Colorado Scientific Society

The objective of the Society is to promote the knowledge and understanding of Earth Science, and its application to human needs

S.F. Emmons Lecture

"Interactions of climate and tectonics on orogenesis"

Douglas W. Burbank
Pennsylvania State University

Thursday, January 20, 2000

Green Center, Colorado School of Mines
Golden, Colorado

Social Half-hour: 7:30 p.m.
Meeting Time: 8:00 p.m.

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S.F. Emmons Lecture Abstract

INTERACTIONS OF CLIMATE AND TECTONICS IN OROGENESIS

Douglas W. Burbank
Pennsylvania State University

Recent geodynamic models that incorporate erosion at the earth's surface have yielded a provocative hypothesis: climatically modulated erosion exerts a strong control on where strain occurs within collisional mountain belts. In particular, these models predict that deformation will be greatest where erosion is most intense. In order to assess this hypothesis, numerous data sets must be assembled, including the spatial and temporal variations in erosion rates, deformation rates, and climate across an orogen. In this talk, I discuss different approaches that can be used to calibrate the interaction between climate, erosion, and tectonics. I move from local examples of the dissection of growing folds, to the erosion and deformation of the Himalaya. In the northwestern Himalaya, I use a geomorphic perspective to illustrate how rates of river incision into bedrock, widespread bedrock landsliding, and glacial erosion interact within this landscape of immense topographic relief. In this region, it appears that deformation and erosion rates are closely coupled: the highest strain occurs where erosion is also highest. The balance between rock uplift and erosion suggest that the mountains could be in a long-term steady state. Perhaps surprisingly, the topography appears at least partially decoupled from spatial variations in tectonic rates. Instead, the topography is more closely tied to regional climatic variations and the distribution of glacial snowlines.

Message from the new President: Mark Hudson

A greeting to you as the Colorado Scientific Society enters the new year and its 3rd century (I will resist that urge to make a Y2K crack). As an incoming president I think this a useful point to review some major functions of our Society.

1. Organization of monthly speaker program to allow members to learn about and discuss a variety of scientific topics.
2. Publication of a monthly newsletter and maintenance of a web site to allow communication among our members and to the outside community.
3. Organization of spring and fall field trips to view first hand the geology that helps define Colorado and its neighboring regions.
4. Support for earth science research through grants to graduate students and by organization of a student-night talk competition.
5. Support for science education through involvement in the state science fair and by sponsorship of student field-trip grants.
6. Providing an environment in which scientists from different academic, industrial, and government backgrounds may meet and interact.

Clearly the Society provides a valuable service to its members and to the larger scientific community. Lets start working on the next 100 years!

-Mark R. Hudson

An Opportunity for Service

The newsletter is a key tie that informs and binds Colorado Scientific Society members together. Volunteers are needed to assist in the monthly reproduction of the newsletter at the U.S. Geological Survey facilities in the Denver Federal Center. Please contact our publicity chairman Dave Moore [303-236-1271, dmoore@usgs.gov] if you would be willing to volunteer a couple of hours to assist with the newsletter. Remember that many hands make light work.

Meeting Time Change

Mark your calendars! For 2000, the meeting of the Colorado Scientific Society will change to the 3rd Thursday of the month.

February Presentation by John Reiss

Next month's presentation, on February 17, will be given by John Reiss, president of the John Reiss, Jr. and Associates, Inc, environmental and geotechnical engineering consulting firm. John is also an amateur astronomer, and the JPL-NASA Ambassador for Colorado. John's talk "Jupiter's Satellite Io: The Volcanic Moon" will cover the details of the latest discoveries on Io by the Galileo spacecraft, the Hubble telescope and other earth-based telescopes. Io, Jupiter's third largest moon, is the most volcanically active body of the solar system. Slides for the talk are a remarkable set provided by NASA scientists.

CSS Newsletter via email

Approximately 100 CSS members have chosen to receive the CSS Newsletter via email, beginning this month. This results in 25% less paper copies to be folded, stapled, and stamped. Hopefully, the results will save paper, time, stamps, and energy.

Memorial Fund Money Well Spent

The following letter and abstract are from Trista Thornberry. She was awarded a $675 Student Research Grant in May of 1999 from the Tweto Memorial Fund. I think you will all agree that this was money "well spent," and it demonstrates the usefulness of the CSS Memorial Funds Program.
-Michael Machette, Treasurer.

December 15, 1999
Earth Resources Department
Colorado State University

To The Colorado Scientific Society,

In the spring of 1999, your organization was generous enough to allocate funding for work I undertook in the Homestake shear zone in central Colorado. Thanks to your support, results of this work will be presented in March/April, 2000 at a fault reactivation conference in London and the Rocky Mountain Region meeting of the Geological Society of America in Missoula.

Your funding contributed to paying for maps, camping fees, food, gas expenses, thin sections, laboratory usage fees and equipment throughout the summer 1999 field season and the fall 1999 laboratory work. Without your support this project would not have been possible. Thank you very much.

Printed below is a copy of the abstract submitted for the March 2000, conference in London. A GSA abstract on the same topic is in preparation at this time.

Signed, Trista Thornberry

Multiple Reactivation of the Homestake Shear Zone, Colorado
Trista Thomberry
Department of Earth Resources,
Colorado State University

The Homestake Shear Zone, located in the central Sawatch Range, Colorado, is a basement fault that, subsequent to early Proterozoic mid-crustal ductile shearing, has experienced multiple phases of brittle reactivation including strike-slip and dip-slip movements since the mid-late Proterozoic. Evidence for this is a wide variety of fault-rock types in overprinting generations and parallelism of ductile shear strands and brittle faults. The strikes and trends of features such as gneissic and migmatitic foliation, mylonitic foliation, cataclasite and breccia veins associated with brittle faults and shear fracture surfaces found in the central branch of the Homestake Shear Zone are all aligned in an average N 6O° E orientation.

Lineation directions collected from mineral fabrics along nearly vertical cataclasite veins are subparallel,

indicating lateral movement. Microstructurally, oriented samples with mica fish from cataclasites and mylonites indicate both dextral and sinistral shear senses. Slickenline orientations from Laramide-age shear fractures indicate both sinistral strike-slip movement and high-angle dip-slip movement. These different slip senses indicate different stress regimes, but their parallel nature points to a fundamental weakness inherent to the Homestake Shear Zone.

Fault-weakening mechanisms such as grain refinement deformation mechanism change, fabric softening, and reaction softening have all played a role in strain localization in the case of the Homestake Shear Zone. The formation of mylonites, cataclasites, and breccias from gneisses involves a series of deformation mechanism changes resulting in overall grain size reduction and weakening. The highly deformed zones are intimately associated with a high concentration of phyllosilicate minerals. Metamorphic fluids permeating the shear zone during earlier movements altered host rock mineralogies (biotite gneisses and migmatites) to chlorite, sericite, talc, and other fluidized minerals. This fluid rich mineralogy concentrated in narrow bands creates a profound weakness in the shear zone and this in turn is more likely to yield when a stress is applied.

Rivers: The Song of Life Exhibition

Foothills Art Center, 809 15th St., Golden will present a major exhibition:

RIVERS: THE SONG OF LIFE

January 15, to March 12, 2000

Five interrelated exhibits will celebrate the beauty and historical significance of rivers of the world, including displays on scientific and historical aspects; the art of fishing; photography of rivers and river life since the 19th century; and paintings and sculptures by 18 top artists from Colorado and throughout the U.S. Admission is free. Hours are 10 am – 5 pm Monday-Saturday: 1-5 pm Sunday.

Contact Carol Dickinson, Director for more information (303-279-3922) or fac@foothillsartcenter.org.

Slide-Talks associated with this exhibition, and co-sponsored by the Colorado School of Mines take place at 7:00 pm, Green Center, CSM, and are free:

Tuesday, January 18 **John Fielder** presents *Colorado 1870-2000,* followed by reception and book signing at Foothills Art Center

Tuesday, February 1 **Charly Heavenrich,** a Colorado river guide, presents *Dancing on the Edge,* followed by reception and book signing at Foothills Art Center

Monday, February 21, at 12 noon **Bob Weimer,** Emeritus Professor of Geology, Colorado School of Mines presents *Rivers: Types, Exploration, Trade* This is a brown bag lunch talk, bring your lunch – cookies and coffee provided.

Earth Science Meetings and Talks

Colorado Scientific Society's regular meetings are held the 1st Wednesday of the month (unless otherwise advertised). Social time begins at 7:00 p.m. and presentations start at 7:30 p.m. For information, contact Mark Hudson at (303) 236-7446 or mhudson@usgs.gov.

Denver International Petroleum Society (DIPS) meets the 2nd Friday of each month at the Wynkoop Brewing Co., 18th and Wynkoop Streets. Reception begins at 11:30 a.m., luncheon at 12 p.m., program at 12:30 p.m. Make reservations (required) by leaving message at (303) 623-5396. Reservations accepted after 8 a.m. on Friday until 10:30 a.m. on Wednesday prior to the meeting. Cancellations accepted until 11:00 am Wednesday prior to the meeting. Cost: $15 for lunches; talk only is available for $2 (make checks payable to "D.I.P.S."). Contact Keith Murray at (303) 986-8554 for information.

Denver Region Exploration Geologists' Society (DREGS) meets in the Mutual Consolidated Water Building, 12700 West 27th Avenue, Lakewood. Social hour 6:00-7:00 p.m. Technical presentation at 7:00 p.m. Meetings are normally scheduled for the first Monday of each month. For information contact Jim Piper, (303) 932-0134, or the website http://www.dregs.org .

Colorado School of Mines Lectures For Heiland Lectures at 4:00 p.m. on Fridays, contact Michelle Szobody (303) 273-3451. For information on Van Tuyl Lectures, call the Dept. of Geology at (303) 273-3800.

Colorado State University Geology Lectures Mondays, 4:10 p.m. in room 109 or 316 of the Natural Resources Building. Call the Dept. of Earth Resources at (970) 491-5661 for further details.

University of Colorado at Boulder, Geological Sciences Colloquium
Wednesdays, 4:00-5:30 p.m., Rm. 180. For schedule, contact Kathy Madsen 303-492-8141.

U. S. Geological Survey, Geologic Division Colloquium
January 20: Mark Meier: "Global Warming and Sea Level Rise"
January 27: Ian Ridley: "What's cookin' in the laser ICP-MS lab? An introduction to a trace element microprobe."
Bldg 20, Denver Federal Center, Thursdays, 1:30-2:30 p.m., Foord Conference Room.
For a more complete schedule, contact Margaret Hiza: (303) 236-0075.

Museums

Friends of Dinosaur Ridge For information call 697-DINO. Visitors' Center is located at 16831 West Alameda Parkway (north side of Alameda, just west of the C-470 overpass). Open 9 a.m. to 4 p.m. weekdays and weekends. Fireside chats are held at the Red Rocks Elementary School Cafe, in Morrison starting at 7 p.m.

COLORADO SCIENTIFIC SOCIETY
2000 DUES AND MEMORIAL FUND CONTRIBUTIONS

(Last Name) (First Name) (Initial) (Telephone)

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❑ *I WOULD LIKE TO RECEIVE THE NEWSLETTER BY EMAIL AS A PDF FILE (IN LIEU OF A PAPER COPY) AND SAVE THE SOCIETY TIME, MONEY, AND A FEW TREES.*

***DUES*:** Dues are for the calendar year and help support the monthly meetings and newsletter, field trips, family night, student night, and the annual Emmons Lecture.

Regular Members ($15) ..... _____

Corresponding Members ($10)..... _

Student Members ($5) ..... _____

MEMORIAL FUNDS: Supports earth-science research grants to graduate students. If not specified as to the fund, contribution will be distributed equally**:**

(A) Ogden Tweto Memorial Fund ..... _____

(B) Steven Oriel Memorial Fund ..... _____

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(E) George Synder Memorial Fund ..... _____

This contribution in memory of _____

***ENDOWMENT FUND*:** Funds are used to support the Society's operations and special activities:..... _____

TOTAL CONTRIBUTION (DUES AND FUNDS): ..... _____

Please make your dues and/or contribution checks payable to the Colorado Scientific Society and specify the Fund(s) to which you are contributing.

All Colorado Scientific Society activities depend on volunteer help. Please mark those activities that you can help with. We will pass your name on to the appropriate Committee Chairperson.

Audio Visual Fund Raising Newsletter Science Fair
Geologic Signs History Sci. Program Student Night
Field Trips Membership Publicity Website

Send this form & your check to: Colorado Scientific Society
P.O. Box 150495
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