



Colorado Scientific Society

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

May Presentations:

“Geological Evolution of Tobago, West Indies”

Art Snoke

University of Wyoming, Department of Geology and Geophysics

And

“The self-destructive nature of mid-latitude Andean volcanoes- and one attempt at stratigraphic reconstruction”

Ren A. Thompson

U.S. Geological Survey

Thursday, May 18, 2000

American Mountaineering Center

**710 10th Street (NE corner with Washington)
Golden, Colorado**

Social Half-hour: 7:00 p.m.

Meeting Time: 7:30 p.m.



President's Note

Is it May already? That means our next meeting of the Colorado Scientific Society will be the final session before the summer break. Let's see if we can match the 200+ April audience that attended the two outstanding talks by Lang Farmer and Peter Lipman. I know Ren Thompson and Art Snoke will also have great talks. Special thanks go to Peter who traveled from California last month for his presentation.

Don't forget to sign up for the upcoming 1-day Spring field trip to the Boulder area on June 10th. Sherman Marsh has again scheduled a fun trip to be led by Bill Atkinson. Look for more details and a sign-up form elsewhere in the newsletter.

Society activities will begin again in September with the annual Family Night. Robert Weimer has graciously agreed to give his talk "Rivers: Types, Exploration, Trade" that received accolades at the Foothills Art Center. Also, late September is the time for a tentatively planned 3-day Fall field trip to fossil fish localities in Kemmerer, Wyoming.

Finally, I would like to thank Chuck Pillmore and Eric Nelson for their ongoing service to the Society. When past-president Ken Pierce had to leave for Montana in February, Chuck ably stepped in to fill the chairmanship of the Memorial Funds committee. Distribution of Memorial Funds research grants is a major service of our Society to the general science community and Chuck has led this activity well. Eric Nelson has once again proven his talent for putting together a great speaker program for the Society and we wish him well as he heads off for a sabbatical in New Zealand.

-Mark R. Hudson, CSS President



Geological Evolution of Tobago, West Indies

Abstract of Presentation by Arthur W. Snoke:

Tobago, West Indies, is a basement high that forms part of the northeasternmost corner of the present-day South American continental shelf. The pre-Cenozoic history of Tobago indicates that it has affinities with a Cretaceous oceanic-arc system, and it is part of an allochthonous terrane (Tobago terrane) that occurs along the South American-Caribbean plate-boundary zone. Mesozoic oceanic-arc crust is exposed on Tobago and can be conveniently divided into three east-west-striking lithologic belts that transect the island: North Coast Schist (NCS), ultramafic to tonalitic plutonic suite, and Tobago Volcanic Group (TVG). A mafic dike swarm widely intruded the plutonic suite and TVG, whereas only scattered premetamorphic and post-metamorphic dikes occur in the NCS belt. The plutonic-volcanic-dike complex is Albian based on paleontological and radiometric age data.

Detailed geologic mapping indicates that the NCS was wall rock for the plutonic suite. A selvage of amphibolitic rocks (<300 m structural thickness) forms a mappable belt between the subjacent NCS and superjacent ultramafic rocks of the plutonic suite. Metamorphic grade in this amphibolite-facies aureole decreases with increasing structural depth, thereby exhibiting an inverted metamorphic gradient. The greenschist-grade penetrative foliation of NCS rocks, commonly containing a plunging, low-angle, west-southwest-east-northeast stretching lineation, is overprinted by a dynamothermal foliation with a down-dip hornblende mineral lineation, related to the emplacement of the ultramafic rocks. Scattered kinematic indicators yield a consistent sense-of-shear that is down-the-plunge of the lineation (i.e., normal sense in present orientation). These data coupled with evidence of mechanical mixing (e.g., dunite-clinopyroxenite breccia) within the ultramafic rocks suggest a history of subsidence of the ultramafic mass late in its crystallization history. This foundering of dense cumulate rocks may be related to intra-arc spreading.

A brittle, normal fault system (Central Tobago fault system) is interpreted as a younger, upper crustal manifestation of the same extensional regime that led to plutonic foundering and development of a normal-sense, amphibolite-facies shear zone along the contact between the ultramafic rocks and rocks of the NCS. Even younger, north-northwest-striking, oblique-slip faults transect the normal fault system. The Southern Tobago fault system is a buried fault system at the southwestern end of the island that has been documented through offshore seismic-reflection profiles and on-shore borehole data.

Arthur W. Snoke
Department of Geology and Geophysics
University of Wyoming
Laramie, WY 82071-3006, U.S.A.
Office: (307) 766-5457
Fax: (307) 766-6679
e-mail: snoke@uwo.edu
<http://home.gg.uwo.edu/faculty/snoke.htm>



The self-destructive nature of middle-latitude Andean volcanoes and one attempt at stratigraphic reconstruction

Abstract for presentation by Ren A. Thompson

The Tatara-San Pedro Complex is a large frontal arc volcanic center of the Andean Southern Volcanic Zone, dissected on all flanks by glacial valleys exposing the eruptive products of seven edifices ranging in age from 930 ka to Holocene. Deposits older than 200 ka are remnants of spatially overlapping volcanoes reduced in volume and aerial extent by glaciation and sector collapse. Preserved remnants represent only 10-50% of eruptive volumes, based on estimates of original edifice geometry, and generally record short eruptive episodes relative to intervening lacunae. The internal stratigraphy of several of these edifices has been reconstructed on the basis of geochemical data from 650 samples collected mainly in 25 canyon wall sections and accompanying geochronologic and paleomagnetic data for a subset of these sampled lavas. Digital photogrammetric projections of canyon wall stratigraphy portray geometries of erosion surfaces in far greater detail and more accurately than conventional field mapping would permit due to inaccessibility of steep canyon walls. Combined with detailed photogrammetric and field mapping, three-dimensional correlation of flow stratigraphy and delineation of major erosion surfaces is possible. The resulting composite stratigraphy is far more complete than the records present in any single section due to the eccentric distributions of the products of consecutive eruptive events and the effects of erosion and extensive glaciation. Many stratigraphic successions record complex temporal variations lacking in evidence for long- or short-term progressive differentiation, and many preserve evidence for variable parent magma compositions. The resulting constraints on petrologic models are far different than they would be if apparently co-magmatic lavas were assumed to reflect single-stage differentiation.

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.



Spring-Summer Field Trip- June 10, 2000

Our Spring-Summer field trip will leave from the Cold Spring Park-n-Ride at 7:30 AM on Saturday, June 10. We will drive along Highway 93 to Boulder where we will pick up our leader, Dr. William Atkinson. Bill is an economic geology professor at CU and will be taking us to several mineral deposits in the Boulder area, and later in the afternoon will give us a tour of the new geology building. We will, of course, have our usual sumptuous lunch!!!

For our first stop we will go up Mapleton Ave., which turns into Sunshine Dr. as it enters the mountains. The road goes up Sunshine Canyon to an overlook of the Gold Hill Mining District. Here we will stop for coffee and donuts and look at maps and the guidebook. The next stop will be the Snowbound Mine where we will visit the old surface plant. It is an old, original 1870's building with one of the few remaining steam hoists. Old tools, and an old original timbered shaft inside the building. Then, we continue up Lefthand Canyon to a bostonite dike on the south side, with a spectacular view of the continental divide. The dike resembles the rocks at Henderson, Climax, and Central City. It may represent the stock that is the source of ores for the area.

Our next stop is Horsefal Flat, where we will have lunch. This is the original site of the town of Gold Hill, that blew away around 1868, after being established for nearly one year. The Gold Hill district was discovered here, at the Horsefal vein, which was explored by numerous pits along the south side of the flat. It is possible to collect pieces of the vein material here. It is a nice lunch spot, with picnic tables, space for the vans, and rocks to cling to, in order to avoid being blown away by the nearly continuous winds. The site was proposed as a location for the first Colorado wind farm, potentially supplying power to Boulder, Longmont, Lafayette, Louisville, Arvada and Lakewood, for approximately 750,000 people.

After lunch we will continue to the Emmett Mine above Jamestown. A flourite-bearing breccia pipe associated with the Porphyry Mountain stock. It is a dramatic example of magmatic water leaving an intrusion, accompanied by collapse of the overlying rock, which is subsequently mineralized. From here, we will walk 100 yards to an overlook of the old Burlington flourite mine, which has been reclaimed and covered. Next, we will go to the top of Porphyry Mountain where there is an exposure of the igneous rocks responsible for the porphyry molybdenum deposit at depth, the flourite deposits, some Pb-Zn-Ag veins, and Au-telluride veins of this district. Time permitting, we will stop at the Golden age mine dump. This was an old Au-pyrite vein mine dump where it is possible to find vein pieces.



On our return to Boulder, with pockets full of rocks, Bill will take us on a tour of the CU Geology Department.

If one or more vans would like to have dinner on the mall, we can arrange for that as well, and get back a little later. I have reserved three vans, so we can take 40 people. The cost will be \$35 for the day, which includes transportation, morning coffee break, lunch, afternoon break, and beverages. We have some brand new radios with external speakers for each van, so communication should be greatly improved. Please fill out the form below, and send it to me via email, snail mail, Fax, or whatever. It's never too late to reserve your space.

Sherm Marsh, Field Trip Chairman
Email: spmarsh@earthlink.net
Phone: (303) 986-0939
Fax (303) 986-5433
8384 W. Iliff Ave.
Lakewood, CO 80227

Yes, I will be attending the Colorado Scientific Society field trip on Saturday, June 10!

Name _____

Phone: _____

Enclosed is my check for \$35.00 _____



Research Grants Awarded for 2000

The Colorado Scientific Society Memorial Funds Committee, consisting of Chuck Pillmore, (Chair), Bob Fleming (2000-2001), Scott Lundstrom (2000-2001), Jack Reed (1999-2000) and Chuck Robinson (1999-2000) met April 26, 1999 to evaluate student research proposals. Proposals from 32 Ph.D. and M.S. candidates from various universities throughout the United States were submitted. The total of 32 for 2000 was a significant decrease from last year's 45 proposals.

Twelve awards totaling \$9,610 were awarded from the Tweto, Oriel, Eckel, Snyder and Pierce Funds. These included: four awards from the Tweto Fund for research in the central and southern Rocky Mountains; three awards from the Oriel Fund for research in structural geology in the northern Rocky Mountains; two awards from the Eckel Fund for research in engineering geology; one award from the Pierce Fund for research on the Heart Mountain detachment; and two awards from the Snyder Fund for Precambrian research in the Rocky Mountains. We are confident that these 12 funded research grants are of the highest quality and fulfill the intentions of the many donors to the Colorado Scientific Society Memorial Funds.

Ogden Tweto Memorial Fund

Jake Armour- \$600, M.S., University of New Mexico, "Existence and potential controls on a Late Holocene (neoglacial) advance in the southern Sangre de Cristo Mountains, New Mexico"

Timothy Farnham- \$500, M.S., University of Colorado at Boulder, "Geochemical and sedimentological variability of a paleosol sequence at the Paleocene---Eocene transition in the Denver Basin"

Annie McCoy- \$710, M.S., University of New Mexico, "Deciphering the tectonic history and importance of the Colorado Mineral Belt"

Margaret E. McMillan, - \$900, Ph.D. University of Wyoming, "Late Cenozoic exhumation of the central Rocky Mountains" (second year funding)

Steven S. Oriel Memorial Fund

Amanda DiUlio, - \$900, M.S., Colorado State University, "Regional thrust kinematics in west-central Wyoming and the origin of Jonah Field"

Shelley Judge- \$1,000, Ph.D., Ohio State University, "Structural analysis of the Wasatch Monocline, central Utah" (second year funding)

Malka Machlus- \$1,000, Ph.D. , Columbia University, New York, "Orbital forcing of Eocene climate---a field study of the Green River Formation, the Green River Basin, Wyoming"

Edwin B. Eckel Memorial Fund



Melissa Crane- \$900, M.S., University of Colorado at Denver, "A geographic information systems analysis of rockfall hazards in Clear Creek Canyon, Colorado".

Cal Ruleman- \$650, M.S., Montana State University, "Late Quaternary slip rates on range-bounding normal faults, North Arm of the Yellowstone Tectonic Parabola, Southwest Montana"

Bill Pierce-Heart Mountain Memorial Fund

Thomas A. Douglas- \$1,200, Ph.D., Dartmouth College, Hanover, New Hampshire, "Mineralization at the New World, Horseshoe, and Sunlight mines, Montana: relating hydrothermal fluids with Heart Mountain faulting"

George Snyder Memorial Fund

Stephen T. Allard- \$650, Ph.D., University of Wyoming, "Mid-crustal response to Proterozoic arc-continent collision, central Laramie Mountains, southeastern Wyoming"

Benjamin Fruchey- \$600, M.S., University of Wyoming, "Constraints on the Archean Evolution of the Wyoming craton: U/Pb geochronological and structural study of the Rattlesnake Hills, central Wyoming"

Enjoy the Summer

Thursday May 18, 2000 will be the last CSS meeting until September. Don't forget to come in September to the CSS Family night, to enjoy the presentation by Robert Weimer, entitled "Rivers: Types, Exploration, Trade," a talk that received accolades at the Foothills Art Center. (Additional CSS talks are already scheduled for October, and will include "Groundwater vulnerability to agricultural contamination in Colorado and the High Plains" by John McCray, Stephanie Schlosser, and Joseph McCarthy, Colorado School of Mines, and "Molecular-Scale Insight to Natural Clean-up of Contaminated Water" by Kathryn Nagy.)

Earth Science Meetings and Talks



Colorado Scientific Society's regular meetings are held the third Thursday 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

May 25 Ray Watts: "Mapping incision style upland erosion using digital elevation models"

June 1 Walt Dean: "The sun and climate"

Bldg 20, Denver Federal Center, Thursdays, 1:30-2:30 p.m., Foord Conference Room.
For a more information contact Margaret Hiza: (303) 236-0075.



Colorado Scientific Society Officers, Councilors, and Chairpersons

OFFICERS

President: Mark Hudson, USGS, 236-7446
President-Elect: Michele Tuttle, USGS, 236-1944
Treasurer: Michael N. Machette, USGS, 273-8612
Secretary: Stephen F. Personius, USGS, 273-8611
Past President: Ken Pierce, USGS, 236-1244

COUNCILORS

1998-2000: Eric Nelson, CSM, 273-3811
1998-2000: Parker Calkin, CU, 442-2184
1999-2001: Emmett Evanoff, CU, 492-8069
1999-2001: Steve Sonnenberg, 839-3012
2000-2002: Paul Welmer, CU, 492-3809
2000-2002: Scott Lundstrom, USGS, 236-7944

COMMITTEE CHAIRPERSONS

Database Manager:
Best Paper Award:
Field Trips:
History:
Membership:
Memorial Funds:
Memorial Funds Treasurer:
Newsletter Editor:
Program:
Publicity:
Webmaster:
Graphics:

Robert C. Bucknam, USGS, 273-8566
Karl Kellogg, USGS, 236-1305
Sherm Marsh, (303) 986-0939
Marjorie E. MacLachlan, USGS-retired, 986-7192
Jim Yount, USGS, 236-5397
Ken Pierce, USGS, 236-1244
Michael N. Machette, USGS, 273-8612
Margaret Hiza, USGS, 236-0075
Eric Nelson, CSM, 273-3811
David Moore, USGS, 236-1271
Bill Wingle, CSM, 273-3905
Lee-Ann Bradley, USGS, 273-8613

**** NOTE: Please help us with publicity by posting copies of the Newsletter on bulletin boards.**

