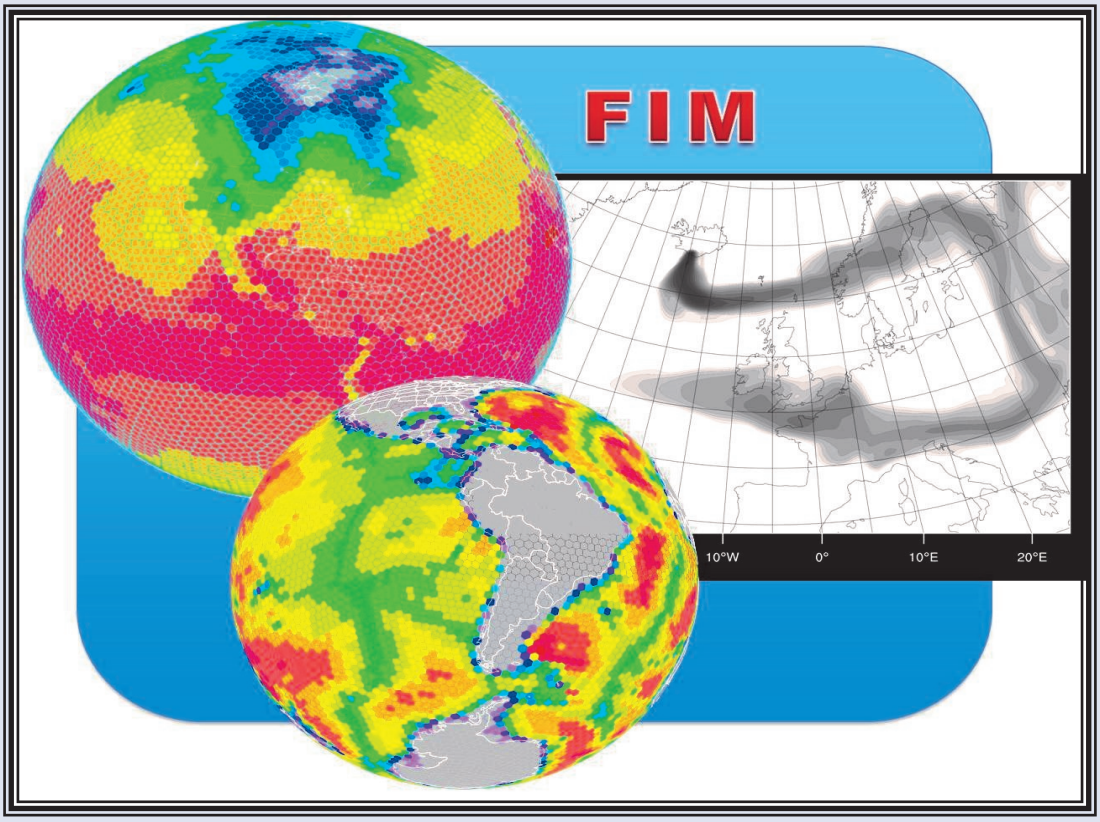
Colorado Scientific Society

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

March Meeting

Ash in the Wind: NOAA Development of Global Atmosphere-Soil-Vegetation-Ocean- Earth System Forecast Models Including Volcanic Eruptions



by
Stan Benjamin, Chief, Assimilation and Modeling Branch, NOAA Global-Systems Division

Thursday, March 21st, 2012

Shepherd of the Hills Presbyterian Church
11500 W. 20th. Ave. (at Simms St.), Lakewood
Social half-hour—6:30 p.m. Meeting time—7:00 p.m.

Everyone is Welcome!

Abstract

NOAA scientists have been increasing the sophistication of earth system models, with atmospheric, ocean, land surface, chemistry components and even volcanic eruptions. One such relatively new global model is called FIM (Flow-following finite-volume Icosahedral Model (FIM) – http://fim.noaa.gov) which uses a soccer-ball-like grid to cover the earth's surface. The FIM model has a 60-level atmospheric model run down to 10km horizontal resolution. It is coupled with a 20-level ocean model, atmospheric chemistry with 20-60 independent species variables, and a multi-level land-vegetation-snow-surface parameterization at each horizontal land grid point. The FIM coupled earth system model has been enhanced with volcanic plume rise and volcanic ash transport in the atmosphere.

The components of the earth system model will be briefly explained and how they interact. Various forecasts will be shown, including a case from the Eyjafjallajokull (Iceland) eruption in April 2010 and hurricane forecasts for Hurricanes Sandy and Isaac, the two US land-falling hurricanes in 2012.

Biography of Stan Benjamin

Stan Benjamin leads the development of weather forecast and earth system forecast models at the NOAA (National Oceanic and Atmospheric Administration) Earth System Research Laboratory (ESRL) in Boulder, CO. Stan holds a B.A. in math (Albion College, Michigan), and M.S. and Ph.D. in meteorology from Penn. State University.

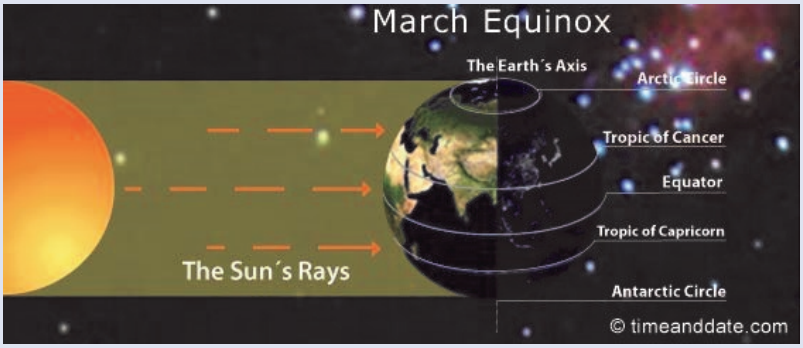
Did you know……?

March is here and the "Spring Equinox" is just around the corner. But why is it called equinox?

On the equinox, night and day are nearly the same length, 12 hours all over the world. This is the reason it's called an "equinox", derived from Latin, meaning "equal night". However, even if this is widely accepted, it isn't entirely true. In reality equinoxes don't have exactly 12 hours of daylight.

The March equinox occurs the moment the sun crosses the celestial equator – the imaginary line in the sky above the Earth's equator – from south to north. This happens either on March 19, 20 or 21 every year. On any other day of the year, the Earth's axis tilts a little away from or towards the Sun. But on the two equinoxes, the Earth's axis tilts neither away from nor towards the Sun, like the illustration shows.

This year, the spring equinox falls on March 20, at 5:02 a.m. in Denver, CO.



References:

Article- http://www.timeanddate.com/createshort.html?url=/calendar/march-equinox.html

Photo- ©iStockphoto.com/CostinT

CSS President's Message - by Matt Sares

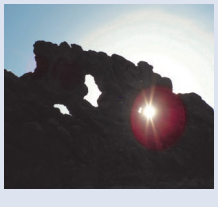
We live in the era of BIG DATA. You see and experience it all around you- in your work, in your home, in the government, in academia, and even in your phone. Some of this information is useful and some is not. Of course, that value judgment often is in the eye of the beholder. You may have experienced this while talking to your children or your parents. Nevertheless, information (and access to it) is expanding at an exponential rate. Often the value of that information is determined by how we make it useful to better understand our world.

Scientific data is no exception to the advent of "big data." In the spatial sciences, like geology, geography, meteorology, oceanography, astronomy, etc., we are reaping the benefits of regional, global, and extraterrestrial data gathering efforts that started decades ago and continue. Also, we are taking older or spatially disparate data, gathering it, and making it more accessible and more useful. Some examples of "big data" that are especially pertinent to the geological community include the following:

National Geologic Map Database – an effort of the U.S. and State Geological Surveys. (http://ngmdb.usgs.gov/ngmdb/ngmdb_home.html)
OneGeology – a global geologic mapping initiative of the geological surveys of the world! (http://www.onegeology.org/)
EarthScope – a National Science Foundation data gathering effort to understand the earth's crust and processes. Includes U.S. Array and the Plate Boundary Observatory. (http://www.earthscope.org/)
State Geothermal Data – geothermal data of all types gathered to assist in the exploration of this earth-generated renewable energy source. Organized by the Assoc. of American State Geologists and assisted by DOE. (http://www.stategeothermaldata.org/)
Groundwater Watch – U.S. groundwater data compiled by the USGS. (http://groundwaterwatch.usgs.gov/)
Planetary Geologic Mapping Program – get to know the geography and geology of other planets! A NASA/USGS effort (http://astrogeology.usgs.gov/PlanetaryMapping/ and http://www.mapaplanet.org/)

Of course, there are many other projects that generate and organize geological data to help us understand the earth, making data accessible to those who can use and benefit from them, and hopefully, to make life better for more people. One of the ways that the explosion of data affects our members is the ability to benefit from the data other scientific disciplines are gathering. This is one of the great new frontiers in science: to understand how earth, ocean, biosphere, atmosphere, and space systems are interacting. Our March presentation by NOAA meteorologist Stan Benjamin explores the integration of these data in global weather models. Come to the meeting and you might gain new insight on your own scientific pursuits!

Where is this Rock? By Pete Modreski



Answer to the picture that appeared on p. 3 of the February newsletter: I'll bet that a lot of you recognized this one, and have been there. It's the Devils Backbone, just west of Loveland, Colorado; a near-vertical fin of Dakota Sandstone, situated on a steep fold limb between an anticline to the east and a syncline to the west. The "windows" shown are just south of the largest such natural window, "The Keyhole".

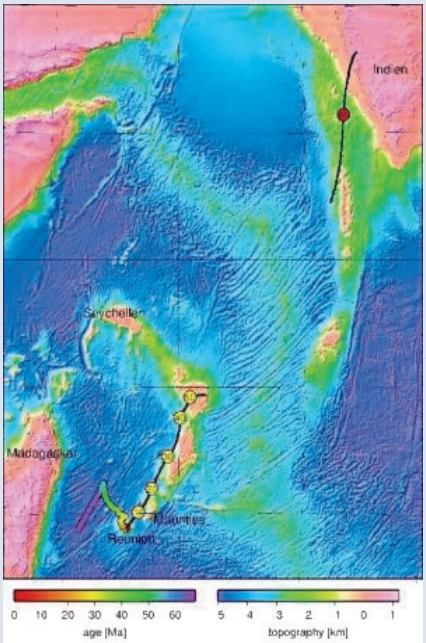
This Month's Rock:
I think many of you will also have seen this site. Aside from a major discontinuity in the geologic record here, there is evidence of past rock quarrying.
The first person to call or e-mail me with the correct answer will get his/her name published in next month's newsletter!

Science News

Fragments of Continents Hidden Under Lava in Indian Ocean: New Micro-Continent Detected Under Reunion and Mauritius

Feb. 22, 2013 — The islands Reunion and Mauritius, both well-known tourist destinations, are hiding a micro-continent, which has now been discovered. The continent fragment known as Mauritia detached about 60 million years ago while Madagascar and India drifted apart, and had been hidden under huge masses of lava.

Such micro-continents in the oceans seem to occur more frequently than previously thought, says a study in the latest issue of *Nature Geoscience*. The break-up of continents is often associated with mantle plumes. These giant bubbles of hot rock rise from the deep mantle and soften the tectonic plates from below, until the plates break apart at the hotspots. This is how Eastern Gondwana broke apart about 170 million years ago. At first, one part was separated, which in turn fragmented into Madagascar, India, Australia and Antarctica, which then migrated to their present position. Plumes currently situated underneath the islands Marion and Reunion appear to have played a role in the emergence of the Indian Ocean. If the zone of the rupture lies at the edge of a land mass (in this case Madagascar / India), fragments of this land mass may be separated off. The Seychelles are a well-known example of such a continental fragment.



A group of geoscientists from Norway, South Africa, Britain and Germany have now published a study that suggests, based on the study of lava sand grains from the beach of Mauritius, the existence of further fragments. The sand grains contain semi-precious zircons aged between 660 and 1970 million years, which is explained by the fact that the zircons were carried by the lava as it pushed through subjacent continental crust of this age. This dating method was supplemented by a recalculation of plate tectonics, which explains exactly how and where the fragments ended up in the Indian Ocean. Dr. Bernhard Steinberger of the GFZ German Research Centre for Geosciences and Dr. Pavel Doubrovine of Oslo University calculated the hotspot trail: "*On the one hand, it shows the position of the plates relative to the two hotspots at the time of the rupture, which points towards a causal relation*," says Steinberger. "*On the other hand, we were able to show that the continent fragments continued to wander almost exactly over the Reunion plume, which explains how they were covered by volcanic rock*." So what was previously interpreted only as the trail of the Reunion hotspot, are continental fragments which were previously not recognized as such because they were covered by the volcanic rocks of the Reunion plume. It therefore appears that such micro-continents in the ocean occur more frequently than previously thought.

The coloured track (left colour scale) west of Reunion is the calculated movement of the Reunion hotspot. The black lines with yellow circles and the red circle indicate the corresponding calculated track on the African plate and the Indian plate, respectively. The numbers in the circles are ages in millions of years. The areas with topography just below the sea surface are now regarded as continental fragments. (Credit: © GFZ/ Steinberger)

Story Source:
The above story is reprinted from materials provided by ***Helmholtz Centre Potsdam - GFZ German Research Centre for Geosciences***.

Journal Reference:
Trond H. Torsvik, Hans Amundsen, Ebbe H. Hartz, Fernando Corfu, Nick Kusznir, Carmen Gaina, Pavel V. Doubrovine, Bernhard Steinberger, Lewis D. Ashwal, Bjørn Jamtveit. **A Precambrian microcontinent in the Indian Ocean**. *Nature Geoscience*, 2013; DOI: 10.1038/NGEO1736

Calendar of Events- March

Colorado Scientific Society's regular meetings are held the 3rd Thursday of the month at the Shepherd of the Hills Presbyterian Church, 11500 West 20th Ave., Lakewood, CO. Unless otherwise advertised- Social time begins at 6:30 p.m. and talks start at 7:00 p.m. For more information, contact Matt Sares, tel. 303-717-3983, matt.sares@state.co.us

Upcoming CSS Meeting presentations:

March 21- "Ash in the Wind: NOAA Development of Global Atmosphere-Soil-Vegetation-Ocean- Earth System Forecast Models Including Volcanic Eruptions", Stan Benjamin, Chief, Assimilation and Modeling Branch, Global Systems Division.
April 18- Suzanne Paschke (USGS) - "**Simulation of Groundwater Flow in the Denver Basin.**"
Jonathan White (CGS) – "**Sinkhole Hazards in Colorado."**
May 16- Don Rosenberry (USGS) - "**Ground-water surface-water exchange in hyporheic settings."**

USGS Rocky Mountain Area Seminar Series is held once every two weeks, 10:30-11:30 a.m., alternate Tuesday mornings, Building 25 Lecture Hall, Denver Federal Center, Lakewood, CO. Public is welcome. Park in the lot east of Bldg. 25 and use entrance E-14. For more information, contact Pete Modreski, tel. 303-202-4766, pmodreski@usgs.gov.

March 5. Dr. David John, (USGS, Menlo Park, CA). **"Miocene volcanoes, hot springs, and gold deposits in the Bodie Hills, California and Nevada."** **RESCHEDULED for April 9th.**
March 26. Dr. Christian Teyssier, Univ. of Minnesota. "**Oceanic and Continental Core Complexes."**

The Denver Geophysical Society & The Rocky Mountain Association of Geologists
19th Annual 3D Seismic Symposium: Making Sound Decisions, **March 05,** at the Sheraton Downtown Denver Hotel . For more information- www.3dseismicsymposium.com.
Please note that registration, sponsorship and booth purchase will be administered on the DGS website at www.denvergeo.org.
Thomas Jorden, Chairman, CEO & President of Cimarex Energy and Mark Zoback, Professor of Geophysics at Stanford University,
"Reservoir Geomechanics Applied to Stimulation of Shale Gas, Tight Gas, Tight Oil Reservoirs."

RMAG- Luncheon, **March 6,** Denver City Center Marriott, 11:30 a.m.; Lunch: 12:00 p.m.; Talk: 12:20 p.m.
Speaker: Terry Gerlach, "**Volcanic Versus Anthropogenic CO2."** Lunch $30, walk-in without lunch $10.
Please note: ONLINE REGISTRATION FOR THIS EVENT WILL CLOSE ON THURSDAY, FEBRUARY 28, 2013 AT 4:00PM

Western Interior Paleontological Society (WIPS) Symposium – March 16-17
"Ice Worlds and Their Fossils. "Discover how glacial climates & life interact to shape evolution and the biosphere." Green Center, Colorado School of Mines campus, Golden, CO. Registration is $85; student registration, $30; single-day registration is also available. For more information: http://www.westernpaleo.org/symposiums/pages_2013/2013.php. Click on "Speakers" for program info.

Colorado School of Mines- Van Tuyl Lecture Series, Golden, CO. Lectures held Thursdays 4-5 p.m. in Berthoud Hall, rm. 241. Refreshments served prior to lecture.

March 7. Dr. Pat Reed, Penn State University. "Model or Myopia? Exploiting Water Markets to Address Population and Drought Risks in a Changing World."
March 14. No Lecture - Spring Break.
March 21. Dr. Irina Overeem, University of Colorado. TBA.
March 28. Dr. Zhong Lu, U.S. Geological Survey. "Frontiers of Radar Remote Sensing."
April 4. Dr. Ravi Anand, CSIRO-Austraila, Association of Applied Geochemists Distinguished Lecturer. TBA.

Desk & DERRICK Club- March 12, at 11:30 a.m., Royal Crowne Plaza Hotel, 1450 Glenarm Place, Denver. Please reply to: marketing@rmoj.com to reserve seating. Lunch $35.00. Speaker: Terry W. Donze. **"Climate Realism."**

FODR- Annual Meeting and Volunteer Appreciation, March 20, 2013, 6-8 PM at the Discovery Center, 17681 West Alameda Parkway (west side of Dinosaur Ridge) Morrison. RSVP to Amber Cain at amber_cain@dinoridge.org or 303-697-3466 x 107.

More Events

CO-AIPG March Luncheon**- Tuesday, March 19, 2013**
Golden Corral Buffet & Grill, 3677 South Santa Fe Drive, Sheridan, CO 80110 (Southwest side at Santa Fe Drive and Hampden Ave.) Lunch starts at 11:30 a.m., speaker 12:30 p.m. **"Best Practices or Worst—It Depends"** by David M. Abbott, Jr., Consulting Geologist.

DREGS- March 11, Social hour: 6:00 to 7:00 p.m.; Presentation: 7:00 p.m. Colorado School of Mines, Golden, Berthoud Hall Room 241. Jonathan Saul Caine, USGS, and John Ridley and Zachary Wessel, CSU. "**To reactivate or not to reactivate--Nature and varied behavior of structural inheritance in the Proterozoic basement of the eastern Colorado Mineral Belt over 1.7 billion years of earth history."**

Denver Mining Club March Schedule:
Golden Corral Buffet & Grill 3677 South Santa Fe Drive, Sheridan, CO 80110 (Southwest side at Santa Fe Dr. & Hampden Ave.) 11:30 a.m. - 1:00 p.m. (+/-)Every Monday, except when noted. Purchase of buffet lunch required.
VISITORS ALWAYS WELCOME!

University of Colorado Benson Earth Sciences Colloquium Schedule:
Lectures held in lecture hall (380), Wednesdays 4pm. Refreshments are served at 3:30 on the 3rd floor. Schedule posted at: http://www.colorado.edu/geolsci/colloquium.htm

March 6. Rich Ketcham, UT Austin. TBD.
March 13. Tonie Van Dam, University of Luxembourg. **"GPS and Absolute Gravity in Greenland."**
March 20. Don Anderson, Cal Tech. **"An Up-sidedown Physics & Seismology Based Boundary Layer Model for Geodynamics, Gechemistry and Ambient Mantle."**
March 27. No Colloquim - Spring Break.

CSU, Department of Geosciences Seminar Schedule
Seminars are located in Warner College of Natural Resources Building, Room 320, Monday afternoon, and will begin at 4:00 pm unless noted otherwise. Schedule posted at http://warnercnr.colostate.edu/geo-news-and-events/department-seminars
March 1. Phil Wannamaker, PhD, University of Utah Energy and Geoscience Institute. **"Stewing the Lithosphere: Views of Magmatic/Hydrothermal Processes in Subduction and Extensional Environments from Electrical Conductivity."**
March 11. TBA.
March 25. Brandon McElroy, PhD, Dept. of Geology & Geophysics, University of Wyoming. **"Not all Rates are Created Equally--Quantifying Variability in Topographic Evolution."**
March 28. Professor Daniel Hanes, Dept. of Earth & Atmospheric Sciences, St. Louis Univ. **"The Influences of the Strong Tidal Jet on the Ebb Tidal Delta, Sand Waves, and Nearshore Dynamics Near San Francisco, California."**

DIPS- March Luncheon Friday, March 8, Wynkoop Brewing Company, 1634 18th St., Denver. Speakers Kevin Corbett, Wrangler Resources LLC, Denver and Glenn Wormald, Consultant, Melbourne, Victoria, Australia. **"Utica Shale Exploration in the Lake Champlain Region of Southern Quebec."** Members generally arrive at 11:30 am with the lunch buffet starting at noon. The talk starts at 12:20 pm to 12:30 pm and goes for 20 to 30 minutes. The cost for the lunch and talk is $20 for members and $24 for non-members. It is $5 for just the talk.

Denver Mining Club- March Schedule
Every Monday, except when noted, 11:30 a.m. - 1:00 p.m. Golden Corral Buffet & Grill, 3677 South Santa Fe Drive, Sheridan, (Southwest side at Santa Fe Dr. & Hampden Ave.) Purchase of buffet lunch required. VISITORS ALWAYS WELCOME!
March 11. Ed Raines, Collections Manager, CSM Geology Museum. **"The Zinc Problem: Its Mineralogy and Metallurgy, the Solution and the Results."**
March 18. Bernard C. Koch, Lakewood Exploration. "**Porphyry Copper Ores: What to Look For."**
March 25. Stuart Sanderson, President, Colorado Mining Association. **"Colorado Mining Update, 2013."**

Denver Museum of Nature and Science- Mammoths & Mastodons: Titans of the Ice Age opened **February 15.**
Life-size models, fossil tusks and skulls, touchable teeth, spear points, cave paintings, interactive displays, and monumental video installations bring the Ice Age back to life.

Pleas and Thank Yous

Membership dues for this year (2013) are still being accepted. You will find a dues payment form in this newsletter or on the CSS Web site: **www.coloscisoc.org/membership/dues.html**
Dues payments are $20 for regular members; $10 for corresponding members (outside the Colorado Front Range area), and $5 for students. You may pay dues by mailing a check to the CSS, or pay with a credit card using PayPal on the CSS website. If you are uncertain if you owe dues or of your member status, contact CSS Treasurer Don Sweetkind by phone at 303–236–1828 or by e-mail at **dsweetkind@usgs.gov**. ***Thank you!!***

Student Research Grants Available!
The Colorado Scientific Society invites students enrolled at an accredited college or university to apply for research grants to be awarded in late May 2013. Grants are generally awarded to students enrolled in a Masters or Ph.D. program, however applications from undergraduates conducting senior-level research will also be considered and are encouraged.
General grant categories:

*Field-oriented research on geology, geochemistry, and geophysics of the Rocky Mountain region,
*Engineering geology research (with no restriction on geographic area of interest),
*Studies on the Heart Mountain fault in N.W. Wyoming or a Quaternary study (with no restriction on geographic area of interest).

The grant amounts actually awarded may vary depending on the number of applicants, however typical amounts from the past years have ranged from $600 to $1200. Students can obtain application forms and a grant policy and procedure information directly from the CSS website at **http://www.coloscisoc.org/grants/grants.html**, or contact Pete Modreski, **pmodreski@usgs.gov.**

Complete applications must be emailed or post-marked by April 8, 2013.
Please encourage your students or student colleagues to apply!

Thanks to the Harvey Family Foundation and many other gracious donors, the **Friends of Dinosaur Ridge** has purchased a property at the north entrance to Red Rocks on the west side of the ridge. Plans to renovate the building and grounds are in the process to create the **Dinosaur Ridge Discovery Center**. The Annual Meeting and Volunteer Appreciation will be held there for all members to see the new property. There will be a public opening once renovations are complete. Donations are still needed to help offset the cost of renovations. Please contact Joe Tempel at **joetempel@dinoridge.org** or 720-971-9649 to make a donation.

STUDENT SCHOLARS CORNER

Twilight of the Mammoths
A Poem: by Zachary Sepulveda, 15 years old, 10th grade at Palmer Ridge High School in Monument, Colorado.

Perched upon a grassy hill ancient hunters prepare to make a kill…

Blaring trumpets shatter the air
Terrified voices echo despair
Hurtling towards their own demise
A chance at life, their fate denies

The blood of giants spills forth upon the grass
Brought forth by razor-edged volcanic glass
Marching closer to defeat with each fresh laceration
Panicking behemoths flee from inevitable damnation

Perfectly adapted to a dying world
Their fate was sealed when their blanket of ice unfurled
Their fragile world was brought to bear before the fury of the sun
And before they even knew it, their time on earth was done.

Happy St. Patrick's Day and Sláinte! (March 17th)

True Four-Leaf Clover

The three leaves on a shamrock are sometimes associated with faith, hope, and love. The 4-leaf clover is an uncommon variation of the common, 3-leaf clover. The fourth leaf, which is smaller than the other three leaves, symbolizes luck. The fourth leaf is a mutation. It is quite rare and occurs once in about 10,000 specimens. According to tradition, such leaves bring good luck to their finders, especially if found accidentally.

2013 CSS Elected Positions

President:……Matt Sares, 303-866-3581 x8290, matt.sares@state.co.us
President Elect:….. …… .Scott Lundstrom, *303-917-2849,* pslundstrom@msn.com
Treasurer:……Don Sweetkind , 303-236-1828, dsweetkind@usgs.gov,
Secretary:…….....Lisa Fisher, 303-215-0480, lisa.fisher@escalantemines.com
Past President…….. …….Pete Modreski, 720-205-2553, pmodreski@aol.com.

We are still seeking volunteers or nominations to fill several vacant posts. They are:

- **Outreach Chair**
- **Publicity Chair**

We will also gladly accept volunteers to serve on any and all of our standing committees. If you have any questions regarding the duties of these positions, please call your favorite officer, councilor, or chair.

Please consider volunteering—many hands make lighter work and we would love to have a larger pool of ideas and contacts!

COUNCILORS

2013–2015: Marieke Dechesne, mdechesne@usgs.gov
2013–2015: Liz Pesce, pesce.e@gmail.com
2011–2013: Celia Greenman, celia.greenman@earthlink.net
2011–2013: Ben Harrison, 303–417–9633, benjh@earthlink.net
2012–2014: Paul Morgan, 303–866–2611, paul.morgan@state.co.us
2012–2014: Rebecca Flowers, 303–492–5135, rebecca.flowers@colorado.edu

COMMITTEE CHAIRPERSONS

Best Paper Award: Pete Modreski, 720-205-2553, pmodreski@aol.com
Database Manager: Emily Taylor, 303–236–8253, emtaylor@usgs.gov
Field Trips: Cal Ruleman, 303–236–7804, cruleman@usgs.gov
History: Beth Simmons, cloverknoll@comcast.net
Hospitality: Ben Harrison, 303-417-9633, benjh@earthlink.net
Membership/Mentor: Liz Pesce, epesce@mines.edu
Memorial Funds: Pete Modreski, 720-205-2553, pmodreski@aol.com
Newsletter Editor: Linda Barton, 720-338-6201, lbarton1611@gmail.com
Outreach: Open
Program: Open
Publicity: Open
State Science Fair: Chuck Weisenberg, 303–238–8806, cweisnbrg@msn.com
Webmaster: Barb Warden, 303-278-2701, bwarden@tablemtn.com

NEW CSS MEMBERS

By Donald Sweetkind

We would like to welcome the following new members to the Colorado Scientific Society. We hope to see you at our meetings to get to know you in person!

Rob Rice (student)

Luke Sattler (student)

Susan Freeman

Blake Reher (student)

Jerry Davidson

Colorado Scientific Society
P.O. Box 150495
Lakewood, CO 80215-0495
http://www.coloscisoc.org

Colorado Scientific Society

Application and Membership Update
Dues and Funds Contributions

Date_____

New Member _____ Renewing Member _____

_____
(email address) (Telephone)

_____
(Last Name) (First Name) (Initial)

_____
(Address)

The success of most Society activities depends on volunteer help. Please circle any activities for which you can provide assistance. We will pass your name on to the appropriate Committee Chairperson.		
Field Trips	History	Outreach
Fund Raising	Newsletter	Program/Talks

Annual Dues (January – December)

Regular Members $20 _____
Corresponding Members $10 _____
Student Members $5 _____

Memorial Funds: These funds support research grants to graduate students in the Earth Sciences throughout the nation. *Please note if contribution is made in the memory of an individual.*

Ogden Tweto Memorial Fund _____
Steven Oriel Memorial Fund _____
Edwin Eckel Memorial Fund _____
Bill Pierce-Heart Mountain Fund _____
George Snyder Memorial Fund _____
Chuck Pillmore Memorial Fund _____

Endowment Fund:

This fund is used to support the Society's monthly meetings and newsletter, field trips, family night, annual Emmons Lecture, invited speaker honorarium, and special activities. _____

TOTAL CONTRIBUTIONS (DUES AND FUNDS): _____

Please make your checks payable to the: *Colorado Scientific Society*	Or register and pay on-line using PayPal at:
Send this form & your check to: **Colorado Scientific Society** **P.O. Box 150495** **Lakewood, CO 80215-0495**	http://www.coloscisoc.org/membership/duespaypal.htm