



# GEOLOGICAL SOCIETY OF NEVADA NEWSLETTER

Geological Society of Nevada, 2175 Raggio Parkway, Room 107, Reno, NV 89512  
(775) 323-3500 - Hours Tuesday -- Friday, 8 a.m. to 3 p.m. Monday by appointment.  
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## CALENDAR OF GSN EVENTS

### Dec. 4, 2014 Thursday **SO. NEVADA CHAPTER JOINT HOLIDAY PARTY WITH AEG and the NEVADA FRIENDS OF PALEONTOLOGY**

The party will be held at the Las Vegas Natural History Museum at 900 Las Vegas Blvd. N., Las Vegas, NV. Begins at 5:30 p.m. A light talk will begin at 6:15 pm.

**Speaker: Dr. Melissa Giovanni, a new professor at UNLV, will present her talk "A geologic trek around Torres del Paine, Patagonia". The party will be potluck-style so please bring a dish to share .** Please contact Josh Bonde for more information [Joshua.bonde@unlv.edu](mailto:Joshua.bonde@unlv.edu). Details on page 9.

### Dec 10, 2014 Wednesday **WINNEMUCCA CHAPTER MEETING & SILENT AUCTION FUNDRAISER**

The meeting will be held at the Martin Hotel, 94 W. Railroad St. Silent Auction along with Appetizers & Drinks at 6:30 p.m., Talk at 7:30 PM. **Speaker: Caleb King, University of AZ. Title: "Eocene Hydrothermal Systems and Contrasting Hydrothermal Alteration in the Battle Mountain District, Nevada". Food & Drinks Sponsored by: MAJOR DRILLING.** Please contact Pat Donovan at [pat.donovan@newmont.com](mailto:pat.donovan@newmont.com) for more information. Abstract and other meeting details on page 8.

### Dec 17, 2014 Wednesday **GSN CHRISTMAS MEETING, SILENT AUCTION & RAFFLE!**

The GSN's annual Fundraiser meeting & dinner will be held this year at the J.A. Nugget, Sparks, NV! Special Guest Speaker is George Davis, University of Arizona on *The Beauty of the Geology of the Colorado Plateau*. Cost for dinner—\$35. **Drinks Sponsored by PERSHING GOLD.** Please make reservations with Laura Ruud at the GSN Office, [gsn@gsnv.org](mailto:gsn@gsnv.org). Details and abstract on page 3. Silent Auction & Raffle details on page 10.

### Dec 18, 2014 Thursday **ELKO CHAPTER HOLIDAY PARTY & SILENT AUCTION FUNDRAISER**

The party will be held at the Western Folklife Center, 501 Railroad St., Elko, NV. Drinks at 6:00 PM, Dinner at 6:30 PM. **Food & Drinks Sponsored by: BOART LONGYEAR.** Please contact Jon Powell at [jon.powell@newmont.com](mailto:jon.powell@newmont.com) for more information. Details on page 9.

**YOUR G.S.N. MEMBERSHIP DUES FOR FY2015 ARE DUE NOW & WILL BE LATE ON JANUARY 1, 2015!!**  
**(Thank you to those who've already renewed for this fiscal year!)**

**G.S.N. DECEMBER MEETING SPONSOR**



pershing gold

**FROM THE PRESIDENT, DECEMBER 2014**  
**“G.S.N. FOR LIFE”**  
**Jon Price, G.S.N. President 2014-2015**



GSN is now offering Lifetime Membership. The cost this year is only \$1,250, for which you will receive membership benefits (the GSN newsletter and opportunities to attend sponsored meetings, field trips, symposia, social events, etc.) for the rest of your life. The logic behind this number is that it is 25 times the current annual dues (\$50). Given the track record of the stock market over the last several decades, we can expect that GSN's investments will stay up with inflation and generate revenue of at least 4% per year, which would be used to pay for your ongoing annual membership benefits (4% of 1250 = 50). Here are four reasons why you should consider signing up for GSN Lifetime Membership:

If you had a good year (that is, if you have a job, or if you had a good year as a consultant), do it now, in case next year isn't as good.

If you aren't sure whether you'll be professionally active 25 years from now, consider it a donation to a great organization. Your contribution now will help assure GSN's financial stability.

If you think you will be working in the geological, exploration, or mining profession 25 years from now, consider it a good business decision. You'll never have to pay the dues again, even if the annual dues rises with inflation.

If you have ever forgotten to pay your dues and wish you hadn't, consider it a hedge against Alzheimer's disease. The GSN office will, however, send annual reminders that you can contribute to the GSN Foundation (for its great support of geology-related field trips for K-12 students; scholarships to UNR, UNLV, and Great Basin College students; grants to support summer field camp for geology students; and support of final cartography of geologic maps contributed to the Nevada Bureau of Mines and Geology for publication).

To help encourage members to sign up for GSN Life Membership, I'll be awarding some unique prizes during the April meeting – likely some significant Nevada-shaped (Nevada) rocks – to the oldest and youngest GSN members who sign up. If you have already paid your \$50 dues for the 2014-2015 fiscal year, please send a check for only \$1,200 (payable to Geological Society of Nevada) to Laura Ruud, Geological Society of Nevada, 2175 Raggio Parkway, Room 107, Reno, Nevada 89512. Otherwise, if you are like me and delinquent on paying your dues for this fiscal year, send a check for \$1,250.

Congratulations to the three students (and their advisors) who recently won the top three prizes during the 2014 Student Geologic Map Competition of the Geological Society of America during its annual meeting this fall in Vancouver, BC:

Chad Carlson: First place for his *Geologic Map of the Terrill Mountains, western Nevada*. Ph.D. student (Advisor-Jim Faulds)

Russell DiFiori: Second place for his *Geologic Map of the Eureka Mining District, eastern Nevada*. M.S. completed-May 2014 (Advisor-Sean Long)

Joel Edwards: Third place for his *Geologic Map of Neal Hot Springs, eastern Oregon*. M.S. completed-May 2013 (Advisor-Jim Faulds)

That is a remarkable achievement and demonstrates that UNR is a first-class university for the training of the next generation of geologic mappers. Jim noted that “all three worked incredibly hard and dedicated many months to generating some very detailed and beautiful maps of some very complex geology. These maps will stand as enormous contributions for many years to come.” Jim also thanked NBMG's Cartographic/GIS staff for helping the students with layout and technical assistance on the maps.

Don't miss this month's GSN meeting, on Wednesday, December 17, at the Nugget in Sparks, when we have the GSN Holiday Party and GSN Foundation Raffle and Auction. There will surely be some fine Nevada-shaped (Nevada) rocks in the raffle, and the talk, by University of Arizona Professor George Davis on *The Beauty of the Geology of the Colorado Plateau* will be the highlight of the evening. Upcoming GSN Fridays include:

January 16 - Paul Hohbach, Coeur, on silver deposits in the western US

February 20 – Alan Koenig, USGS, Denver – Where the Trace Elements in Ore Deposits Live - Applications of a New Elemental Analysis Technique.

March 20 –UNR-Department of Geological Sciences and Engineering Faculty – A Sampling of Geoscience Research at UNR

April 17 – UNR student posters and 5-minute presentations (TBD)

The year will be capped off with the GSN 2015 Symposium, May 14-24, including short courses and field trips. Registration is open through the GSN website. Happy Holidays!

**Thanks to ENVIROTECH DRILLING**  
**For Hosting the GSN's NOVEMBER 21st MEETING!**

# GSN DECEMBER 17, 2014 Membership Meeting

## Reservations Are Required - Please Cancel if You Are Unable to Attend

Please e-mail [gsn@gsnv.org](mailto:gsn@gsnv.org) or call 775-323-3500 by 4 p.m. on FRIDAY, DECEMBER 12, 2014.

Social Hour, Silent Auction & Raffle: @ 6:00 pm; Dinner @ 7:00 pm; Live Auction @ 7:30 pm; Speaker @ 8:00 pm

Location: J.A. NUGGET, SPARKS, NEVADA. Interstate 80 east to Rock Blvd/Nugget Avenue exit.

(Park in the Nugget garage and take 2nd Floor Skywalk)

**\$35.00 per person. PRE-PAYMENT IS ENCOURAGED! (See form attached with newsletter)**



## The Beauty of the Geology and Landscapes of the Colorado Plateau

George H. Davis, Regents Professor, The University of Arizona

Geologists have a secret that few outsiders know. In *The Grace of Great Things* author and humanist Robert Grudin touched upon this secret, but without reference or thought to the life and work of geologists. He wrote:

*“What liberates the imagination is the sense that work in its theory and practice holds aesthetic possibilities, that jobs can be elegantly conceived and gracefully done. This sense of beauty unlocks feelings of pleasure ... and breaks down the barrier between worker and work; [we] commit to work not merely the ‘thinking’ consciousness but the full resources of the mind.”*

As geologists we can relate to this, for our ‘work’ takes us from time to time into regions of sublime beauty, and into ‘wilderness’ experiences that contrast so sharply, and in such a welcome way, to most aspects of the frenetic pace of contemporary life. For me, the ‘factory’ to which Grudin’s philosophy especially applies is the Colorado Plateau. Geological exposures in this raw semi-arid landscape give the ‘worker’ a sense that he/she is looking at 3D sculptures positioned on pedestals for complete 4D viewing. It is no wonder that so many of America’s National Parks and Monuments are located within the Colorado Plateau.



Navajo Sandstone exposed on flank of Kaibab uplift, big horn sheep for scale (photo by George Davis)

Committing the ‘full resources of the mind’ of geologists is non-trivial, for geologists tend to have certain learned-capacities for ‘seeing’ the world in ways that are quite rare. The history of our science, the training of geologists, and the exploration for new discoveries place a premium on the development of certain special categories of vision. I refer to these as *paleovision*, to see ancient landscapes, seascapes, and paleoclimates; *subsurface vision*, to see what structures and natural resources lie beneath the surface of the earth; *chrono-vision*, to see the duration and passing of time; and *rheological vision*, to see that regions of so-called solid rocks are almost without strength in response to the steady drumbeat of plate motions. These capacities of vision are what is unique about geology and geologists, not just the knowledge and facts that are organized into the ‘buckets’ we happen to call stratigraphy, paleontology, petrology, structural geology, economic geology, and the like.

Let’s begin to close out 2014 AD by leaving our buckets at home, putting on our ‘vision goggles’, and exploring some of the geology and landscapes of the Colorado Plateau. We will pay closest attention to the classic *Kaibab Uplift*, which in Paiute means ‘mountain lying on its side’. To appreciate more fully the Kaibab and its setting we need to ‘take in’ the San Francisco Peaks, the Grand Canyon, Kodachrome Basin and Cottonwood Road, Bryce and Zion canyons, Capitol Reef, Monument Valley, and the Henry Mountains.

(See George Davis’s Bio-Sketch on page 7)

# “FACES OF GSN”

## Justin and Ajeet Milliard

It is an honor for us to be selected for an article in the “Faces of GSN” series, a tome of geo-lives well lived, shared by a humble family of geologists. We only recently had the privilege of joining GSN but have already gained valuable friendships and insights into the small global community formed by GSN geologists. Admittedly, our story will be shorter than most because of our ages, but it speaks to the opportunities and experiences afforded to our cadre of scientists residing in Nevada.

### BORN GEOLOGISTS

The Milliard’s interests in geology were fashioned at a young age during their outdoor-oriented childhoods. Ajeet grew up at the base of Black Butte (a small stratovolcano made famous to beer enthusiasts by Deschutes Brewery). She spent her childhood hiking and skiing the Oregon Cascades well into her twenties. Her introduction to formal geology was at Central Oregon Community College where her Geology 201 professor, Bob Reynolds, fueled her interests in Oregon’s volcanic story. Ajeet earned her associate’s degree at Central Oregon and later transferred to Oregon State University. There she completed her bachelor’s degree in 2008 and master’s degree in 2011 under the guidance of professor Andrew Meigs. Her thesis investigated the transition zone between continental contraction and extension, from north to south respectively, east of the flanks of Mt. Hood. During her time at Oregon State, Ajeet was exposed to geology beyond the study of volcanoes that consume many Oregon geologists. Instead, an interest in tectonics and fold-and-thrust belts was spurred by a trip to the Pyrenees Mountains and a National Association of Geoscience Teachers internship with the USGS at Menlo Park under the direction of Walter Mooney.

Justin’s childhood was spent in the shadow of the Rockies in Parker, Colorado. He spent much of his youth exploring not only Colorado, but also all corners of the West with his parents and five siblings. His father was the General Manager/ Vice President for the Rocky Mountain office of Viking Resources Corporation located in Denver but was admittedly jealous of the company’s field geologist. He therefore nurtured Justin’s interests in the outdoors and suggested he pursue a bachelor’s degree in professional geology, which Justin did at the University of Montana, which was close to where his family had recently retired. Here Jim Sears, Marc Hendrix and Don Winston fueled Justin’s innate interests in economic and structural geology. Justin spent a summer as an intern in Alaska at Kennecott-Hecla Greens Creek Mine under the direction of Mike Satre. Following graduation with his bachelor’s in 2006, Justin spent the summer as a field assistant mapping the Blackfoot River Basin (where he also spent much time fly fishing). Justin then spent a year in the oil patch as a mud logger for Pason Systems USA under the leadership of Joe Watson, best known by an infamous business up front – party in the back hairstyle.

### PATHS COLLIDE

Mud logging has proven to be an integral part of both Ajeet and Justin’s professional history, providing ample time for reflection and an impetus for redirecting their career paths. Justin’s mud logging time was spent on the western slope in Colorado and Utah, where he enjoyed being reacquainted with the colors and grandeur of the Colorado Plateau. However, it was during this time of reflection when he chose to begin his master’s degree at Oregon State, also under the guidance of Andrew Meigs. It was during this time that both Justin and Ajeet’s geologic and romantic fates would intertwine, the later of which was neither in their advisor’s plan nor NSF proposal.



**Fig. 1:** Deschutes River outside Maupin, OR where Sitka and Justin aided Ajeet in her field-work on one of the state’s great fly-fishing rivers

Ajeet had recently arrived in Andrew’s tectonics lab to complete her senior thesis and was present the day Justin came to settle in. After claiming the best desk in the office (or so he thought), Ajeet kindly informed him that it was already taken...by her. It only looked empty because she kept it extraordinarily clean, and this is where the subtle sassiness began. Justin’s thesis project was to map Tertiary volcanics and sediments in Oregon’s southeast corner to understand the tectono-magmatic history of the greater Harney Basin in Oregon. Unknowingly, it was a project that would lend well to his employment in the Nevada mining industry a few years down the road. Supplementing his time in the desert, Justin was fortunate to be selected for two Oregon State/University of Washington oceanographic research cruises in the central Pacific Ocean as a research assistant. Not only did these cruises allow him to test his sea legs for 4 months (an ambition of the landlocked child), (Cont. on page 5)

(Milliards—Cont. from page 4)

child), it gave him a fortuitous opportunity to explore two meccas of volcanology, Hawaii and the Galapagos.

## “EXPLORING” ECONOMIC GEOLOGY

Albeit neither of their theses had an economic focus, both Ajeet and Justin, however, were encouraged by Dr. Meigs to take courses taught by Oregon State’s economic geology professor, John Dilles. He challenged them to explore beyond their comfort zones of folds, faults and volcanics into the complicated multi-disciplinary realm of economic geology. Dilles also wasn’t shy to put Justin’s crow-hop in check in distance throwing competitions at Oregon State’s field camp (Justin, being the zealous teaching assistant and ignorant of John’s past life as a short-stop for Cal-Tech’s baseball team). Though not a serious interest at the time, this exposure to mineral deposit geology proved to be one of the more critical experiences for both of them.



**Fig. 2:** LCDR McCaslin and Ensign Milliard following a successful aerobatics flight

After Justin defended his thesis in January 2010, both he and Ajeet moved to Florida. During this time, Ajeet decided to explore the life of a mud logger in Pennsylvania and California while Justin stepped away from geology to try his hand at another childhood dream: flying. He was commissioned in the US Navy and spent approximately two years training as a Naval Flight Officer before both his trainers and loved ones piloted him back to a career in geology; to be shared with his future wife. The timing of his decision allowed Justin to figuratively “slip out” the backdoor of active duty to reserve status, where he currently resides.

Concurrently, there was a slowdown in oil and gas drilling and Ajeet was hired by

Ronald Lujan at Newmont to be a contract core logger on the Buffalo Valley project. After several months on contract work, Ajeet was hired on full-time by Dick Reid to the Great Basin Exploration Group. This new position offered an upgrade in living status from the remote Valmy RV Park to big city life in Elko. At the same time, Justin was wrapping up active-duty responsibilities in Florida and preparing to join her. After a two-year hiatus, Justin’s return to geology was a success as he secured a contract exploration job through a fellow University of Montana alum Robert Kell, who was vice president of exploration for a Canadian junior, SAMEX. Justin was promptly on a plane to Chile. Ajeet spent the next year (2011-2012) working halo exploration on the Long Canyon gold deposit, assisting on a summer exploration-sampling campaign in Alaska for Newmont and fulfilling the treasurer position of the Elko GSN Chapter. All the while, Justin spent 90 percent of that year mapping in Chile’s Atacama Desert and managing a drilling campaign of epithermal, IOCG and porphyry systems. Naturally, his down time was spent taste testing a variety of Chilean Caménère and Cristal (THE beverages of choice for any Chilean geologist).



**Fig. 3:** Allie Phillips and Ajeet at the base of Denali during their summer field season in Alaska with Newmont

## CALLING NEVADA HOME

Fall of 2012 was transformative for these two as a couple and as geologists. Ajeet and Justin were married in Lamoille Canyon. The couple was quickly adopting Nevada as their home and wanted to share the hidden beauty and allure in their backyard with their family and friends. The newlyweds tentatively anticipated working together as geologists in Chile but unforeseen managerial circumstances at SAMEX led to its decline after 19 years. Instead, Justin was hired by Jerry Zeig at Tintina Resources Inc. and started working in Montana as a contract exploration geologist on the Black Butte Copper Project. After three years spent on opposite sides of the country and planet, Justin and Ajeet reveled in being separated by only two states, making it easy for romantic rendezvous and snowboarding weekends in remote Montana. Though an interesting project, Tintina was still awaiting funding and state approval to move forward on the Black Butte (Cont. pg. 6)



**Fig. 4:** Atop the Maricungas in Chile visiting the highest active volcano in the world, Ojos del Salado masked in the clouds, with fellow OSU alum Lauren Foiles

(Milliards, Cont. from pg. 5)

project. This limited long-term employment possibilities for Justin and signaled that it was finally time to work in the same area code as Ajeet.

In January 2013, Justin began employment with a rapidly evolving Canadian junior, Klondex Gold and Silver Mining Company, at their Fire Creek Exploration Project in Lander County.

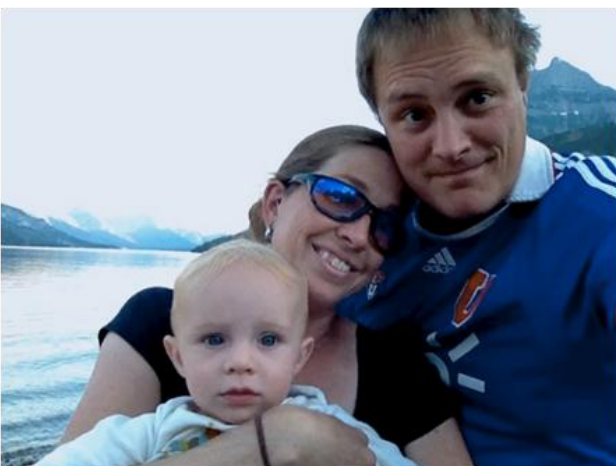
Chief geologist Steve McMillin recognized the need to better understand the complicated nature of mineralization in the narrow, high-grade vein setting. Fortunately for Justin, a background specializing in extensional tectono-volcanics fit the bill. Working tirelessly, the Klondex team was able to bring the geologic picture together, operate a very successful bulk-sampling campaign and raise the capital to position the company for successful growth. Shortly after starting at Klondex, Ajeet shared the news that although he may not ever fire live-ammunition from a jet, Justin's personal armament was on target and they were expecting their first child in October. Upon learning of this life change, Ajeet chose to continue her work on the Long Canyon deposit in a new capacity; as a research project for a doctorate program at the University of Nevada Reno.



**Fig. 5:** Parents and close friends share in festivities at the culmination of our wedding party/ceremony at the Lion's Camp in Lamoille Canyon

## BACK TO SCHOOL

On October 7, 2013, the couple's junior geologist was ready to vacate his first studio apartment and enter the outside world. To assist in this next chapter, Ajeet's parents volunteered to make what most western Oregonians would consider a great sacrifice: moving to the desert of northeastern Nevada from the beautiful and VERY green Oregon coast. They have quickly grown to appreciate the Silver State's raw beauty and seasons. Soon thereafter the Milliard clan moved to Reno in preparation for Ajeet's first semester back as a student in January 2014. Ajeet reinvigorated her academic spirit and skills, completing her first field season with husband and son operating her field camp out of Wells and her parents managing the base camp in Lamoille. Having family nearby allowed Ajeet to do field work, Justin to continue at Fire Creek and for Caylen to thoroughly entertain his grandparents. Justin sunk his roots further into Nevada, taking on duties as membership chair for the Elko GSN Chapter for the 2014-15 session. Continued success for Klondex Mines Ltd. at both its Fire Creek Exploration Project and recently acquired Midas Mine allowed Justin and his supervisor, John Marma, to successfully submit a proposal to Klondex senior management to fund a doctoral research project. The project's focus will be the Northern Nevada Rift and using it to understand intra-continental rift formation, which we believe, is the result of a continental scale self-organizing system. A system with multiple mechanisms, such as Basin and Range tectonism and Yellowstone hot spot magmatism influencing its development and subsequent hydrothermal activity directly related to epithermal deposit location and formation. Working with John Muntean, the director of the Ralph J. Roberts Center for Research in Economic Geology (CREG) at the University of Nevada, Reno, Justin has submitted an academic proposal to the CREG committee to assist in funding. They are anxiously awaiting the projects approval to begin the academic program in January 2015.

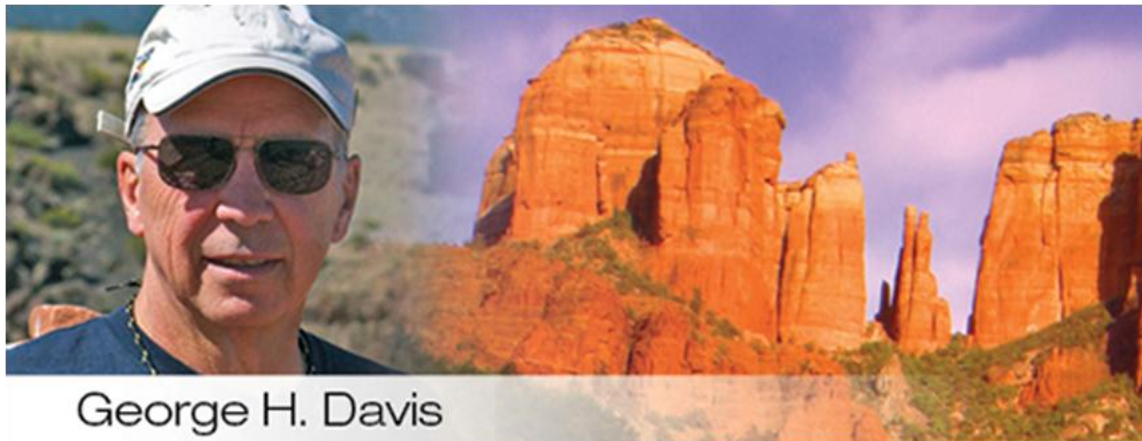


**Fig. 6:** Geology-centric family vacation to Waterton Glacier National Peace Park with our new junior geologist Caylen

## JUST THE BEGINNING

Our careers are still in their adolescence but have afforded us a wealth of amazing experiences, sunsets, vistas, outcrops, friends and lives. A reflection repeated by every "Face of GSN" is worthy of repeating yet again: It is hard to believe we get paid to do what we innately delight in, "geologizing" or "arm-waving" ... depending on who is speaking. We constantly remind ourselves to enjoy every day in a life where recreation and career unite. We anticipate long and successful careers in economic geology that we hope will culminate in a second contribution to the "Faces of GSN" some 50 years from now; in our careers' retirement phase (which we all know never really happens for a field geologist). We thank our families (near and far), friends, supervisors (Klondex and Newmont), advisors (Central Oregon Community College, University of Montana, Oregon State University and University of Nevada – Reno) and colleagues (GSN and beyond) for their support and flexibility in allowing us both the opportunity to pursue our professional and personal goals in this challenging field.

(Speaker Bio from page 3)

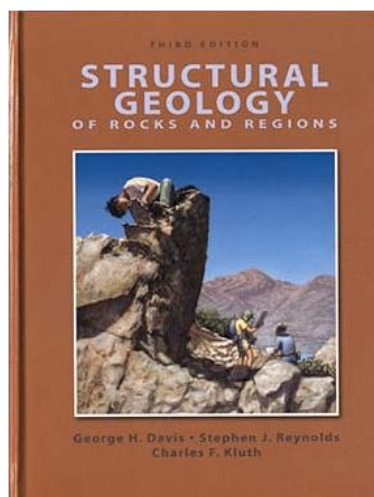


### *Bio-Sketch*

George Davis is a field-oriented structural geologist whose primary scientific investigations have been carried out in the American Southwest, especially within the Colorado Plateau and Basin and Range Provinces. He and Peter Coney originated the concept of mid-Tertiary extensional metamorphic core complexes. George's ongoing work includes geochronology research on the Sanctuary of Zeus on Mt. Lykaion, Greece. George is a Regents Professor in the Department of Geosciences at The University of Arizona and has served there in a number of leadership capacities, including Head of Geosciences, Vice Provost of Academic Affairs, Executive on Loan to the Board of Regents, Vice President for Business Affairs, and Executive Vice President and Provost.

George earned degrees in geology from The College of Wooster (BA), The University of Texas, Austin (MA), and The University of Michigan (PhD). He has authored nearly 200 publications in geology, advised ~45 M.S. and Ph.D. students, and served on the research committees of ~125 graduate and undergraduate students. His undergraduate structural geology textbook (*Structural Geology of Rocks and Regions*), used internationally, is now in its 3<sup>rd</sup> edition and has extended his 'reach' as a teacher.

George has served science broadly, including chairing the Advisory Committee for NSF's Geosciences Directorate, and serving as President of the Geological Society of America. George received the Lindgren Citation Award for Excellence in Research, conferred by the Society of Economic Geologists; and was selected by The University of Michigan as among its 100 most distinguished Ph.D. recipients. Recent awards have included an Honorary Doctoral Degree from Carleton College (2012); being named the National Recipient of the "Inspire Integrity Award", a teaching award conferred by the National Society of Collegiate Scholars (2012); and receiving the Career Contribution Award in Structural Geology and Tectonics, conferred by the Geological Society of America (2010).



# GSN WINNEMUCCA CHAPTER MEETING & SILENT AUCTION

**WEDNESDAY, DECEMBER 10, 2014**

**Location: The MARTIN HOTEL, WINNEMUCCA, NV**

**Time: 6:30 p.m. SILENT AUCTION and Appetizers/Drinks**

**MAJOR**  
Drilling America, Inc.

**7:30 p.m.—Talk begins**

**MAJOR**  
Drilling America, Inc.

**SPEAKER: CALEB KING, University of Arizona**

**Food and Drinks Sponsored by: MAJOR DRILLING**

**There will also be a Food Drive so please donate non-perishable food items!**



## **Eocene Hydrothermal Systems and Contrasting Hydrothermal Alteration in the Battle Mountain District, Nevada**

Caleb A. King\* and Mark D. Barton

*Department of Geosciences and Institute for Mineral Resources, University of Arizona*

### **ABSTRACT**

The Battle Mountain district in north-central Nevada hosts numerous Eocene intrusive centers that have hydrothermal systems, many with associated Cu/Au mineralization. Mineralization types include porphyry-type Cu-Au(-Mo), distal-disseminated Au, and Au ± Cu skarns. These systems contain high-temperature quartz veins, potassic and sericitic alteration, and abundant sodic-calcic, calcic, and potassic-calcic alteration. Most systems, including Copper Canyon, Copper Basin, and Buffalo Valley and the deeply exposed Elder Creek porphyry system, have superimposed features. For these systems, crosscutting relationships, combined with published geochronology and 37 new U-Pb dates, demonstrate that the Au(-Cu) systems are Late Eocene (39-42 Ma). Conversely, mid-Cretaceous magmatism (94-98 Ma) generated porphyry Mo(-Cu) mineralization at Buckingham and Buffalo Valley Moly.

Alteration assemblages in these Eocene systems form distinct zones and were defined by mapping secondary mineral assemblages and by petrographic and electron microprobe studies. Alteration of siliciclastic rocks and igneous rocks in the district includes: potassic alteration (Qz + Bio + Kf ± Rut with Po + Asp + Cpy + Py ± Mt ± Au), sericitic alteration (Qz + Ser + Py with varying amounts of Chl + Asp + Cpy), sodic-calcic alteration (Na-plag + Act + Dio + Chl + Tit + Ep + Ap ± Gar ± Scap, associated with the removal of metals from the host rocks), potassic-calcic alteration (Kspar + Dio + Act + Gar + Ep + Tit + Ap with Cpy + Py + Mt ± Hm; Qz dissolution), and calcic alteration (Ca-plag + Act + Dio + Qz ± Gar with Cpy + Py + Mt ± Hm). Two types of skarn occur in the district. Fortitude-type skarns replace carbonate rocks and consist of Cpx + Gar + Po with Au + Cu mineralization, whereas Copper Basin-type skarns replace feldspathic and silicic as well as carbonate rocks and consist of Gar + Hem + Mt with Au + Cu mineralization.

The volume and distribution of these alteration assemblages, combined with petrologic considerations, indicates two main fluid sources: magmatic fluids generated potassic, sericitic, and Fortitude-type skarns, and moderately saline, non-magmatic fluids produced Na-Ca(-K) alteration mineral assemblages and Copper Basin-type skarns. Those features inferred to be magmatic-hydrothermal are restricted in their extent (ca. 1 km) and related to particular intrusive phases, whereas the Na-Ca-K alteration typically extends over many kilometers and is not correlated to any particular intrusive phase.

In addition to our work at Battle Mountain, reconnaissance and selected new mapping has revealed that other exposed Eocene plutons in northeastern Nevada may contain many analogous features. Many of these plutons exhibit local magmatic-hydrothermal features including potassic (secondary Bi ± Kf) alteration and quartz veins, yet the distinctive Na-Ca-K alteration is remarkably widespread and heretofore, largely unnoted. Observations within the Battle Mountain district and regionally indicate that a variety of fluids – magmatic and non-magmatic – played significant roles in Eocene intrusion-centered hydrothermal systems, and that the consequences of both fluid types, particularly the latter, need to be considered in interpreting Cenozoic metallogeny.



**GSN SOUTHERN NEVADA CHAPTER JOINT HOLIDAY PARTY  
WITH THE A.E.G. and the FRIENDS OF NEVADA PALEONTOLOGY**

**THURSDAY, DECEMBER 4, 2014**

**Location: The Las Vegas Natural History Museum, 900 Las Vegas Blvd. N.**

**Time: 5:30 p.m. Food & Drinks**

**The party will be potluck style so please bring a dish to share .**

**6:15 p.m.—Presentation begins**

**SPEAKER: Dr. Melissa Giovanni, UNLV Professor**

**TITLE: "A geologic trek around Torres del Paine, Patagonia"**

**Please contact Josh Bonde for more information [Joshua.bonde@unlv.edu](mailto:Joshua.bonde@unlv.edu).**



**GSN ELKO CHAPTER HOLIDAY PARTY & SILENT AUCTION/RAFFLE**

**THURSDAY, DECEMBER 18, 2014**

**Location: The WESTERN FOLKLIFE CENTER**

**Time: Refreshments @ 6:00 p.m.**

**Dinner @ 6:30 p.m. catered by Luciano's**

**Silent Auction & Raffle to benefit the Elko Scholarship Fund**

**Food and Drinks Sponsored by: BOART LONGYEAR**



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# G.S.N.'S ANNUAL CHRISTMAS MEETING, ROCK RAFFLE & AUCTION

WEDNESDAY, DECEMBER 17, 2014

J.A. NUGGET, SPARKS, NEVADA (note change of venue!!)

Dinner Cost - \$35.00/person

6 p.m. - Open Bar, Raffle & Silent Auction

7 p.m. - Dinner (\$35), 7:45 p.m. - Live Auction, 8 p.m. - Presentation

Sponsor for the Evening is:



We are still seeking donations of any items suitable for the raffle or silent auction: gift baskets, attractive rock or mineral samples, gems or gemstones, jewelry, wine or other spirits, logo items, geological equipment, commemorative coins, GOLD, or any geology or mining-related items will be gratefully accepted. Raffle proceeds support GSN Foundation's educational projects.

Donors will have their names displayed on signs at the event as well as having their names listed in the January newsletter.

Please contact D.D. LaPointe to drop off donated items with her or to arrange pick-up of donated items. **We need to have all items in hand by Monday, December 15, 2014.** Thank you for your support! D.D.'s cell number is 775-240-4916 and email is [dlapoint@unr.edu](mailto:dlapoint@unr.edu).

Donations can also be dropped off with Cami Prenn at Mine Development Associates, 210 So. Rock Blvd., Reno OR with JoAnn Newbury at NuLegacy Gold, 5450 Riggins Court, Suite 1B. Reno, NV. Call JoAnn in advance at 775-224-1717. You can drop off donations with me at the GSN office too!

## Nevada Geology Calendar 2015 is here!

The Nevada Bureau of Mines & Geology's 12-month 2015 calendar features a different geologic topic each month:

Snow Covered, Lacustrine Sediments, Pahranaagat Shear Zone, Sandstone, Natural Arches, Hot Springs, Las Vegas Valley, Metamorphic Rocks, Ruby Mountains, High Alpine, Folded Rock, Black Rock Desert, and Abandoned Mine Safety. It is full of beautiful photos highlighting Nevada's scenic wonders and also includes interesting facts about Nevada geology that really make you want to go and visit those sites. **\$15 ea.** Click here to order:

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12-month calendar



calendar dimensions: 13" x 9.5"

Monthly topics include... Snow Covered • Lacustrine Sediments • Pahranaagat Shear Zone • Sandstone • Natural Arches • Hot Springs  
Las Vegas Valley • Metamorphic Rocks • Ruby Mountains • High Alpine • Folded Rock • Black Rock Desert  
Interesting facts about Nevada and Nevada geology also included

NEVADA BUREAU OF MINES AND GEOLOGY

*Thank you to our generous donors in November!*

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## Activity Update

Mike Brady, October 2014  
[www.activityupdate.com](http://www.activityupdate.com)



### NEVADA

Navaho Gold Ltd. announced that it terminated its interest in the Utah Clipper Property of Columbus Gold Corp. *Press Release: September 18*

Freeport McMoRan Mineral Properties Inc. announced that it acquired an option to purchase the Southwest Tintic, Utah; Butte Valley, Nevada and the Cave Peak, Texas properties from Quaterra Resources Inc. for \$5,000,000 cash over 2 years. (resource @ Butte Valley = 181,800,000 tonnes @ 0.60% Cu inferred) *Press Release: September 11*

Gold Resources Corp. announced that it acquired an option to earn a 100% interest in the Radar Property from Altan Nevada Minerals Ltd. for \$1,500,000 cash. *Press Release: September 10*

West Kirkland Mining Inc. announced that recent drill results at the Three Hills Project include 161.54-174.26 meters @ 0.61 gpt Au, 4.0 gpt Ag (TH14R-02); 128.02-134.11 meters @ 0.48 gpt Au, 3.2 gpt Ag (TH14R-03); 172.21-222.5 meters @ 0.73 gpt Au, 3.2 gpt Ag (TH14R-04) and 179.83-185.93 meters @ 1.03 gpt Au, 5.0 gpt Ag (TH14R-05). (resource = 7,731,000 tonnes @ 0.61 gpt Au measured+indicated) *Press Release: September 9*

Scorpio Gold Corp.(70%) announced that recent drill results at the Mineral Ridge/Brodie Project include 0-3.05 meters @ 0.55 gpt Au (MR14850); 32.0-33.53 meters @ 1.06 gpt Au (MR14899); 76.2-83.82 meters @ 0.84 gpt Au (MR14941) and 68.58-70.1 meters @ 1.51 gpt Au (MR14957). *Press Release: September 16*

Rye Patch Gold Corp. announced that recent drill results at the Gold Ridge Project include 61-93 meters @ 0.15 gpt Au (GR-016); 56.4-76.2 meters @ 0.67 gpt Au (GR-017); 0-18.3 meters @ 0.23 gpt Au (GR-018) and 0-24.4 meters @ 0.24 gpt Au (GR-019). *Press Release: September 15*

Premier Gold Mines Ltd. announced that it completed the purchase of a 100% interest in the Cove-McCoy Property from Newmont Gold Corp. (resource @ Cove = 425,000 tonnes @ 10.46 gpt Au indicated) *Press Release: September 11*

Pilot Gold Inc.(78%) announced that recent drill results at the Kinsley Mountain Project include 411.5-437.4 meters @ 1.34 gpt Au (PK153); 255.1-273.4 meters @ 3.91 gpt Au (PK159C); 235.0-239.9 meters @ 6.81 gpt Au (PK162C) and 280.4-283.6 meters @ 1.10 gpt Au (PK166C). *Press Release: September 10*

Pershing Gold Corp. announced that recent drill results at the Relief Canyon Project include 131.1-154.8 meters @ 1.26 gt Au (RC14-160); 148.5-179.9 meters @ 3.56 gpt Au (RC14-177); 160.7-184.3 meters @ 1.88 gpt Au (RC14-179) and 119.5-159.6 meters @ 2.02 gpt Au (RC14-185). (oxide resource = 24,270,000 tonnes @ 0.68 gpt Au measured+indicated) *Press Release: September 15*

Veris Gold Corp. announced that it paid a fine of \$182,000 to the U.S. Environmental Protection Agency for failure to correctly report to regulators the release of toxic chemicals into the air and ground from the Jerritt Canyon Complex during 2007 and 2008. *Reno G/J: September 26*

Klondex Mines Ltd. announced that recent underground drill results at the Midas Mine include 0.4 meters @ 48 gpt Au, 11,251 gpt Ag (MUC-2502); 0.4 meters @ 99 gpt Au, 2,223 gpt Ag (MUC-2529); 0.8 meters @ 38 gpt Au, 1,778 gpt Ag (MUC-2532) and 0.7 meters @ 37 gpt Au, 68 gpt Ag (MUC-02554). (reserve = 545,000 tonnes @ 3.24 gpt Au, 266 gpt Ag proven+probable) *Press Release: September 10*

Gold Standard Ventures Corp. announced that based on recent drill results at the Pinion Project, resources aggregate 20,840,000 tonnes @ 0.63 gpt Au indicated and 55,930,000 tonnes @ 0.57 gpt Au inferred. (no previous estimate) *Press Release: September 10*

Corvus Gold Inc. announced that recent drill results at the North Bullfrog/Yellowjacket Project include 153.3-181.1 meters @ 1.0 gpt Au, 6.1 gpt Ag (NB14-387); 142.0-166.6 meters @ 2.8 gpt Au, 14.1 gpt Ag (NB14-389); 130.8-216.5 meters @ 0.3 gpt Au, 10.4 gpt Ag (NB14-390) and 211.8-221.1 meters @ 1.9 gpt Au, 11.5 gpt Ag (NB14-392). (resource @ Yellowjacket = 4,000,000 tonnes @ 0.97 gpt Au, 5.1 gpt Ag indicated) *Press Release: September 4*

# ROCK TALK

## A FEW THOUGHTS ON THE MID-TERM ELECTIONS FROM KEL BUCHANAN

### National Implications

For the past 38 years, West Virginia Congressman Nick Rahall has been a thorn in the side of the extractive minerals industry. During the Clinton administration, Rahall and Senator Bumpers of Arkansas submitted joint bills that included a super royalty on mineral production and a total revision/repeal of the 1872 mining law. Every other year in all subsequent administrations, Rahall introduced his bill repealing the 1872 law, and if not for the actions of Senator Reid to table the Rahall bills in the Senate, Rahall's bill may well have passed in 2008, when the Senate had 60 Democratic seat. On November 4<sup>th</sup>, West Virginia retired Congressman Rahall.

It may be that most of the younger geologists in the GSN are not familiar with Congressman Rahall, but the seasoned GSN veteran is more than familiar with him. On the face of it, there is reason for the minerals industry to thank the voters of West Virginia. But not so fast! The same mid-terms that retired Rahall also reduced Senator Reid to the status of minority leader. There is no guarantee that Senator Reid will run again in 2016. If he does not run, and even if a Republican were elected in his stead, the fact is that in 2016, there will be 34 Senate seats up for grabs and 24 of those seats are now in the hands of Republicans. A newly rejuvenated 2016 Democratic Senate majority without the bulwark of Senator Reid could be problematic for our industry.

### Nevada Implications

The results of NV 4 congressional district, and the defeat of Steven Horseford by Cresent Hardy, resulted in bifurcated Lyon County having representation from the same political party. The folks who want Pumpkin Hollow to move ahead were probably mildly surprised by the results of the election, but for Pumpkin Hollow, waiting seven years for the U.S. Senate to act has always been the problem, not the House.

There could be some unintended consequences for this election however, and it directly relates to the change in control of the U.S. Senate. With control of both sides of the isle, the Republican majorities could revisit the Yerington lands bill in the House, make it more palatable to the people of Lyon County, and move the revised bill to the Senate. The Republican majority (influenced by Senator Heller with his new and improved status) could quickly make the new lands bill a reality.

### Reno Implications

For the first time, a geologist was elected to serve on the Reno City Council. Naomi Duerr has a sterling background dealing with water issues in her former capacity working on the flood control project. Her husband Herb and she are active in the mining industry and both are members of the GSN (of course). Congratulations to Naomi.



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<http://www.miningamerica.org/news/the-nwma-bulletin/>

## **Nevada Sage-grouse Conservation Plan sent to Governor Sandoval**

On October 1, the Nevada Sagebrush Ecosystem Council finalized the [\*\*2014 Nevada Greater Sage-grouse Conservation Plan\*\*](#). The state plan emphasizes the void, minimize, mitigate principle.

The same day, Ren Lohofener, USFWS Pacific Southwest Region Director sent a [\*\*letter\*\*](#) to the Nevada Sagebrush Ecosystem Council criticizing the draft plan and essentially stating that USFWS does not believe Sage-grouse habitat can be mitigated or restored. The letter questions how the state plan could allow for impacts in occupied Sage-grouse habitat and that "creating Sage-grouse habitat is not mitigation for loss of occupied habitat."

This letter generated a four page [\*\*response from Congressman Mark Amodei\*\*](#) (R-NV). In addition to chastising Mr. Lohofener for failing to copy the Congressman on Sage-grouse related correspondence despite numerous requests, Rep. Amodei expressed disbelief with the position that creating Sage-grouse habitat is not mitigation for loss of occupied Sage-grouse habitat. Rep. Amodei's letter also emphasizes the impact of catastrophic wildfire on Sage "Hen" habitat and that mining impacts are less than 2% of the total acreage lost to fire in Nevada in the last 20 years. The letter closes with this admonition, "Should your response not be forthcoming within 30 days, I will advise my colleagues of your desire to communicate in the formal hearing context and begin work on scheduling appropriate field and Capitol Hill hearings."



# ROCK TALK

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## Legislative Update

### **Northern Nevada Lands Bills Pass**

The House approved a [package](#) of Northern Nevada land bills that would create about 74,000 acres of federal wilderness while paving the way for development that could bring an estimated 1,000 high-paying jobs to Nevada.



The House passed the Northern Nevada Land Conservation and Economic Development Act sponsored by Reps. Mark Amodei, R-Carson City, and Steven Horsford, D-Nev. The package of seven bills must still be approved by the Senate, where it has the support of Nevada Sens. Harry Reid, a Democrat, and Dean Heller, a Republican.

The legislation would accelerate development of an open pit mine near an underground mine already under construction. The bill would also designate about 48,000 acres in Lyon County as the Wovoka Wilderness Area, which would be protected from development.

### **Sen. Reid quietly to block development of 800,000 acres in central Nevada**

A bill quietly introduced in Congress would restrict mining and energy exploration over a sweeping area of rural Nevada, allegedly preserving scenic valleys and buffering a landmark piece of desert artwork about the size of the National Mall in Washington D.C. It was created using bulldozers, cranes, front end loaders and scrapers. Sen. Harry Reid last month introduced legislation to withdraw 805,100 acres of federal land in Garden Valley and Coal Valley straddling the Lincoln and Nye county lines, a desolate area bigger than Rhode Island.

The restrictions would not affect current valid land use such as grazing, but it would forbid the Bureau of Land Management from selling any land or granting permits for oil or mineral prospecting. Activities for new geothermal, solar or wind energy development also would be restricted. You can read more about the legislation at the [Las Vegas Review Journal](#).

While the legislation has little chance of passing, do not be surprised if President Obama uses executive action to declare the 805,100 acre parcel a National Monument.



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<http://www.miningamerica.org/news/the-nwma-bulletin/>

## Nevada Mining Association Names New Director

Dana Bennett has been named the new President of NVMA. Dana is a former regional director of the Nevada Governor's Office of Economic Development and current owner of Bennett Historical Research Services (BHRS). She will fill the seat of the NVMA presidency effective December 1.

Dana, a Nevada native, brings with her more than 20 years' experience in the public and private sector, as well as great experience in mining and with NVMA in particular. She represented the NVMA with R&R Partners, Inc. at the Nevada Legislature and has done extensive historical research into government policy on behalf of NVMA.





**2015 MEMBERSHIP DUES DUE NOW! DEADLINE DECEMBER 29, 2014!**

It is now time to renew your membership dues for the **current fiscal year 2015!** You can do this online at our website by following this link: <http://gsnv.org/membership/join-gsn.php> or by filling out the form below and returning it to the GSN office by Fax: 775-323-3599; or by mail to 2175 Raggio Pkwy., Reno, NV 89512

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**2015**

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Offices are located at NBMG's Great Basin Science Sample & Records Library at The Desert Research Institute

Walk-in Office hours: Tuesday through Friday, 8:00 AM - 3:00 PM. Mondays - Call or email for appointment.

The Geological Society of Nevada (GSN) is a non-profit, educational organization whose principal objective is to promote the advancement of geological sciences, especially as they relate to Nevada. GSN supports the dissemination of information through meetings, field trips, publications and academic endeavors. Membership is open to geologists, geophysicists, geochemists, engineers, educators, students, prospectors or anyone else with an interest in the geological sciences and/or the goals of the GSN. The organization is based in Reno with additional Chapters in Elko, Winnemucca and Southern Nevada.

The membership year begins on January 1. Annual dues of \$50.00 (\$25.00 for full time students) are due prior to December 31. The GSN conducts a Field Trip in the Fall and one in the Spring of each year. Monthly meetings are held September through May in Reno, Elko, Winnemucca and Las Vegas. If you would like to receive email announcements from Elko, Winnemucca or Las Vegas please check a box.

Please help support the GSN Foundation, the Student Dinner Fund, or Student Field Trip Fund when renewing. Foundation dollars are used for the Kindergarten through 12th grade Field Trip Earth Science Grant Program, Nevada Mapping Grants and University of Nevada and UNLV scholarships, and Field Camp Grants.

**MEMBERSHIP APPLICATION**

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**Everything is the same as before, except as indicated below.**

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- I have met the licensing requirements and want "QP" (Qualified Person) by my name in the directory.

I authorize GSN to send to me, via email: GSN announcements, publications updates, employment opportunities, etc.

Yes  No

**Optional Chapter Affiliation (to be eligible for chapter voting and emails from those Chapter Officers)**

Elko Chapter  Southern Nevada Chapter  Winnemucca Chapter

Regular Membership Dues 2015 - Email newsletter \$50.00 (**International & Domestic**) \_\_\_\_\_

Regular Membership Dues 2015 - Hardcopy newsletter via postal service \$70.00 (**Domestic Only**) \_\_\_\_\_

Student Membership Dues 2015 - Email newsletter only \$25.00 (Nevada students' dues paid for by Geotemps, Inc.) \_\_\_\_\_

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## 25TH ANNUAL AIPG EXPLORATION ROUNDUP TO BE HELD DECEMBER 11, 2014!

The **25th AIPG Exploration Roundup** will be held on **Thursday, December 11, 2014** at the **Ramada Inn**, 14<sup>th</sup> floor Skyroom, 6<sup>th</sup> and Wells, Reno, Nevada. Cocktail hour is at 6:00 PM, dinner at 7:00 PM and the program begins at 8:00PM. Eight speakers are scheduled.

**Boart Longyear** is the bar sponsor and also a student sponsor. Global Hydrologic Services is providing the mineral specimens for UNR student raffle. Reservations made prior to December 9<sup>th</sup>, \$50.00, after December 9<sup>th</sup> \$60.00. Cash or checks only please.

Tony Taylor, Selex  
Richard Reid, Newmont  
Don Harris, Allied Nevada  
Bill Howald, Rye Patch  
Richard Bedell, Renaissance  
Andy Wallace, Columbus Mines  
Gregg Loptien, Agnico-Eagle  
Keith Wood, Barrick

Reservations: Kel Buchanan, [summitcrk@aol.com](mailto:summitcrk@aol.com) or 775 786-4515

## OTHER UPCOMING EVENTS

**30 NOVEMBER - 6 DECEMBER.** American Exploration and Mining Association Meeting, Reno, NV, USA (formerly Northwest Mining Association). Website: [www.miningamerica.org](http://www.miningamerica.org). Discount registration due by November 16, 2014.

**2 DECEMBER** Arizona Geological Society, Tucson AZ. Speaker: Victor Baker; Title: **Megafoods on Earth, Mars, and Beyond**". Sheraton, 5151 E Grant Rd. (& Rosemont), Tucson AZ 85712. Begins @ 6 pm. For more information and to register go to: <http://www.arizoneageologicalsoc.org/event-1789716>.

**5 DECEMBER** Nevada Petroleum & Geothermal Society, Reno, Nevada. Annual Christmas Party. 6:30 PM, Ramada Reno Hotel; 1000 East 6th St., Reno NV 89512. Please RSVP by Wednesday, December 3, 2014. Donations needed for door prizes and raffle. Bring a wrapped gift for exchange. Please make reservations by using the following link: [https://docs.google.com/forms/d/1W\\_dOdlN6\\_fO2ffiZhL5yRs7pFdERDd4RfZypM5jplw/viewform](https://docs.google.com/forms/d/1W_dOdlN6_fO2ffiZhL5yRs7pFdERDd4RfZypM5jplw/viewform)

**6 DECEMBER, DREGS, Denver Regional Exploration Geologists' Society Annual Christmas Party.** Begins at 6:30 pm at the Calvary Episcopal Church, Downtown Golden, CO (1320 Arapahoe St. -across from the Armory Building). Gourmet pot-luck dinner with ham, salmon & drinks provided by DREGS. Please bring a side dish or dessert to share. RSVP to Craig at [cfhgeo@attglobal.net](mailto:cfhgeo@attglobal.net). \$15 at the door.

**6 DECEMBER** Northern Nevada Section of SME: Annual Holiday Party. Circus-Circus Mandalay Ballroom, Reno NV. Happy Hour @ 6 pm, Dinner followed by Live Auction starting at 7 pm. Dinner \$70. RSVP by November 26 to Brooke

## 14-24 MAY 2015, GSN SYMPOSIUM 2015: NEW CONCEPTS AND DISCOVERIES

Being held at J.A. Nugget, Sparks, Nevada. Pre- and Post-Field Trips, Short Courses, Exhibits, Technical Program and GSN-SEG Forum. For more information please contact Molly Hunsaker, [mollymhunsaker@2015GSNsymposium.org](mailto:mollymhunsaker@2015GSNsymposium.org). You can **REGISTER NOW** for the Technical Session, SEG Forum, Field Trips, Short Courses and Exhibits online at: [www.gsnv.org/2015-symposium](http://www.gsnv.org/2015-symposium). **REGISTRATION IS NOW OPEN & EXHIBITS ARE 2/3 SOLD!!**



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*Exploration Geophysicist*

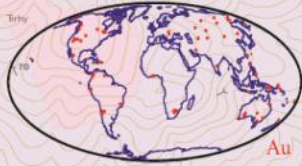
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## Big Sky Geophysics

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Geophysicist

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Interpretations*

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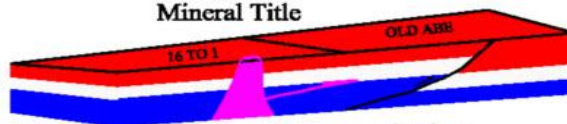
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