



Los Alamos Geological Society
P.O. Box 762, Los Alamos, NM 87544-0762

December Meeting

Time: Tuesday, December 14, 2010, 7:30 pm

Place: Christian Church

92 East Road

Los Alamos, NM 87544

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Wrap-a-Rock Party!

'Twas two weeks before Christmas, when all through the club the rock hounds were stirring, finding specimens in the mud. The wrappings were put on the table with care, In hopes that the rock hounds soon would be there; The geologists were nestled all snug in their beds, While visions of gems rocks danced in their head; And Mom in her 'kerchief, and I in my cap, Had just turned on Fox News to listen to the flap.

When out on the street there arose such a clatter, I sprang from my sofa to see what was the matter. Away to the window I flew like a flash, Pulled up the window blinds with ultimate panache. The moon on the breast of the Santa Fe brown Made everything look like it had gone on to town. When, what to my wondering eyes should appear, But a miniature sleigh, and eight igneous reindeer.

With a little lady driver, and I had to admire her, I knew that it must be the geologist patron St. Barbara. More rapid than lava her coursers they came, And she whistled, and shouted, and called them by name; Now Pumice! now

Ijolite! now Latite and Andecite! On, Breccia! on Travertine! on Hornfels and Rhyolite! To the top of porch! To the top of the wall! Now dash away! Dash away! Dash away all!

As dry alluvium that before the wild hurricane flies, When they meet with an obstacle, mount to the sky, So up to the church-top the coursers they flew, With the sleigh full of Pyrolite, and St. Barbara too. And then in a twinkling, I heard on the roof, the prancing and pawing of each little hoof. As I drew in my head and was turning around, Down the drain pipe St. Barbara slid to the ground.

She gave me to know that I had nothing to fear And left mountains of Iherzolite for the geologists' cheer. She left to the rooftop and climbed back in the sleigh, And called to her courses and soon was away. But I heard her exclaim as she drove out of sight, **Happy wrap-a-rock party, and to all a good night!**

42nd

Annual

**Los Alamos Geological Society
EARTH TREASURE SHOW
2010**

Saturday, Dec. 4 Sunday, Dec. 5
9am - 5pm 10am - 4pm

Masonic Temple
Canyon Rd and 15th St
Los Alamos

FREE ADMISSION
Fun for Everyone!

<i>Silent Auction</i>	<i>Gems and Minerals</i>
<i>Geode Sawing</i>	<i>Jewelry</i>
<i>Door Prizes</i>	<i>Fossils</i>
<i>Kids' Crafts</i>	<i>Books</i>
<i>Wheel of Fortune</i>	<i>Unique Exhibits</i>
<i>Mineral ID</i>	<i>Delicious Food</i>

Proceeds benefit the LAGS Scholarship Fund

Upcoming Meetings

January 2011—Annual Banquet. Speaker is Dr. Giday WoldeGabriel, Los Alamos National Laboratory. He will be speaking on recent findings on earliest humans from Africa. Date TBD. Stay tuned for more information.

'M8' Earthquake Simulation Breaks Computational Records, Promises Better Quake Models *ScienceDaily (Nov. 23, 2010)*

A multi-disciplinary team of researchers has presented the world's most advanced earthquake shaking simulation at the Supercomputing 2010 (SC10) conference held this week in New Orleans. The research was selected as a finalist for the Gordon Bell prize, awarded at the annual conference for outstanding achievement in high-performance computing applications.

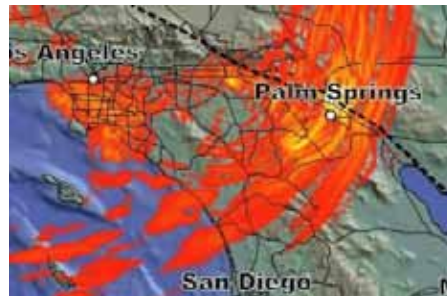
The "M8" simulation represents how a magnitude 8.0 earthquake on the southern San Andreas Fault will shake a larger area, in greater detail, than previously possible. Perhaps most importantly, the development of the M8 simulation advances the state-of-the-art in terms of the speed and efficiency at which such calculations can be performed.

The Southern California Earthquake Center (SCEC) at the University of Southern California (USC) was the lead coordinator in the project. San Diego Supercomputer Center (SDSC) researchers provided the high-performance computing and scientific visualization expertise for the simulation. Scientific details of the earthquake were developed by scientists at San Diego State University (SDSU). Ohio State University (OSU) researchers were also part of the collaborative effort to improve

the efficiency of the software involved.

While this specific earthquake has a low probability of occurrence, the improvements in technology required to produce this simulation will now allow scientists to simulate other more likely earthquakes scenarios in much less time than previously required. Because such simulations are the most important and widespread applications of high performance computing for seismic hazard estimation currently in use, the SCEC team has been focused on optimizing the technologies and codes needed to create them.

The M8 simulation was funded through a number of National Science Foundation (NSF) grants and it was performed using supercomputer resources including NSF's Kraken supercomputer at National Institute for Computational Science (NICS) and the Department of Energy (DOE) Jaguar supercomputer at the National Center for Computational Science. The SCEC M8 simulation represents the latest in earthquake science and in computations at the petascale level, which refers to supercomputers capable of more than one quadrillion floating point operations (calculations) per second.



This image shows detail from the M8 simulation. (Credit: Southern California Earthquake Center)

"Petascale simulations such as this one are needed to understand the rupture and wave dynamics of the largest earthquakes, at shaking frequencies required to engineer safe structures," said Thomas Jordan, director of SCEC and Principal Investigator for the project. Previous simulations were useful only for modeling how tall structures will behave in earthquakes, but the new simulation can be used to understand how a broader range of buildings will respond.

However, given the massive number of calculations required, only the most advanced supercomputers are capable of producing such simulations in a reasonable time period. "This M8 simulation represents a milestone calculation, a breakthrough in seismology both in terms of computational size and scalability," said Yifeng Cui, a computational scientist at SDSC. "It's also the largest and most detailed simulation of a major earthquake ever performed in terms of floating point operations, and opens up new territory for earthquake science and engineering with the goal of reducing the potential for loss of life and property."

Specifically, the M8 simulation is the largest in terms duration of the shaking modeled (six minutes) and the geographical area covered -- a rectangular volume approximately 500 miles (810km) long by 250 miles (405 km) wide, by 50 miles (85km) deep. The team's latest research also set a new record in the number of computer processor cores used, with 223,074 cores sustaining performance of 220 trillion

calculations per second for 24 hours on the Jaguar Cray XT5 supercomputer at the Oak Ridge National Laboratory (ORNL) in Tennessee.

In terms of earthquake science, these simulations can be used to study issues of how earthquake waves travel through structures in the earth's crust and to improve three-dimensional models of such structures.

LAGS Regular Meeting Tuesday, 16th November- ber, 2010

By Paul Bradley

The November 2010 meeting of LAGS was on the 16th and we had a good turnout of over 25 people. The meeting started with announcements, mostly concerning the fact the Earth Treasure show. The show will be on December 4 and 5, with setup on Friday the 3rd. Paul and Rick described the field trip to the Quebradas Road area, which was rained out in April. Paul briefly described upcoming meetings, including the January banquet on the 22nd and the December wrap-a-rock meeting on December 14. After that, Paul introduced Richard Stead, who talked about his many trips to Death Valley.

Richard started off by talking about the superlatives of Death Valley. It is the hottest place in the US and arguably the world. It has the record for most days over 130, 120, and 110. It had over 100 days above 110 one year. Ouch. It has all of the ecologic zones from arid to alpine in one Park. Speaking of which, it is now the largest national park in the

lower 48 states at 5262 square miles. This is larger than Yosemite and Yellowstone combined! One more superlative. It has the largest elevation relief in the US, with the lowest elevation being 282 feet below sea level (lowest in North America) and Telescope Peak is the highest point at 11,050 feet. Death Valley is a pull-apart basin with 2 half-grabens and 2 normal faults dominating the geology. The oldest rocks are 1.7 Ga and are incredibly chopped up, to the point that one cannot trace the same type of rock for any distance. There are many rocks from the first supercontinent of Rodinia (1.3 to 0.9 Ga) and then lots of carbonate rocks were deposited from 900 Ma to 280 Ma, indicating the presence of marine deposition. The Jurassic age saw a large volcanic intrusion. The pull-apart behavior started more recently, with the movement of the Pacific plate past the North American plate.

Some of the highlight points include Dante's View, which is an overlook at 5450 feet above sea level. Only 2.3 miles away is Badwater at 282 feet below sea level. However, it is impossible to climb from one to the other directly and one must take a long, winding road around. The escarpment shows signs of recent activity, as there is a 20 foot displacement from an earthquake that happened about 2000 years ago. There are several salt bed related features in the basin, including a salt flat with halite (table salt) and at least 50 other minerals. There are polygonal salt beds (similar to polygonal mud cracks), and the Devil's Golf Course, with

miniature towers of evaporate material. Nearby are the Badwater turtlebacks – named for their distinctive shape. This are juxtaposes Tertiary volcanics next to 1.7 Ga rocks. In the Valley is Artist's drive, where late Miocene volcanic rocks interacted with iron oxides to form a palette of colors in the rocks. Although they are pastel, most colors are represented here. Richard also described many other places he visited and some of the unique plants and animals found there. Some are found nowhere else. One example is the Salt Creek Springs pupfish, which exists only in the one very deep pool. The water happens to be three times as salty as the ocean. Richard spent some time describing his favorite place, Ubehebe crater. This is a maar, or volcanic explosion caused by hot magma hitting groundwater and instantly turning it to steam. Richard also took the long and somewhat treacherous drive to the Racetrack. Many people have seen the pictures of a large rock sitting with a long streak behind it where it slid around. But how did it form? Although it is not known for sure, the best theory suggests they move in the winter. Rain will fall, turning the clay into very slippery mud. The cold weather will then freeze the water and strong winds funneled between the mountain ranges will blow the rock over the frozen ground easily and leave the track behind. Richard concluded his talk by encouraging people to visit this unique national park and answered many questions as people looked over his large selection of books and maps.

LAGS Board Meeting Wednesday, 27th October, 2010

by Paul Bradley

The November 2010 Earth Treasure Show (ETS) planning meeting was held at 7:45 AM on November 17 at Ruby K's. Rick Kelley, Barbara Carlos, Eric Nelson, Stuart Schaller, Jim Nesmith, Emily Schultz-Fellenz, and Paul Bradley were present. Emily has the banner and will get it to Paul Bradley, who will put it up on November 29. Barbara has contacted most people and most of the spots have been filled. Barbara will pick up the street signs from Paul Bradley at the shed. The tables are in hand; the club will rent 13 tables from Bethlehem and Paul will buy two 6 foot tables for the final "payment" to the Shrine. Some supplies need to be purchased. Tom Merson will get butcher paper. Others will buy yellow duct tape, painter's masking tape, and other supplies. Display cases are coming along. Terry Wallace will have four club cases together, most likely at the far end of the dealer room. Paul will supplement this with a case related to mining. Six more will be taken by Allan Schmiedicke, Rick Kelley, Sherry Miller (2), field trips, and Bandelier. The three Federation cases will have a mining artifact exhibit, a Bureau mineral exhibit, and one on pegmatites. The Mersons will host the silent auction sorting and labeling session Wednesday December 1 and Paul will conduct an interview with KRSN that morning. Club members, please mark December 4 and 5

as the show dates. We will need people the morning of Friday the 3rd to help with setup. Eric mentioned one non-ETS item. The check for the 2010 scholarships did not arrive in time to the New Mexico Geological Society. They asked and the board agreed to have NMS use the 2010 and 2011 money to fund 8 scholarships for the 2011 field conference, which will cover the Tusas mountains. At that point, the meeting was adjourned.

Field Trips by Paul Bradley and Rick Kelley

At the time of print, there was no information on any field trips. Stay tuned for field trip information.

ANNOUNCEMENTS

2010 AGU Fall Meeting 13–17 December Moscone Convention Cen- ter Howard Street, Between Third & Fifth Sts. San Francisco, California, USA

The Fall Meeting is expected to draw a crowd of over 16,000 geophysicists from around the world. The Fall Meeting provides an opportunity for researchers, teachers, students, and consultants to present and review the latest issues affecting the Earth, the planets, and their environments in space. This meeting will cover topics in all areas of Earth and space sciences.

LAGS Needs A VP for Programs

LAGS needs one or two volunteers to join the LAGS Board as VP for Programs. Time commitment is minimal and your efforts help make every month's meeting enjoyable for the Club. Please consider giving back to LAGS by volunteering. Contact any current LAGS board member if interested.

Annual Meeting and Show of the Rocky Moun- tain Federation of Miner- alogical Societies

In June 2011, the Colorado Springs Mineralogical Society will host the annual meeting and show of the Rocky Mountain Federation of Mineralogical Societies. Members and visitors traveling to Colorado Springs will be able to observe a wide variety of geological features and several field trips are in the planning stages.

Albuquerque Geological Society

U.S. EPA/NCER GRANT AN- NOUNCEMENT

Summary: The U.S. EPA as part of its Science to Achieve Results (STAR) program, is offering Graduate Fellowships for master's and doctoral level students in environmental fields of study. The deadline is November 5, 2010 at 4:00PM for receipt of paper applications, and November 5, 2010 at 11:59:59 PM ET for receipt of electronic applications to Grants.gov. The Agency plans to award 105 new

fellowships by June 30, 2011. Go to (http://www.epa.gov/ncer/rfa/2011/2011_star_gradfellow.html) for further information.

GEOLOGY SEMINARS AT NEW MEXICO UNIVERSITIES:

If anyone would like to have any of the below speakers talk to AGS, please drop me an email.

New Mexico State University Geological Sciences Colloquium — Wednesdays at 4:00 PM in Room 230, Gardner Hall, University Department of Geological Sciences. Refreshments are served at 3:45 PM. To ensure a seat. E-mail geology@nmsu.edu or call 575-646-2708 for further information. *Thursday's Joint Colloquium with Physics is in Room 229*

New Mexico Tech Bureau/EES Seminar Series — usually Thursdays at 4:00 pm during the spring and fall semesters sponsored by the Bureau and the Department of Earth & Environmental Science See the schedule at (<http://www.ees.nmt.edu/seminar.html>)

University of New Mexico 401/501 Colloquium Series — Department of Earth & Planetary Sciences Friday afternoons at 2:00 PM in Northrop Hall, Room 122 (the large Lecture Hall at the east end of the building). Refreshments are available before the talks beginning at 1:45 PM. Upcoming talks are: Call 505-277-4204 for further information.

UPCOMING WORKSHOPS

2010 – The AAPG has planned a number of fascinating workshops and field trips. For further information do to <http://aapg>.

informz.net/aapg/archives/archive_220170.html

NEW PUBLICATION OF INTEREST

Geologic Map of the Albuquerque-Rio Rancho metropolitan area and vicinity. Sean Connell, 2008. Price \$24.95 + S&H Order from pubsofc@gis.nmt.edu or call 575-835-5490.

Water, Natural Resources, and the Urban Landscape, The Albuquerque Region, L. Greer Price, Douglas Bland, Peggy Johnson, and Sean D. Connell, Editors 152 pp.. Excellent document. Price \$15 + S&H Order from pubsofc@gis.nmt.edu or call 575-835-5490

Show Calendar

Dec. 3-5--EL PASO, TEXAS: El Paso Mineral & Gem Society; El Maida Auditorium, 6331 Alabama; Fri. 10-6, Sat. 10-6, Sun. 10-5; adults \$3, seniors \$2, under 12 free; gems, minerals, fossils, beads, jewelry, tools, books, equipment, geode cutting, silent auction, demonstrations; contact Jeannette Carrillo, 4100 Alameda Ave., El Paso, TX 79905, (877) 533-7153; e-mail: gemcenter@aol.com

Dec.. 3-5--HUACHUCA CITY, ARIZONA: 2nd annual show, "Miner's Mania Gem Show"; Tombstone Gem Show; Tombstone Territories RV Resort, 2111 E. Hwy. 82; Fri. 10-6, Sat. 10-6, Sun. 10-4; free admission; Arizona lapidary artists, miners and collectors, many local minerals, Arizona mining history displays, prizes, special raffle; contact Betty Krug, P.O. Box 414, Tombstone, AZ 85638, (520) 457-

9505; e-mail: rockwranglers@gmail.com; Web site: www.tombstonegemshow.info

Dec.. 3-5--SANTA BARBARA, CALIFORNIA: Show, "Gem Faire"; Earl Warren Showgrounds/Exhibit Hall, 3400 Calle Real; Fri. 12-7, Sat. 10-6, Sun. 10-5; weekend pass \$5; contact Yooy Nelson, (503) 252-8300; e-mail: info@gemfaire.com; Web site: www.gemfaire.com

Dec. 10-12--COSTA MESA, CALIFORNIA: Show, "Gem Faire"; Gem Faire Inc.; OC Fair & Event Center/Bldg. 10, 88 Fair Dr.; Fri. 12-7, Sat. 10-6, Sun. 10-5; weekend pass \$5; contact Yooy Nelson, (503) 252-8300; e-mail: info@gemfaire.com; Web site: www.gemfaire.com

Dec.. 17-19--SAN DIEGO, CALIFORNIA: Show, "Gem Faire"; Gem Faire Inc.; Scottish Rite Event Center, 1895 Camino del Rio S; Fri. 12-7, Sat. 10-6, Sun. 10-5; weekend pass \$5; contact Yooy Nelson, (503) 252-8300; e-mail: info@gemfaire.com; Web site: www.gemfaire.com

Jan. 1-31--QUARTZSITE, ARIZONA: Show, "Desert Gardens International Gem & Mineral Show"; Desert Gardens RV Park; 1064 Kuehn St. (I-10 Exit 17, south side); 9-6 daily; free admission; crystals, minerals, rough, polished, jewelry, lapidary equipment; contact Sharon or Sandy, 1064 Kuehn St., Quartzsite, AZ 85346, (928) 927-6361; e-mail: info@desertgardensrvpark.net; Web site: www.desertgardensrvpark.net

Jan. 7-9--DEL MAR, CALIFORNIA: Show; Gem Faire Inc.; Del

Mar Fairgrounds/Bing Crosby Hall, 2260 Jimmy Durante Blvd.; Fri. 12-6, Sat. 10-6, Sun. 10-5; \$7 weekend pass; contact Yooy Nelson, (503) 252-8300; e-mail: info@gemfaire.com; Web site: www.gemfaire.com

Jan. 14-16--GLOBE, ARIZONA: 54th annual show; Gila Co. Gem & Mineral Society; Gila County Fair Grounds, 3 mi. north of US 60-70 Junction; Fri. 9-5, Sat. 9-5, Sun. 9-4; live demonstrations, door prizes, displays, minerals, jewelry; contact Val Lathem, (602) 466-3060; e-mail: val65@cox.net

Jan. 14-16--SANTA ROSA, CALIFORNIA: Show; Gem Faire Inc.; Sonoma County Fairgrounds/Grace Pavilion, 1350 Bennett Valley Rd.; Fri. 12-6, Sat. 10-6, Sun. 10-5; \$7 weekend pass; contact Yooy Nelson, (503) 252-8300; e-mail: info@gemfaire.com; Web site: www.gemfaire.com

Jan. 15-16--FREDERICKSBURG, TEXAS: 42nd annual show, "Hill Country Gem & Mineral Show"; Fredericksburg Rockhounds; Pioneer Pavilion, Lady Bird Johnson Municipal Park; Sat. 9-6, Sun. 10-5; free admission; contact Jeff Smith, 208 Castle Pines Dr., Kerrville, TX 78028, (830) 895-9630; e-mail: jeffbrenda@windstream.net; Web site: www.fredericksburgrockhounds.org

Jan. 28-30--REDLANDS, CALIFORNIA: Annual symposium; Mineralogical Society of Southern California Micromounters; San Bernardino County Museum, 2024 Orange Tree; giveaway tables, mineral sales,

silent and live auctions, speakers, field trip; contact Eugene Reynolds, (714) 697-4435, or Dr. Robert Housley; e-mail: rhouley@its.caltech.edu; or Gene Reynolds; e-mail: garquartzman@hotmail.com

Jan. 28-30--SAN RAFAEL, CALIFORNIA: Show; Gem Faire Inc.; Marin Center/Exhibit Hall, 10 Avenue of the Flags; Fri. 12-6, Sat. 10-6, Sun. 10-5; \$7 weekend pass; contact Yooy Nelson, (503) 252-8300; e-mail: info@gemfaire.com; Web site: www.gemfaire.com

New Publications from GSA

Ancient Earthquakes, edited by Manuel Sintubin, Iain S. Stewart, Tina M. Niemi, and Erhan Altunel, 2010

Ancient earthquakes are pre-instrumental earthquakes that can only be identified through indirect evidence in the archaeological (archaeoseismology) and geological (palaeoseismology) record. Special Paper 471 includes a selection of cases convincingly illustrating the different ways the archaeological record is used in earthquake studies. The first series of papers focuses on the relationship between human prehistory and tectonically active environments, and on the wide range of societal responses to historically known earthquakes. The bulk of papers concerns archaeoseismology, showing the diversity of approaches, the wide range of disciplines involved, and its potential to contribute to a better understanding of earthquake history.

Ancient Earthquakes will be of interest to the broad community of earth scientists, seismologists, historians, and archaeologists active in and around archaeological sites in the many regions around the world threatened by seismic hazards. This Special Paper frames in the International Geoscience Programme IGCP 567 "Earthquake Archaeology: Archaeoseismology along the Alpine-Himalayan Seismic Zone."

Geology and Tectonic Evolution of the Central-Southern Apennines, Italy, by Livio Vezzani, Andrea Festa, and Francesca C. Ghisetti, 2010

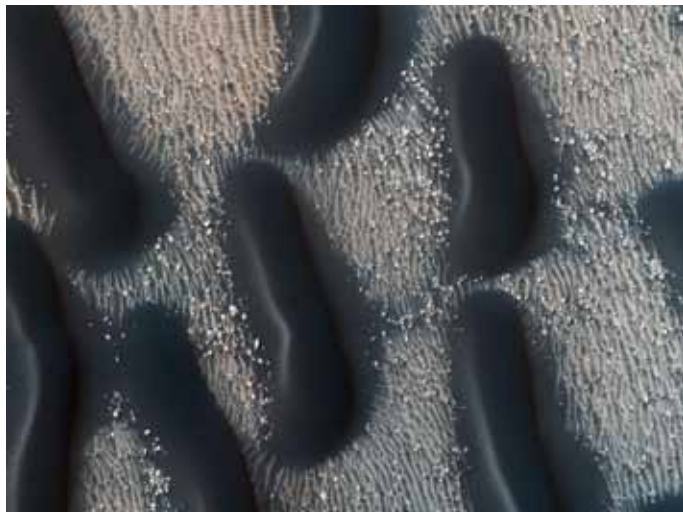
This richly illustrated book, with its accompanying CD-ROM of full-color geological maps (scale 1:250,000) and stratigraphic-structural documentation, provides a comprehensive review of the geology and tectonics of the central-southern Apennines, one of the classical fold-and-thrust belts of the Alpine orogeny. It is a useful and up-to-date reference for researchers, teachers, and explorationists and can be used to plan either real or virtual field trips to some of the most beautiful mountain areas of Italy.



"Susie wants to win an MTV Music Award. Jimmy wants his own reality show. Molly wants implants, lipo, and an entourage. Doesn't anyone want toys anymore?!"

Test Your Knowledge

Test your knowledge and see if you can guess where on Earth (or off) this image is from. Answer will be in next month's issue.



Test Your Knowledge — Last Month's Answer



Photo of a geological intrigue the Moeraki Boulders in the South Island of New Zealand.

They begin their lives buried deep in the earth along the banks that fringe the beach. The famous Moeraki Boulders are septarian concretions formed in the mudstone earth. The constant battering of the ocean waves erodes the mudstone to reveal these almost spherical boulders which are scattered along the beach - a geological intrigue. Moeraki Boulders, Moeraki Beach, Otago, East Coast, South Island, New Zealand.

Membership News

Next Board Meeting

The next Board Meeting will be Wednesday, Dec. 22, 7:30 a.m. at Ruby K's.

Join the LAGS Google group for the latest club information! <http://groups.google.com/group/los-alamos-geological-society>

Follow LAGS on Facebook! www.facebook.com

Useful Links (courtesy of AGS Newsletter)

Four Corners Geological Society – www.fourcornersgeologicalsociety.org

Wyoming Geological Society – www.wyogeo.org

Utah Geological Association – www.geology.com

Club Calendar 2010

Dec. 4–5—Earth Treasures Show.

Dec. 14—LAGS Regular meeting. Wrap-a-rock Party!

Dec. 13-17—AGU Fall meeting in San Francisco.

Dec. 22—LAGS Board meeting at 7:30 a.m. at Ruby K's.

Jan. 22—LAGS Annual Banquet. Speaker is Dr. Giday WoldeGabriel, Los Alamos National Laboratory. He will be speaking on recent findings on earliest humans from Africa.

Newsletter Deadlines

email: lmendius@hotmail.com

If you have items that you would like to see in the newsletter, please contact Louise Mendius on or before the last Thursday of the month. The deadlines for each newsletter issue are:

January 2011 issue: December 29, 2010

February 2011 issue: January 28, 2011

March 2011 issue: February 25, 2011

April 2011 issue: March 28, 2011



LOS ALAMOS GEOLOGICAL SOCIETY
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Raffle		
Refreshments	Barbara Carlos	662-5086
Science Fair Judges:	Richard Stead and Paul Bradley	

Our organization is devoted to studying and promoting interest in geology, mineralogy, archeology, paleontology, and the lapidary arts. Membership is available to any person, family, or institution in sympathy with the objectives of the Society.

General meetings are held on the third Tuesday of the month at the Christian Church, 92 East Road, Los Alamos at 7:30 p.m. The Executive Board meets the fourth Wednesday of the month. Field trips are held the Saturday following the general meeting. Exceptions to the schedules for field trips are published in the Obsidian Observer.

All activities and field trips of the Society are open to the public; reservations may be required for some events. All memberships are family memberships with annual dues of \$20. The dues entitle a family to participate in LAGS activities until the end of the calendar year. Any officer of the Society may be contacted for additional information.

The Society is a member of the RMFMS and an affiliate member of the AFMS, and is a sponsor of the New Mexico Symposium at Socorro, NM. Articles may be printed from the Obsidian Observer if credit is given to authors and their publications.

FIRST CLASS