltech, can bring together such a diversity of disciplines in a single paper of epic scope that is fundamentally structural geology and active tectonics at its very best. As a Society we congratulate and thank them for their deep contribution to the forefront of our science by awarding them the Geological Society of America Structural Geology & Tectonics Best Paper Award for 2003.

**Response by Jerome Lavé**

(read by Jean-Phillip Avouac)

I am honored to receive the Best Paper Award in Structural Geology and Tectonics in 2003. It was a great surprise for me when I learned that our paper on Siwaliks Terraces was recognized in this way, and I wish first to thank John Suppe for nominating this paper and for his laudatory citation. I particularly appreciated his compliments and emphasis on the interdisciplinary approach, which is I’m convinced, a requisite for modern geology and which has driven my research form my early scientific careers until today. At the end of my period of study at engineering school, I could for this reason hardly choose between geology and geophysics. A solution was given to me when I discovered through Paul Taponnier’s passionate teaching in IPGP that seismotectonics offered the possibility of combining the two approaches. I looked, therefore, in that direction and accepted Jean-Philippe Avouac’s proposal because, like any lover of mountain climbing, I am fascinated by the vertiginous and icy peaks of the Himalayas. However, my advisor, Jean-Philippe, was aware of the generally intense tectonic activity in foothills from his work in Tien Shan piedmont, and we rapidly focused our research on the frontal relief, i.e. the Siwaliks Hills. I had to turn away from the high peaks and ironically to spend most of my Ph.D. in the lowest and warmest place of Nepal between 50 and 200 m above sea level! Nevertheless, it was a tremendous experience, both culturally because I discovered the gracious and wonderful people living in the Himalayan foothills, and scientifically because there was so much to explore and analyze. The Siwaliks area had indeed received much less attention than the High Himalayas to which most of the geologists had been attracted by metamorphism, granitic plutons, tectonics not to mention the breathtaking scenery.

Our observations and results in the Siwaliks, in particular, the possibility to link structure and terrace uplift and to calculate shortening rate, was made possible by several favorable circumstances. First, after our initial analysis of several satellite images of central Nepal, we chose to focus on the Bagmati River, which in fact presents, as far as I can tell from almost 10 years of looking at terraces all along the Himalayan front in Nepal, one of the best preserved sequence of terraces. Secondly, recent microseismicity records and GPS data greatly helped us to build and propose a consistent seismotectonic model of the Himalayan thrust system.
Throughout my Ph.D. work, I benefited immensely from intense scientific discussion with my advisor and co-author Jean-Philippe Avouac. All the results presented in our paper would have not been possible without financial and technical support by the Laboratoire de Géophysique (LDG) for field trip, satellite images and DEM acquisition, numerous $^{14}$C dates, and more particularly, without the French-Nepalese collaboration between the LDG and the Department of Mines and Geology (DMG) in Kathmandu. This work would never have been as successful without the delightful and fruitful discussions with Dr. Pandey on seismology and Nepal seismicity, without the logistic help from DMG and Thierry Héritier, and without the field assistance from numerous good-humored and experienced Nepalese geologists. I share this award with all of them.

Regarding the paper itself, it benefited greatly from extensive reviews spanning the several years that passed since Jean-Philippe and I first wrote two companion papers on tectonic and geomorphologic analysis of the fluvial terraces across the frontal folds. The papers were rejected! We then had to cut, write, re-write and revise a more complete and successful version of the tectonic part, which finally was published 3 years after its first submission. Your choice to honor this paper tonight therefore represents a just reward for this exhausting literature effort. It also illustrates that the peer-review process, which often imposes intensive and tedious rewriting, pushes the researchers toward more clarity and excellence. At this occasion, I would like to acknowledge the particularly insightful and detailed reviews by Ray Weldon, Alex Densmore and Daryl Granger.

Thank you again very much for your recognition of our paper.

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**In Memory - Gretchen Nakayama**

Sometimes life is unfair and takes a colleague from us long before her time. Gretchen Nakayama (nee Protzman) died on October 6, 2003, after battling cancer for more than a decade. Although Gretchen's reputation in academic circles was limited, she made a tremendous impact among her colleagues as a researcher at ExxonMobil Upstream Research Company (formerly Exxon Production Research Co.). Her academic background brought her to explore the mechanics of deformation processes in fold-and-thrust belts, first as an undergraduate at the University of Rochester and then as a doctoral student at UC Davis. Within Exxon Gretchen was able to apply her technical abilities and begin to develop her tremendous people-skills to embark upon a career in management. However, this career was interrupted four years ago when cancer that had been in remission for six years returned with a vengeance.

It was in these last four year's of Gretchen's life that her qualities really emerged and distinguished her as a remarkable person. For those of us fortunate enough to know Gretchen during this period, she prolonged her time with us through her courage, her inner peace, and her astounding ability to maintain a positive outlook and attitude in the face of pain, suffering and illness. Through her struggles, Gretchen inspired us to live each day to its fullest without complaint about events beyond our control.

Gretchen leaves her husband Glen and daughter Claire. A charitable fund has been established at AAPG in her memory (AAPG Foundation for the Gretchen Nakayama Memorial Grant; attn: Diane Keim, AAPG, P. O. Box 979, Tulsa, OK 74101). The Memorial Grant will support student research in structural geology.

- Peter Vrolijk
Fantastic news for all of us -

John Ramsey writes that 'Folding and Fracturing of Rocks' has been reprinted by Blackburn Press. You can obtain information via the website <http://www.blackburnpress.com>. It is apparently an exact copy of the McGraw Hill original, and costs $74.95 (US$). THANKS John, for seeing this happen!

2004 GSA Annual Meeting – 'Geoscience in a Changing World'

November 7-10, 2004
Colorado Convention Center
Denver, Colorado

(7/13 - Abstracts due by midnight, MST)

Once again, GSA will be hosted in the Rocky Mountains and High Plains. The meeting looks very interesting for those of us in SG&T. Outlined below are topical sessions, Pardee symposia, and field trips of interest to Division members. Mark your calendars with the dates below and see you there!

Pre-Meeting Field Trips –

Strike-Slip Tectonics and Thermochronology of Northern New Mexico
Thurs–Sat, Nov 4–6. Eric Ertslev, Dept of Geosciences, Colorado State University, Fort Collins, CO 80523, (970) 491-5661, fax 970-491-6307, erslev@cnr.colostate.edu; Steven Cather; Seth Fankhauser; Matt Heizler; Rob Sanders. Max: 40. Cost: $255. Begins and ends in Denver or Santa Fe, New Mexico.

Geology of the Silvercliff–Rosita Hills Mining District and Spanish Peaks Area

Structural Implications of Underground Coal Mining in the Mesaverde Group, Somerset Coal Field, Delta and Gunnison Counties, Colorado

Colorado Front Range—Anatomy of a Laramide Uplift

Continental Accretion—Colorado Style: Proterozoic Island Arcs and Back Arcs of the Central Front Range
Overview of Laramide Structures along the Northeastern Flank of the Front Range

Concurrent Field Trip –
Tour of U.S. Geological Survey National Earthquake Information Center, Golden, Colorado

Post-Meeting Field Trip –
Laramide Horizontal Shortening in the Rockies: Faulting and Folding in Oblique Backlimb-Tightening Structures of the Northeastern Flank of the Front Range, Colorado

Topical Sessions –
T12 Fluid Flow and Solute Transport in Fractured Rocks
T13 Modeling Flow and Transport in Chemically and Physically Heterogeneous Media
T14 Applications of Geophysics to Groundwater Resource Management
T36 Geophysical Solutions for Characterizing and Locating Geological Sites for Carbon Dioxide Sequestration
T37 GIS, GPS, and Remote Sensing in Geologic Hazard Assessment
T48 Unraveling the History of Ocean Crust Production: Evidence For and Against Changes in Seafloor Spreading Rates Since the Mesozoic
T58 Sedimentary and Stratigraphic Principles and Concepts Applied to the Study of Metamorphic Terranes and Igneous Provinces
T70 Modeling Grain-Scale Processes in Metamorphic Rocks
T73 Early Paleoproterozoic (2.5-2.0 Ga) Events and Rates: Bridging Field Studies and Models
T74 1500 to 2500 Ma: A Period of Changing Mantle Regimes in Earth History?
T75 A Xenolith Perspective on the Physical and Chemical Evolution of Continental Lithosphere
T76 Pre-EarthScope Synthesis of the Rocky Mountains I: Framing the Key Geological, Geophysical, and Geodynamic Controversies
T77 Pre-EarthScope Synthesis of the Rocky Mountains II: Surface Processes, Geodynamics, and the Roles of Neotectonics and Climate in Development of Modern Topography

T79 Pre-EarthScope Synthesis of the Rocky Mountains IV: New Ideas on Late Paleozoic Intraplate Orogenesis: The Greater Ancestral Rocky Mountains


T81 Regional Geology of the Northern Rockies: A Session Honoring Betty Skipp

T82 Bill Braddock's Backyard-Proterozoic to Recent Geology of the Northern Colorado Front Range

T83 Cordilleran Arc Magmatism, BATHOLITHS and Continental Crustal Genesis

T84 Terrane Translation, Orogenesis, and Plate Interactions in the Late Mesozoic to Early Cenozoic North American Cordillera, and Implications for Paleoecographic Reconstructions

T85 Whence the Mountains? New Developments in the Tectonic Evolution of Orogenic Belts: Celebrating the Dynamic Career of Raymond A. Price at the 50Year Mark

T86 Ribbon Continents: Their Origin, Development, and Role in Rifting and Orogenesis

T87 Recent Advances in Himalayan Geology

T88 Thrust Belts and Plateaus: The Anatomy of Convergent Systems

T89 Tectonic Evolution of the Arctic Basin and its Margins

T90 Low-angle Normal Faults and Faulting: Field Studies, Fault Rocks, Mechanics, and Weakening Mechanisms

T91 Paleomagnetism and Rock Magnetism Perspective of Shear Zone Kinematics

T92 Neotectonics and Earthquake Potential of the Eastern Mediterranean Region

T93 Crustal Seismic Anisotropy as a Measure of Regional Tectonic Deformation (Posters)

T94 Geoinformatics and Geological Sciences: The Next Step (Posters)

T95 Differentiating Climatic from Tectonic Controls on Landscape Evolution (Posters)

T96 Records of Late Quaternary Climatic Change from the Americas: Interhemispheric Synchroneity or Not

T97 Geologic History and Processes of the Colorado River

T98 Evolution of the Great Plains Landscape

T123 Teaching Structural Geology in the 21st Century GSA Structural Geology and Tectonics Division; National Association of Geoscience Teachers; On the Cutting Edge

T124 Using Field Observations and Field Experiences to Teach Geoscience: An Illustrated Community Discussion (Posters)

T125 Using Digital Geological Maps to Build Deeper Understanding of Earth Science Relationships (Posters)
Pardee Keynote Symposia -

**P1 Early Paleoproterozoic (2.5–2.0 Ga) Events and Rates: Bridging Field Studies and Models**

**P2 Geoinformatics and the Role of Cyberinfrastructure in Geosciences Research**
Randy Keller, University of Texas, El Paso, Texas; Lee Allison, Kansas Geological Survey, Lawrence, Kansas

GSA-Sponsored Short Courses

Introduction to Geographic Information Systems (GIS), Using ArcGIS9 for Geological Applications

Multi-Temporal Stereo Aerial Photography

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**RESOURCE BIN**

* Scott Wilkerson (DePauw University) has written ‘DETACH’ an Excel spreadsheet (Mac or PC) that allows the user to construct detachment folds formed by different amplification mechanisms (as described by Poblet and McClay, 1996).

  The software is available free at [http://www.depauw.edu/acad/geosciences/mswilke.asp](http://www.depauw.edu/acad/geosciences/mswilke.asp).

  European users see [http://www.geol.uniovi.es/Investigacion/OFAG/Foldteam.html#Software](http://www.geol.uniovi.es/Investigacion/OFAG/Foldteam.html#Software).

* 2D Fault-related fold modeling software: Rick Almendinger's kinematic modeling program, FaultFold, can now be downloaded directly from the Cornell web site in either Macintosh or Windows flavors. This program allows one to make forward models of fault-bend folds, similar folding over multi-bend faults, and trishear fault propagation folds. One can have up to 30 faults in a section, and the program will model both normal and reverse faults. Additionally the program enables grid search "inverse" trishear modeling of real structures. The Macintosh OS X version has two types of grid searches: (a) a key bed search where the geometry of one bed is well known, and (b) a fit to profile (by Néstor Cardozo) where by a transect of bedding dips and stratigraphic contacts, combined with known stratigraphic thicknesses, can be best fit to a trishear model. The Windows version of the program has the same functionality as the Mac version except that it does not yet include the fit-to-profile grid search. See animations made using the program and/or download a copy for non-commercial users at [http://www.geo.cornell.edu/RWA/trishear/default.html](http://www.geo.cornell.edu/RWA/trishear/default.html).

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Dr. James P. McCalpin, Dr. Jim Evans and Dr. Susanne Janecke (Utah State University) will be offering their acclaimed short course "Field methods in neotectonics and paleoseismology" for 3 grad credits from Utah State. The field course features trench analysis across active faults and will be June 7-19 in southern Colorado. Cost varies with housing arrangements, and ranges from $700 (no credit, camping-out) to $1,880 (full credit, motel). Information is available at [http://www.geohaz.com/04curric.htm](http://www.geohaz.com/04curric.htm). The pre-registration deadline is April 28.
High-strain zones: From structural analysis and theoretical modeling to tectonic and economic significance


This session (SS05) is a tripartite oral session. The first session (early morning) consists of three talks on kinematic aspects of high-strain-zone evolution and will start with a keynote lecture by P.F. Williams (University of New Brunswick). He will offer a general definition of *high-strain zone*, and speak about outstanding problems in explaining the evolution of common structural features within high-strain zones.

The second session (late morning) will start with a keynote lecture by P-Y. F. Robin (University of Toronto), who will take a critical look at widely used methodology for reconstructing the kinematic path of ductilely deformed rocks. This lecture is followed by three talks on common S/Z structures, superimposed folds, and other deformation features in high-strain zones.

The third session (afternoon) consists of six talks ranging from the tectonic significance of specific major high-strain zones to the analysis of their absolute age and including talks on the Cabot Fault Zone in Newfoundland and the South Range Shear Zone transecting the Sudbury Basin. The closing talk will concern the connection between transpressive deformation and gold mineralization in an Archean greenstone belt of northern Ontario.

**SGT Division Members,**

We would like to invite SGT members who work on any aspect of flat-slab subduction to present their work at the 32nd International Geological Congress in Florence, Italy, August 20-28, 2004. The second circular is available online at the Congress website: <http://www.32igc.org>.

The symposium G 05-10 entitled "Flat Subduction in the Andes and Related Orogenic Systems.” The symposium is sponsored by the ICL /ILP Andean Subcommittee. Organizers are Brendan McNulty, California State University - Dominguez Hills, USA <bmc@ceo.com>, and Victor A. Ramos, University of Buenos Aires, Argentina <andes@gl.fcen.uba.ar>.

The symposium will encompass the following topics:

~ Origin and oceanic control in flat subduction
~ Thermal controls in upper and lower plates
~ Present and past flat subduction
~ Tectonic and magmatic effects on the upper plate

**2003 FOG Field Trip Report**

The 2003 FOG (Friends of the Grenville/Amis du Grenville) Field Trip was held October 3-5 in the Tweed-Kaladar area in southern Ontario, where the southwestern Grenville Province descends beneath Paleozoic cover rocks. The focus of the trip was the southernmost part of the Composite Arc Belt, with its NE-SW elongate plutonic bodies and narrow intervening belts of folded metastratified rocks.

This trip highlighted several issues that need to be addressed in order to understand the possible linkages between pluton emplacement, transpressive deformation and related shearing. Of particular structural interest was the shape of the Addington granite and other intrusives and the nature of their contacts. The Addington
granite is an alaskitic to granodioritic body over 100 km long (paralleling the NE-strike of all units) but only several km wide. It is commonly lineated (subhorizontal through most of the body) and largely lacks feldspar porphyroclasts. The leaders provided evidence suggesting the Addington and other plutonic bodies were emplaced as sheets, so extreme flattening and elongation are not required to produce the observed map patterns.

The contact zone of the Addington granite was examined along the northwestern margin of the body. Along Highway 7 we examined an intrusive contact where a fine-grained, dark, probably dioritic border phase and underlying metasedimentary schist hostted felsic injections (presumably from the Addington granite), all of which had been subjected to strong vertical flattening. These rocks are in sharp tectonic contact with a strongly sheared granitic rock displaying feldspar porphyroclasts and local ultramylonitic zones, which then passed further southward into the Addington body proper. Carbonate-bearing metasedimentary rocks crop out immediately to the north of this contact zone, but their contact is not exposed.

The contact zone between another deformed intrusive, the Northbrook pluton, and inferred conglomerate was visited along a roughly km-long transect north of Kaladar. Interpretation of these rocks proved controversial. Here tonalite of the Northbrook pluton has been variably hydrothermally altered (epidote and calc-silicate alteration). The ‘basal’ part of the layered (metastratified?) rocks close to the contact contains horizons with clasts of tonalite to granite ranging from several cm to several 10’s of cm in size, and rarer fine-grained dark clasts rich in epidote, amphibole or clinopyroxene. Extensional fractures across the fabric of the ‘conglomerate’ are filled with K-feldspar. The clasts have been interpreted in some previous studies as marking a conglomerate horizon. However, several participants noted that the clasts are contained within what appears to be a zone of strongly sheared and hydrothermally altered tonalite of the marginal zone, suggesting that this clast-bearing zone marks a tectonic contact between the Northbrook pluton and the metastratified rocks. To these participants the shearing allowed access to fluids, which resulted in the epidotic alteration of the sheared matrix, an ensuing significant reduction in strength, and the isolation of little-deformed tonalite clasts within a sheared, heavily altered matrix. This interpretation would also explain the presence of rare fine grained epidote-rich clasts.

This find provided an exciting opportunity to discuss the importance of the fundamental research topic of Reaction Softening and the more applied topic of the interplay between hydrothermal activity, shear zones and potential mineral deposits. Though such reassessments are the daily bread of government geologists tackling the study of the Grenville Province, it gave participants and especially the numerous student attendees a superb case-example to reflect on how limited our knowledge often is, how great the need for new field-based research is, and how the results of such research could serve to support the sustainable development of regional, rural and isolated communities in the Grenville Province and metamorphic terranes in general. The fact that research conducted by Friends of the Grenville may make a difference in communities was reflected by the dinner sponsored by the Southern Ontario Regional Resident Geologist Office (Ministry of Northern Development and Mines) and the Southern Ontario Prospectors Association (SOPA).

The trip was enthusiastically led by Fried Schwerdtner and Pierre-Yves Robin of the University of Toronto and students John Burke, Matt Downey and Guido Serafini. Sharyn Alexander who could not attend also contributed to the trip preparation. Approximately 60 geologists from both sides of the international border participated, including professional geologists (academic, government and industrial) and a lively group of students.

Next fall’s FOG trip will be in the Saguenay region of Québec, led by Claude Hébert of the Ministère des Ressources naturelles de la Faune et des Parcs, Québec. The 1506 Ma and 1393-1383 Ma magmatic episodes recorded in the basement of the huge 1160-1140 Ma Lac-St-Jean Anorthosite Suite (20,000 km²) provide key evidence for the extension of the Pinwarian magmatic arc of Labrador into the central Grenville Province. Younger magmatic episodes are documented by intrusions with ages of 1082-1067 Ma, 1045 Ma, and 1020 Ma. The field trip will focus on structural events and on relationship between almost all of the six magmatic episodes and regional structures.

- L. L. Peter Gromet (Brown University) and Louise Corriveau (Commission géologique du Canada)
Additional Meetings:
For a listing of Earth Science related meetings, see <http://www.agiweb.org/calendar/index.html>.

April 14-20, 2004. 5th International Symposium on Eastern Mediterranean Geology, Thessaloniki, Greece. Information: 5th ISEMG, c/o Prof. Spyros Pavlides, Department of Geology, Aristotle University, GR-54124, Thessaloniki, Greece; phone +30 (231) 099.84.94, fax +30 (231) 099.84.82; <ac@geo.auth.gr>.

April 18-21, 2004. AAPG Annual Convention, Dallas, TX. Information: AAPG Convention Dept., PO Box 979, Tulsa, OK, 74101-0979, USA, (888) 945-2274 (USA and Canada only) or (918) 560-2679, fax (918) 560-2684.


September 19-25, 2004. Eurogranites 2004 Field Meeting: The Galway and Leinster Granites in Ireland. Contact: Pádraig Kennan, Geology Dept, University College Dublin, Dublin 4, Ireland, <pkennan@iol.ie> or John Reavy, Geology Dept, University College Cork, Cork, Ireland, <j.reavy@ucc.ie>.

October 24-27, 2004. AAPG International Conference & Exhibition, Cancun, MX. Info: Convention Dept, PO Box 979, Tulsa, OK, 74101 USA; (888) 945-2274 (USA/Canada) or (918) 560-2679, fax (918) 560-2684.
Greetings again from the High Plains. A lot of Division news and information is posted on the SG&T website at <http://rock.geosociety.org/sgt/index.html> by our Division web manager, Kevin Smart <ksmart@swri.edu>. Please help him continue to update and streamline the Division web page by checking in often and sending him your suggestions. And please continue to send your news and information to Barb S. <barb@sheffels@aol.com> or myself <bjohn@uwyo.edu> to share with the rest of the Division, as it’s a good way to communicate with a large group of interested people. Here’s the latest news …

Timothy (Tim) F. Wawrzyniec has moved to the University of New Mexico as a Senior Research Scientist for the Paleomagnetism Laboratory at the University of New Mexico. Speaking of New Mexico, former Division Chair Laurel Goodwin has moved north to the University of Wisconsin – Madison. In addition, Colin Shaw (PhD with Karl Karlstrom), headed that way as well, to the University of Wisconsin – Eau Clare.

There seems to be some sort of shift east (and south) these days. Nicholas (Nick) W. Hayman finished his PhD at the University of Washington (Darrel Cowan), and has started a post-doc at Duke with Jeff Kars. He is investigating fault rocks from lavas and sheeted dikes from fast-spread ocean crust and the influence on microstructures and fluid interactions. Dave Barbeau (PhD, 2003, University of Arizona with Peter DeCelles) has joined the Department of Geological Sciences at the University of South Carolina, and Tom Kalakay (PhD, University of Wyoming) is now resident at Vanderbilt University. Phil Resor (PhD, 2003, Dave Pollard, Stanford) headed out to Wesleyan University (Middleton, CT), and Tim Schroeder (PhD, 2003, University of Wyoming, Barbara John) finally left the Rockies and is at Eastern Connecticut State College. And finally, even farther east, Zoe Shipton, currently at Trinity College, Dublin, will be moving to Glasgow University Earth Sciences to take up a lectureship this April. Congratulations to all.

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