



# Granite State Geologist

The Newsletter of the Geological Society of New Hampshire,  
Spring Edition – March 2016 – Issue No. 92

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## In this issue:

- **Summer Field Trip will be August 6**
- **The Miocene is one, should Anthropocene be another?**
- **First use of Cucamonga outside of Bugs Bunny cartoon?**
- **Dinner speaker – UNH professor – Margaret Boettcher April 21 at The Puritan- Manchester**
- **Can you say perfluorooctanoic? PFOA in NH**
- **What your Board is doing**
- **Wee rex to T. rex – missing link dinosaur discovered**
- **Upcoming Events Summer Field Trip and Much More!**

## MESSAGE FROM THE PRESIDENT

Spring is busting out all over and this edition is fit to bust with Society news and plans and with new discoveries like missing-link dinosaurs and the appearance of the groundwater contaminant PFOA in NH.

First, you should know that the spring dinner meeting is going to be a week later (April 21<sup>st</sup>) than the usual date due to Tax Day falling on the day after Thursday the 14th. (Note also that Lea Anne Atwell is helping Erin Kirby by handling the reservations for the April meeting.) Get your reservations in before April 15!!!

The Society is opening new doors by expanding its support of earth science education--see Lea Anne's article on the Board's activities later in the newsletter for details. And I encourage you to bring a friend to the April meeting as a way of reaching out to more people with interests in geology as another way the Society fulfills its mission of advancing the science of geology.

The summer field trip is set for August 6 with geology stops up the Mt. Washington Auto Road, a tour of the new museum and the up-dated Mt. Washington Observatory where member Brian Fowler was appointed the new President last June. Barbeque down below afterwards. Details will be coming soon.

Another change. The October meeting will be on Wednesday night, October 12, instead of our usual Thursday night to accommodate people with plans to attend NEIGC Friday morning on the Maine coastline (and to mollify any trixadexaphobics.)

Note that this is an election year. The Board has two open positions for members-at-large this year, as well as any other Board position. Nominations will close and the slate will be distributed in mid-September. If you are interested in serving on the Board, contact the Nominating Committee members, Abby Fopiano or Thor Smith. If you'd like to try out a Board meeting in June or September, just let me know.

So there are many changes and opportunities coming up. If you want to know about them, the GSNH webpage will keep you updated. The Board is making major renovations to make it soon.

## JANUARY RAFFLE WINNERS

Thanks to the UNH Earth Sciences Department who donated this meeting's prizes. Tina Cotton – 3<sup>rd</sup> prize – Grandchild's Mineral Kit – Nine common mineral specimens for that little scientist in your life. Tom Schevenell – 2<sup>nd</sup> prize – Large beryl crystal section (Be<sub>3</sub>Al<sub>2</sub>(Si<sub>6</sub>O<sub>10</sub>) from Paris Maine. NH State Mineral. Ore of beryllium. Robert Francis – 1<sup>st</sup> prize – Copper ore with possible flecks of gold (CuFeS<sub>2</sub> and Au) from an undisclosed location. And thanks to everyone who buys a ticket. The raffle earnings go towards the Society's education grant fund.



Lee Wilder and Tom Fargo deliver raffle prizes to the winners at the October meeting at Makris Lobster House.

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## GSNH MEMBER PUBLISHES TWO NEW GLACIAL PAPERS

Thom Davis (at The Department of Natural and Applied Sciences, Bentley University, Waltham, MA 02454-4705) and others published ***Cosmogenic exposure age evidence for rapid Laurentide deglaciation of the Katahdin area, west-central Maine, USA, 16 to 15 ka*** in the Quaternary Science Reviews 116 (2015) 95-105. He also coauthored ***Cold-based Laurentide ice covered New England's highest summits during the Last Glacial Maximum*** published in the March 2016 issue of GEOLOGY.

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## WHAT IS YOUR BOARD DOING? By Lea Anne Atwell

On March 10<sup>th</sup>, Lee Anne Atwell hosted the quarterly Board meeting at the NHDES offices in Concord, NH. Key items discussed included:

- Potential ideas for a summer 2016 field trip, including the Mount Washington Observatory. Stay tuned for details!
- So far, we've sold 39 GSNH t-shirts, the proceeds of which are going to our Charles Spaulding Speaker's Fund. We still have plenty of t-shirts available for \$18 each; t-shirts can be purchased at our upcoming dinner meeting in April.
- BOD elections are coming up in October! Members serve two year terms. Stayed tuned for more details in the next newsletter. Talk to a current BOD member if you are considering running.
- To accommodate the NEIGC field trips this year, we are moving our October dinner meeting from our usual Thursday night to Wednesday, October 12<sup>th</sup> so that we can continue the tradition of having our meeting during Earth Science week.
- Did you know that part of GSNH's mission is to *"Contribute to the public education and understanding of the geology of New Hampshire, including the dissemination of knowledge of New Hampshire geology to interested professions, groups and individuals?"* To that end, we discussed potentially having a training workshop during Earth Science week to support teachers instructing on earth science topics and the geology of New Hampshire. We also frequently get requests to attend science fairs or do presentations for scouting groups, libraries, and other clubs. If you are interested in participating, please contact Lee Wilder.
- GSNH's website is under review for updates. Abby, our webmaster, provided us with Google Analytics for assessing our page's effectiveness in reaching people. We have viewers from as far away as China that check out our website. We are moving forward with hiring a web designer to help with our website and reviewed quotes and discussed potential candidates. We hope to include a map of interesting NH geological locales with the new website similar to Maine's at [http://www.maine.gov/dacf/mgs/explore/explore\\_map.shtml](http://www.maine.gov/dacf/mgs/explore/explore_map.shtml). We also hope to solicit website sponsors to defray the costs of the updates. Stay tuned!

Our next meeting will be on Thursday, June 9, 2016 at Toad Hall in Hopkinton. All members are welcome to attend our meetings. Please let a Board member know if there is something you would like added to our agenda!

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## THE GSNH DINNER MEETING – BRING A FRIEND

**APRIL 21, 2016**

**MAKE YOUR RESERVATION NOW!**

**AT PURITAN BACKROOM**

**245 HOOKSETT RD, MANCHESTER**

**SOCIAL HOUR START AT 5:30, DINNER AT 6:30**

Email reservations to Lea Anne Atwell at [LeaAnne.Atwell@des.nh.gov](mailto:LeaAnne.Atwell@des.nh.gov) or

Mail to: **Lea Anne Atwell, GSNH Dinner Meeting, PO Box 401, Concord, NH 03302.**

**Checks to arrive before April 15, 2016 payable to: GSNH.**

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**IN HONOR OF MARCH 14, 2016**

**OTHERWISE KNOWN AS  $\pi$  DAY**



$\sqrt{-1}$   $2^3$   $\Sigma$   $\pi$

**...and it was yummy!!!**

**THE MIOCENE EPOCH** This is an entry in the Encyclopedia of Earth based on an article written for the University of California Museum of Paleontology by Brian R. Speer, Lucy Brining, Valerie Chan, Ellen Choi, Michael De Sosa, and Christina Lee.

<http://www.eoearth.org/view/article/51cbee737896bb431f697f0f/?topic=51cbfc79f702fc2ba812a064>

The Miocene Epoch refers to a span of [geologic time](#) from 5.3 million to 23.0 million years ago.

Figure 1 shows the major geologic epochs of the Cenozoic Era and the relative position of the Miocene.

Era	Period	Epoch (start mya)	
Cenozoic	Quaternary	Holocene 0.01	
		Pleistocene 2.6	
	Tertiary	Neogene	Pliocene 5.3
			Miocene 23.0
		Paleogene	Oligocene 33.9
			Eocene 55.8
Paleocene 65.5			

**Stratigraphy** - The

Miocene was first recognized and defined by Charles Lyell in the early nineteenth century. While examining rocks in the Paris Basin, he noted that different strata contained varying percentages of living mollusc species. The Miocene consisted of layers in which only 18% of the fossils were represented among living mollusc species.

Stratigraphy within the Miocene, as with much of the Cenozoic,

is often defined on a highly regional basis. Terrestrial faunas are recognized in ages that vary from continent to continent, primarily because the animals themselves varied from place to place. These ages are usually defined on the basis of the land mammals, so that North America, Europe, Australia, etc. each have their own Land Mammal Ages.

For marine stratigraphy, diatoms and foraminifera are the primary groups used to recognize ages. By this time, both groups were abundant and diversified globally, so much so that diatomite is a common marine sediment of the Miocene. Because the diatoms are abundant, and are the substance of which many marine deposits are formed, they are particularly useful for identifying the relative ages of fossil deposits.

**Life in the Miocene** - Many of the fossils of species of this time have close relatives alive today, which can be both good and bad. It is good in that we have living representatives to infer past biology, but bad in that we may be tempted to infer too much from this.

The overall pattern of biological change for the Miocene is one of expanding open vegetation systems (such as deserts, tundra, and grasslands) at the expense of diminishing closed vegetation (such as forests). This led to a re-diversification of temperate ecosystems and many morphological changes in animals. Mammals and birds in particular developed new forms, whether as fast-running herbivores, large predatory mammals and birds, or small quick birds and rodents.

Plant studies of the Miocene have focused primarily on spores and pollen. Such studies show that by the end of the Miocene 95% of modern seed plant families existed, and that no such families have gone extinct since the middle of the Miocene. A mid-Miocene warming, followed by a cooling is considered responsible for the retreat of tropical ecosystems, the expansion of northern coniferous forests, and increased seasonality. With this environmental change came the diversification of modern graminoids, especially grasses and sedges.

Because of plate movements, the African-Arabian plate joined with Asia during the Miocene closing the seaway which had previously separated these two landmasses. This new land connection allowed for previously separated faunas and floras to come into contact with each other and resulted in a number of organism migrations.

In addition to changes on land, important new ecosystems in the sea led to new life-forms there. Kelp forests appeared for the first time, as did sea otters and other organisms unique to those environments. At the same time, such ocean-going mammals as the Desmostylia went extinct

**Paleoclimate and Geology** - The Miocene was a time of warmer global climates than those in the adjacent Oligocene and Pliocene epochs. During the Miocene two major ecosystems first appear: kelp forests and grasslands. The expansion of grasslands during this epoch is correlated to a drying of continental interiors as the global climate first warmed and then cooled.

The Miocene saw a change in global circulation patterns due to slight position changes of the continents and globally warmer climates. Conditions on each continent changed somewhat because of these positional changes, however it was an overall increase in aridity through mountain building that favored the expansion of grasslands. Because the positions of continents in the Miocene world were similar to where they lie today, it is easiest to describe the plate movements and resulting changes in the paleoclimate by discussing individual continents.

In North America, the Sierra Nevada and Cascade Mountain ranges formed, causing a non-seasonal and drier mid-continent climate. The increasing occurrences of drought and an overall decrease in absolute rainfall promoted drier climates. Additionally, grasslands began to spread, and this led to an evolutionary radiation of open habitat herbivores and carnivores. The first of the major periods of immigration via the Bering land connection between Siberia and Alaska occurred in the middle of the Miocene, and by the end of the Miocene the Panama isthmus had begun to form between Central and South America.

Plate tectonics also contributed to the rise of the Andes Mountains in South America, which led to the formation of a rain shadow effect in the southeastern part of the continent. The movement of the plates also facilitated trends favoring non-desert and highland environments.

In Australia, the climate saw an overall increase aridity as it continued to drift northwards, though the continent went through many wet and dry periods. The number of rainforests began to decrease, to be replaced by dry forests and woodlands. The vegetation began to shift from closed broad-leaved forests to more open, drier forests as well as grasslands and deserts.

Eurasia also experienced increasing aridification during the Miocene. Extensive steppe vegetation began to appear, and the grasses became abundant. In southern Asia, grasslands expanded, generating a greater diversity of habitats. However, southern Asia was not the only area to experience an increase in habitat variability. Southern Europe also saw an increase in grasslands, but maintained its moist forests. Although most of Eurasia experienced increasing aridity, some places did not. The climate in some Eurasian regions, such as Syria and Iran, remained wet and cool.

During the Miocene, Eurasia underwent some significant tectonic rearrangements. The Tethys Sea connection between the Mediterranean and Indian Ocean was severed in the Mid-Miocene causing the increase in aridity in Southern Europe. The Paratethys barrier, which isolated Western Europe from the exchange of flora and fauna, was periodically disrupted, allowing for the migration of animals. Additionally, faunal routes with Africa were well established and occasional land bridges were also created.

Africa also encountered some tectonic movement, including rifting in East Africa and the union of the African-Arabian plate with Eurasia. Associated with this rifting, a major uplift in East Africa created a rain shadow effect between the wet Central-West Africa and dry East Africa. The union of the continents of Africa and Eurasia caused interruption and contraction of the Tethys Sea, thereby depleting the primary source of atmospheric moisture in that area. Thus rainfall was significantly reduced, as were the moderating effects of sea temperature on the neighboring land climates. However, this union enabled more vigorous exchanges of flora and fauna between Africa and Eurasia.

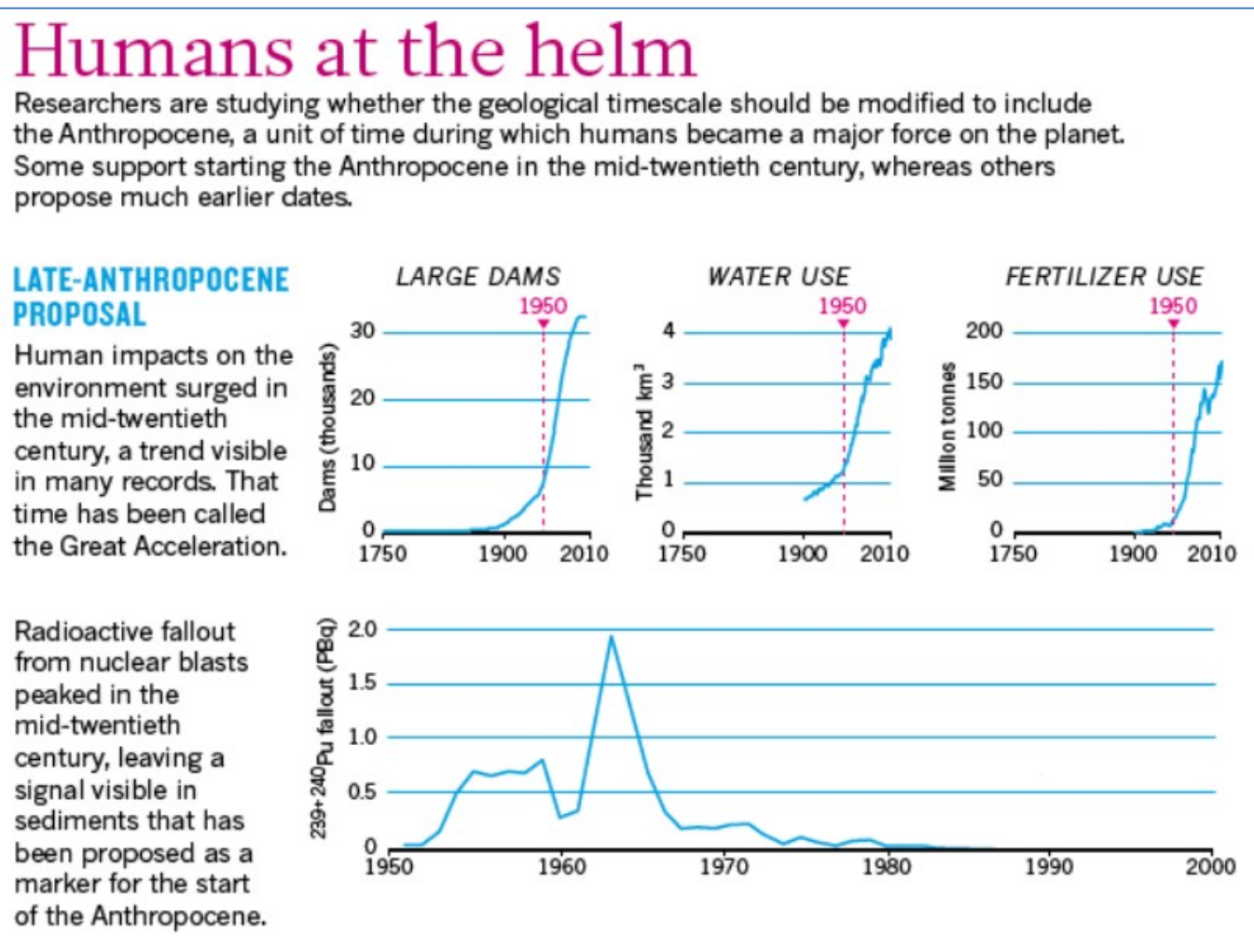
Antarctica became isolated from the other continents in the Miocene, leading to the formation of a circumpolar ocean circulation. Global ocean and atmospheric circulation were also affected by the formation of this circumpolar circulation pattern, as it restricted north-south circulation flows. This reduced the mixing of warm, tropical ocean water and cold, polar water causing additional buildup of snow and ice on Antarctica. This accelerated the development of global seasonality, aridity, and enhanced global cooling.

## And I said that to raise this issue... ANTHROPOCENE: THE HUMAN AGE

Almost all the dinosaurs have vanished from the National Museum of Natural History in Washington DC. The fossil hall is now mostly empty and painted in deep shadows as palaeobiologist Scott Wing wanders through the cavernous room.

Wing is part of a team carrying out a radical, US\$45-million redesign of the exhibition space, which is part of the Smithsonian Institution. And when it opens again in 2019, the hall will do more than revisit Earth's distant past. Alongside the typical displays of *Tyrannosaurus rex* and *Triceratops*, there will be a new section that forces visitors to consider the species that is currently dominating the planet. "We want to help people imagine their role in the world, which is maybe more important than many of them realize," says Wing.

This provocative exhibit will focus on the Anthropocene — the slice of Earth's history during which people have become a major geological force. Through mining activities alone, humans move more sediment than all the world's rivers combined. *Homo sapiens* has also warmed the planet, raised sea levels, eroded the ozone layer and acidified the oceans.



Given the magnitude of these changes, many researchers propose that the Anthropocene represents a new division of geological time. The concept has gained traction, especially in the past few years — and not just among geoscientists. The word has been invoked by archaeologists, historians and even gender-studies researchers; several museums around the world have exhibited art inspired by the Anthropocene; and the media have heartily adopted the idea. "Welcome to the Anthropocene," *The Economist* announced in 2011.

The greeting was a tad premature. Although the term is trending, the Anthropocene is still an amorphous notion — an unofficial name that has yet to be accepted as part of the geological timescale. That may change soon. A committee of researchers is currently hashing out whether to codify the Anthropocene as a formal geological unit, and when to define its starting point.

But critics worry that important arguments against the proposal have been drowned out by popular enthusiasm, driven in part by environmentally minded researchers who want to highlight how destructive humans have become. Some supporters of the Anthropocene idea have even been likened to zealots. “There’s a similarity to certain religious groups who are extremely keen on their religion — to the extent that they think everybody who doesn’t practice their religion is some kind of barbarian,” says one geologist who asked not to be named.

The debate has shone a spotlight on the typically unnoticed process by which geologists carve up Earth’s 4.5 billion years of history. Normally, decisions about the geological timescale are made solely on the basis of stratigraphy — the evidence contained in layers of rock, ocean sediments, ice cores and other geological deposits. But the issue of the Anthropocene “is an order of magnitude more complicated than the stratigraphy”, says Jan Zalasiewicz, a geologist at the University of Leicester, UK, and the chair of the Anthropocene Working Group that is evaluating the issue for the International Commission on Stratigraphy (ICS).

**Written in stone** For geoscientists, the timescale of Earth’s history rivals the periodic table in terms of scientific importance. It has taken centuries of painstaking stratigraphic work — matching up major rock units around the world and placing them in order of formation — to provide an organizing scaffold that supports all studies of the planet’s past. “The geologic timescale, in my view, is one of the great achievements of humanity,” says Michael Walker, a Quaternary scientist at the University of Wales Trinity St David in Lampeter, UK.

Walker’s work sits at the top of the timescale. He led a group that helped to define the most recent unit of geological time, the Holocene epoch, which began about 11,700 years ago. The decision to formalize the Holocene in 2008 was one of the most recent major actions by the ICS, which oversees the timescale. The commission has segmented Earth’s history into a series of nested blocks, much like the years, months and days of a calendar. In geological time, the 66 million years since the death of the dinosaurs is known as the Cenozoic era. Within that, the Quaternary period occupies the past 2.58 million years — during which Earth has cycled in and out of a few dozen ice ages. The vast bulk of the Quaternary consists of the Pleistocene epoch, with the Holocene occupying the thin sliver of time since the end of the last ice age.

**A many-layered debate** The push to formalize the Anthropocene upsets some stratigraphers. In 2012, a commentary published by the Geological Society of America asked: “Is the Anthropocene an issue of stratigraphy or pop culture?” Some complain that the working group has generated a stream of publicity in support of the concept. “I’m frustrated because any time they do anything, there are newspaper articles,” says Stan Finney, a stratigraphic paleontologist at California State University in Long Beach and the chair of the ICS, which would eventually vote on any proposal put forward by the working group. “What you see here is, it’s become a political statement. That’s what so many people want.”

Some researchers argue that it is too soon to make a decision — it will take centuries or longer to know what lasting impact humans are having on the planet. One member of the working group, Erle Ellis, a geographer at the University of Maryland, Baltimore County, says that he raised the idea of holding off with fellow members of the group. “We should set a time, perhaps 1,000 years from now, in which we would officially investigate this,” he says. “Making a decision before that would be premature.”

That does not seem likely, given that the working group plans to present initial recommendations by 2016. Some members with different views from the majority have dropped out of the discussion.

Regardless of the outcome, the Anthropocene has already taken on a life of its own. Three Anthropocene journals have started up in the past two years, and the number of papers on the topic is rising sharply, with more than 200 published in 2014.

Read more at [http://www.nature.com/news/anthropocene-the-human-age-1.17085?WT.mc\\_id=TWT\\_NatureNews](http://www.nature.com/news/anthropocene-the-human-age-1.17085?WT.mc_id=TWT_NatureNews)

**THE BEAUTIFUL FUKANG (careful now!) METEORITE** Kaushik Tuesday, May 21, 2013  
<http://www.amusingplanet.com/2013/05/the-beautiful-fukang-meteorite.html>

The Fukang meteorite, believed to be some 4.5 billion years old, which is as ancient as Earth itself, was unearthed near a town of the same name in China, in 2000. It is a pallasite, a type of meteorite with translucent golden crystals of a mineral called olivine embedded in a silvery honeycomb of nickel-iron. It's a gorgeous meteorite, and possibly the most stunning extraterrestrial piece of rock man has ever seen.



The Fukang meteorite was found by a hiker. The man had often stopped and had lunch on this giant rock, and he always wondered what the metal and crystals were. He finally took a hammer and chisel and broke some pieces off, which he sent to the USA to confirm that it was a meteorite.

The original meteorite weighed just over a thousand kilogram, but the rock was so brilliant that everybody wanted a piece of it. Since then it has been divided into dozens of thin slices and auctioned or distributed around the world.

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Don't forget to pay your dues. Membership renewal is January 1<sup>st</sup>.



**GEOBOOKS** The Geological Society of London Publishing House are pleased to present you with these titles in diverse areas of Earth Science. Please see the titles below, along with direct links to purchase each title.

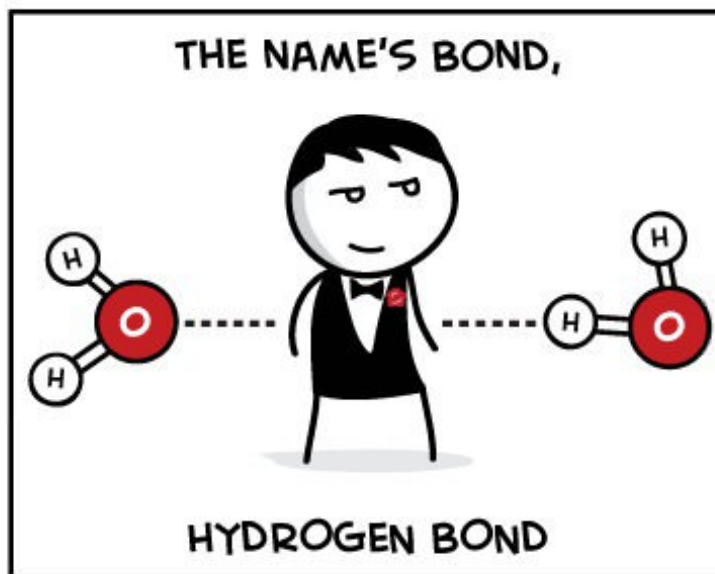
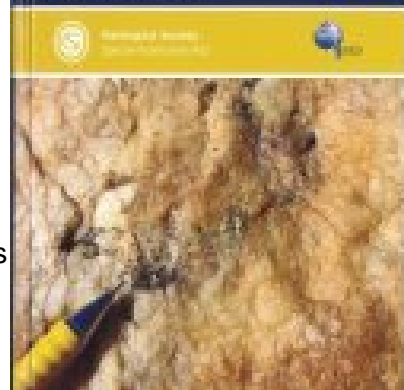
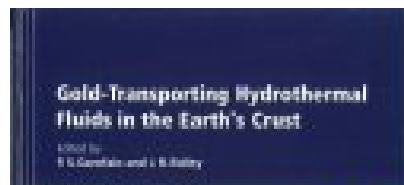
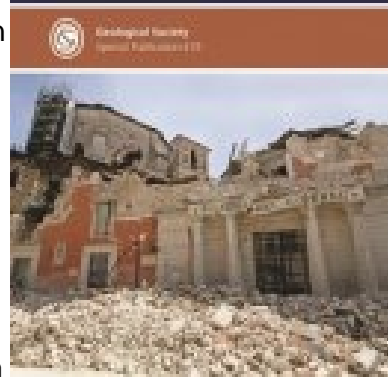
**Geoethics: the Role and Responsibility of Geoscientists** - This Special Publication will be an important tool for geoscientists, aimed at increasing the awareness of their societal role and responsibility in conducting education, research and practice activities. What are the responsibilities of a geoscientist? And what motivations are needed to push geoscientists to practice the Earth sciences in an ethical way?

The major environmental challenges affecting human communities require not only a strictly scientific and technical preparation by the geoscientists, but also a reflection on their broader obligations towards society. It is important that geoscientists consider geoethics as an indispensable framework on which to base their training and activity. The principles of geoethics can guide them to pursue the common good by weighing the benefits and costs of each choice, and identifying eco-friendly and society-friendly solutions that guarantee the respect of the right balance between human life and the dynamics of the Earth.

Communication and dissemination of geosciences should become core activities in building a knowledge-based society, which is able better to protect itself and the Earth ecosystems in order to guarantee a life in harmony with our planet for future generations.

**Gold-Transporting Hydrothermal Fluids in the Earth's Crust** - The majority of gold deposits are generated by hydrothermal fluids within small volumes of rock in tectonically active continental margins. This publication presents the most up-to-date studies on the properties of such hydrothermal fluids, highlighting the mechanisms of gold deposition. It will be of interest to all researchers and exploration geologists working on gold deposits.

You can save both time and money by ordering from our North American Distributor by calling 800-972-9892 or emailing [GSL.orders@aidcvt.com](mailto:GSL.orders@aidcvt.com). Also available at [Amazon.com](http://Amazon.com) and [BN.com](http://BN.com).



Kiss a geologist and feel the earthquake!

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THE GSNH DINNER MEETING – **BRING A FRIEND**

**APRIL 21, 2016**

**MAKE YOUR RESERVATION NOW!**

**AT PURITAN BACKROOM**

**245 HOOKSETT RD, MANCHESTER**

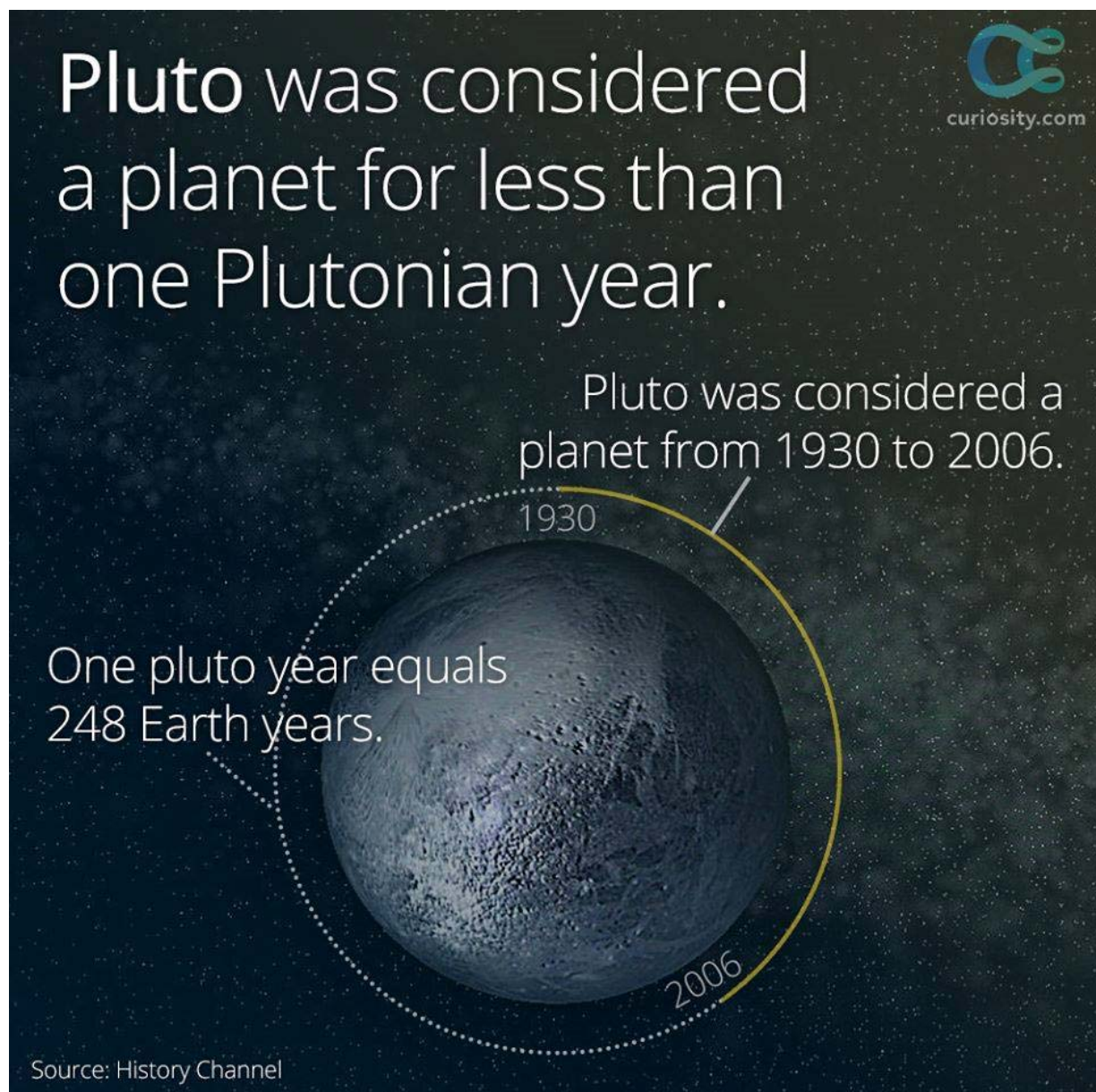
**SOCIAL HOUR START AT 5:30, DINNER AT 6:30**

Email reservations to Lea Anne Atwell at [LeaAnne.Atwell@des.nh.gov](mailto:LeaAnne.Atwell@des.nh.gov) or

Mail to: **Lea Anne Atwell, GSNH Dinner Meeting, PO Box 401, Concord, NH 03302.**

Checks to arrive **before April 15, 2016** payable to: GSNH.

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## **PRESIDENT'S 2017 BUDGET PROPOSES \$1.2 BILLION FOR THE USGS**

SOURCE: U.S. Geological Survey

WASHINGTON, D.C. -- The President's fiscal year 2017 budget request for the U.S. Geological Survey reflects the USGS's vital role in addressing some of the most pressing challenges of the 21st Century by advancing scientific discovery and innovation. The \$1.2 billion FY 2017 request supports USGS' ability to maintain the diversity of its scientific expertise so it can continue the large-scale, multi-disciplinary investigations it is uniquely qualified to carry out and provide impartial science to resource managers and planners.

"This is a smart, innovative and forward-looking budget that invests in Interior's key missions, now and in the future, so we can continue to serve the American people," said Secretary of the Interior Sally Jewell. "The President's budget provides targeted investments to create economic opportunities by growing our domestic energy portfolio, building climate resilient communities, and revitalizing America's national parks as we mark their 100th anniversary. Consistent with the President's abiding commitment to Indian Country, this budget provides critical support for Tribal self-determination and economic advancement, including a historic transformation of the Bureau of Indian Education school system to help improve education for Indian children."

"Our diversity of scientific expertise uniquely positions the USGS to help address today's critical natural resource issues," said Suzette Kimball, USGS Director. "From earthquakes to invasive species, from water quality to critical minerals, USGS science plays a pivotal role and this budget request supports that important mission."

The FY 2017 budget request allows the USGS to advance priorities set forth in the USGS Science Strategy Plans, such as: developing the ground system for Landsat 9; informing the management of water for the 21st century; understanding climate and land-use change; investigating new and emerging invasive species and disease; improving science for rapid disaster response and prevention; developing enhanced mapping tools and products; advancing landscape-level sciences; conducting critical mineral and energy resources research; and pursuing studies that protect environmental health.

This budget is also designed to keep core USGS science programs intact. These programs provide valuable services to the Nation and include science that helps decision makers minimize loss of life and property, manage natural resources, and protect and enhance our quality of life.

[http://www.sustainablecitynetwork.com/topic\\_channels/environmental/article\\_5f94070e-cf9f-11e5-af3b-a7278a939a5f.html?utm\\_source=SCN+InBox+e-Newsletter&utm\\_campaign=ee0bb4558e-Newsletter\\_2-10-2016\\_Muni&utm\\_medium=email&utm\\_term=0\\_11e7ac761c-ee0bb4558e-188437469&mc\\_cid=ee0bb4558e&mc\\_eid=7627a98fc8](http://www.sustainablecitynetwork.com/topic_channels/environmental/article_5f94070e-cf9f-11e5-af3b-a7278a939a5f.html?utm_source=SCN+InBox+e-Newsletter&utm_campaign=ee0bb4558e-Newsletter_2-10-2016_Muni&utm_medium=email&utm_term=0_11e7ac761c-ee0bb4558e-188437469&mc_cid=ee0bb4558e&mc_eid=7627a98fc8)

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## **A 'SCORCHER': 2015 SHATTERS RECORD AS WARMEST YEAR**

It's not rare for a year to break record temperatures. But it's now happened two years in a row — and 2015 was "very, very clearly the warmest year by a long chalk," says Gavin Schmidt, director of NASA's Goddard Institute for Space Studies. NASA is presenting the annual review of global average temperatures in conjunction with NOAA, which says that not only did 2015 finish as the warmest year on record, but it did so by the widest margin ever — nearly a third of 1 degree Fahrenheit warmer than 2014's average.

In 2015, the average temperature on land and ocean surfaces around the world was "1.62° F (0.90° C) above the 20th century average," according to NOAA. That makes 2015 the hottest since instrument records began being kept in 1880, beating the record set in 2014 by 0.29° F (0.16° C). The Northern Hemisphere saw the biggest rise in land temperatures, finishing 2.59° F hotter than the 20th century average. As for the United States, NOAA [released that data](#) last week, saying that for the 19th consecutive year, the annual average temperature for the continental U.S. was hotter than the 20th century average.

The agency reported, "The last year with a below-average temperature was 1996." Globally, 10 months in 2015 tied or broke monthly temperature records, culminating in a December that was more than half a degree Fahrenheit warmer than its predecessor in 2014 — a record margin, NOAA says.

<http://www.npr.org/sections/thetwo-way/2016/01/20/463709775/a-scorcher-2015-shatters-record-as-warmest-year-nasa-and-noaa-say>

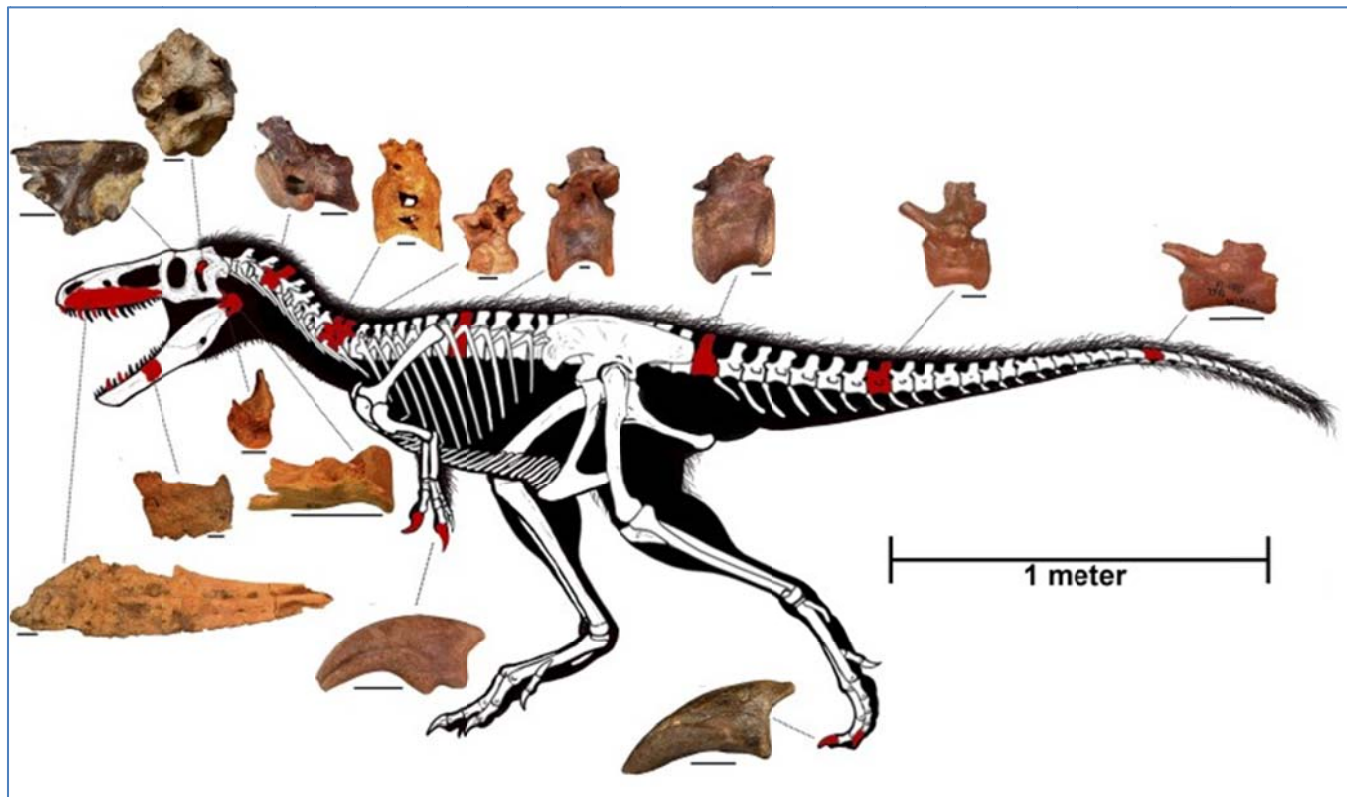
## FROM WEE REX TO T. REX: MODEST FORERUNNER TO HUGE PREDATOR FOUND

By Will Dunham and Sandra Maler

WASHINGTON (Reuters) – Fossils of a smaller, older cousin of Tyrannosaurus rex unearthed in northern Uzbekistan's remote Kyzylkum Desert are showing that the modest forerunners of that famous brute had already acquired the sophisticated brain and senses that helped make it such a horrifying predator.

Researchers said on Monday the horse-sized Cretaceous Period dinosaur, named *Timurlengia euotica*, that roamed Central Asia 90 million years ago sheds new light on the lineage called tyrannosaurs that culminated with *T. rex*, which stalked North America more than 20 million years later.

The researchers used CT scans to look inside *Timurlengia*'s braincase and digitally reconstruct its brain, sinuses, nerves, blood vessels and inner ear. The make-up of the inner ear indicated *Timurlengia*, like *T. rex*, excelled at hearing lower frequency sounds.



**A reconstructed skeleton of a newly discovered horse-sized dinosaur named *Timurlengia euotica*.**

*Timurlengia* was relatively small but boasted the advanced brain and senses of the colossal apex predators like *Tyrannosaurus rex* that lived at the end of the dinosaur age, paleontologist Steve Brusatte of Scotland's University of Edinburgh said. "This tells us that tyrannosaurs got smart before they got big." These traits came in handy when tyrannosaurs had the opportunity to rise to the top of the food chain and become very big after other large dinosaur predator groups disappeared.

*Timurlengia*, named for 14th century Central Asian conqueror Tamerlane, was 10-13 feet (3-4 meters) long and about 600 pounds (270 kg). *T. rex* reached about 42 feet (13 meters) and 7 tons. *Timurlengia* was a nimble, long-legged pursuit hunter and probably a better runner than *T. rex*.

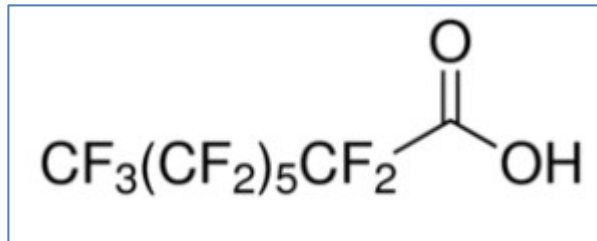
Tyrannosaurs appeared about 170 million years ago and initially were roughly a person's size. Before *Timurlengia*'s discovery, there had been a gap in the tyrannosaur fossil record between about 100 and 80 million years ago that had left questions about their evolution. The fact *Timurlengia* was still relatively small 80 million years after tyrannosaurs first appeared showed their immense size occurred suddenly, late in their evolutionary history. "Tyrannosaurs only became really big about 80 million years ago," Sues said.

Read more at <http://newsdaily.com/2016/03/from-wee-rex-to-t-rex-modest-forerunner-to-huge-predator-found/#URI2peVj8s1IHs71.99>

## PERFLUOROCTANOIC ACID

From MSDS sheets - Linear Formula  $\text{CF}_3(\text{CF}_2)_6\text{COOH}$ , Molecular Weight 414.07

From Wikipedia (Editor - sorry!) - PFOA persists indefinitely in the environment. It is a toxicant and carcinogen in animals. PFOA has been detected in the blood of more than 98% of the general US population in the low and sub-parts per billion range, and levels are higher in chemical plant employees and surrounding subpopulations. How general populations are exposed to PFOA is not completely understood. PFOA has been detected in industrial waste, stain resistant carpets, carpet cleaning liquids, house dust, microwave popcorn bags, water, food, some cookware and PTFE such as Teflon.



See also the American Cancer Society site for discussion on PFOA risks. "PFOA has the potential to be a health concern because it can stay in the environment and in the human body for long periods of time. Some studies look at cancer rates in people. Studies have looked at people exposed to PFOA from living near or working in chemical plants. Some of these studies have suggested an increased risk of testicular cancer with increased PFOA exposure. Studies have also suggested possible links to kidney cancer and thyroid cancer, but the increases in risk have been small and could have been due to chance. Other studies have suggested possible links to other cancers, including prostate, bladder, and ovarian cancer. But not all studies have found such links, and more research is needed to clarify these findings. <http://www.cancer.org/cancer/cancercauses/othercarcinogens/athome/teflon-and-perfluorooctanoic-acid--pfoa>

From ***Chemical discovered in Merrimack drinking water prompts investigation*** By Kimberly Houghton, Union Leader Correspondent

MERRIMACK March 04. 2016 8:42PM — Low levels of a perfluorochemical have been detected in the local drinking water, prompting an investigation by state environmental officials. Last week, representatives from Saint-Gobain Performance Plastics notified the New Hampshire Department of Environmental Services that perfluorooctanoic acid, or PFOA, was discovered at low levels in samples taken from four water faucets at their Merrimack facility, according to a release from DES. "We don't have any information at this time that indicates the water is not safe to drink," Jim Martin of DES told the New Hampshire Union Leader.

Still, Martin said if residents are concerned they could use traditional carbon filters such as Brita, or drink bottled water until additional testing is completed next week. Saint-Gobain in Merrimack is served by the Merrimack Village District Water System. Superintendent Ron Miner of the MVD was not immediately available on Friday to comment on the issue.

According to a statement from DES, the EPA has not set an enforceable drinking water standard for PFOA, however a provisional health advisory of 0.4 micrograms per liter for PFOA has been established. The amount detected in samples from Merrimack's drinking water late last week was 0.03 micrograms per liter. "Sampling to date in Merrimack has not identified PFOA at levels above the provisional health advisory level," DES wrote in its statement issued Friday afternoon.

Saint-Gobain specializes in high-performance plastics, including flexible tubing applications, seals, coated fabrics, polymer products and bearings, according to its website. DES officials said that PFOA has been detected in other communities near Saint-Gobain facilities, including areas in New York and Vermont. "Because materials containing PFOA have been used at the plant in Merrimack, and out of an abundance of caution, Saint-Gobain voluntarily tested the water at its Merrimack facility, and intends to test the groundwater," says the DES release, adding DES will oversee the investigation, and is working with the town and MVD officials to determine if PFOA is present in any of the MVD wells that serve 25,000 customers in Merrimack.

Private wells near the Saint-Gobain campus will be investigated to determine if they have been impacted, said DES. DES said it will inform local residents as soon as the results of the well tests are available, and will issue any additional information concerning upcoming groundwater investigations. <http://www.unionleader.com/Chemical-discovered-in-Merrimack-drinking-water-prompts-investigation>. See also the series of NHDES updates at: <http://des.nh.gov/organization/commissioner/pfoa.htm>.

## CHEAP OIL BUOYS CONSUMERS, SHAKES UP GLOBAL GOVERNMENTS

By The Associated Press Posted Feb. 2, 2016 at 8:11 PM

<http://www.fosters.com/article/20160202/NEWS/160209858>

Cheap oil will be sticking around for a while. That reality is wreaking havoc and causing uncertainty for some governments and businesses, while creating financial windfalls for others. Less expensive crude is delighting consumers in some regions, while leading to widespread job losses elsewhere.

Oil has fallen from \$107 to below \$30 in the past 19 months. Furious production by the U.S. and OPEC led to an oversupply. Recently, a sluggish global economy has spurred concerns about demand.

A recovery in oil prices depends on when supply and demand can get close to equilibrium. It could be a rocky ride. In a recent research note, Goldman Sachs predicted "the path to a rebalanced market will be protracted and arduous."

The U.S. government forecasts Brent crude, the international benchmark, will average \$40 a barrel this year. Bank of America Merrill Lynch is a bit higher, at \$46.



**An oil pump stands as the Saudi Hawks Aerobatic Team of the Royal Saudi Air Force performs during the Bahrain International Airshow in Sakhir, Bahrain. Cheap oil will be sticking around for a while. That reality is wreaking havoc and causing uncertainty for some governments and businesses, while creating financial windfalls for others. AP Photo/Hasan Jamali, File**

**NORTH AMERICA** - U.S. households have saved hundreds of dollars on gasoline and heating oil. That's money they can spend in other areas of the economy. Businesses such as airlines that burn large amounts of fuel have reaped savings in the billions. But energy company profits have plunged, as have their stocks. Layoffs and spending cuts by oil drillers have offset some of the boost from steady consumer spending. Meanwhile, states like Alaska and North Dakota need to plug big budget gaps. The Energy Department expects a decline in U.S. oil production, but says oil will only average \$38 this year.

For new mines in Alberta's oil sands to cover costs, oil needs to be \$85 to \$95 a barrel, according to IHS Global Insight. Western Canadian Select oil sands crude recently traded around \$15. Canadian oil companies have slashed budgets, laid off tens of thousands of workers and cut dividends. A Bank of Canada report says companies see dramatic change for the global industry, with weaker companies

### **(CHEAP OIL BUOYS CONSUMERS, SHAKES UP GLOBAL GOVERNMENTS - CONTINUED)**

restructuring or exiting the oil business, while healthier companies buy distressed assets. Canada's dollar is down 20 percent versus its U.S. counterpart. Prices for imported groceries have risen and Canadians are reconsidering a U.S. vacation.

Mexico is better insulated nowadays from an oil collapse. Oil accounts for 20 percent on national revenue, compared with 40 percent up until 2012. However, the country has postponed or canceled some oil projects, and delayed auctions for deep water exploration and production oil contracts, as part of its historic energy reform. — **David Koenig, Dallas; Rob Gillies, Toronto; Eduardo Castillo, Mexico City**

**MIDEAST** - Saudi Arabia and Iraq have been furiously pumping oil, per OPEC's decision to maintain robust production. Their hope is that the 12-year lows in crude prices will push more expensive producers, such as U.S. shale drillers, out of the market. OPEC's production rose by an average 1 million barrels a day in 2015. Now Iran, free of Western sanctions, plans to boost production by 500,000 barrels a day. Saudi Arabia cut back on some fuel subsidies and anticipates an \$87 billion budget shortfall this year. It's dipping into reserves to finance a war in Yemen. An initial public offering of at least a part of the giant state-run Saudi Arabian Oil Co. is under consideration. Iraq diverted money from construction projects to fund a costly war against the Islamic State. Baghdad also started discussions with international oil companies operating in the oil-rich south to revisit the terms of their service contracts. Iran's economy was slowed by the sanctions over its contested nuclear program. While sanctions relief has been slow to reach the average Iranian, the country is aggressively moving forward with business deals. — **Jon Gambrell, Dubai, United Arab Emirates; Sinan Salaheddin, Baghdad, Iraq**

**ASIA** - China's economy grew by 6.9 percent in 2015, the country's slowest rate in 25 years, raising concerns about global economic strength and contributing to the oil price decline. Still, China's economy is hardly collapsing. The International Energy Agency predicts oil consumption in China will grow 3.4 percent this year, down from 6 percent in 2015. With a growing emphasis on the services sector, China should see less oil demand from heavy industry and construction. That will likely be offset by growing car ownership and more demand for petrochemicals. China is the world's fifth-biggest oil producer, but financially strapped state-owned oil companies are likely to cut production. For most of Asia, plunging oil prices have alleviated heavy costs for imported oil and gas. For exporting nations, low oil helps and hurts. Auto exports to countries like the U.S. are profitable. But countries such as Brazil and Russia are tightening their belts after splurging on consumer goods from Asia when commodity prices soared. In Japan, consumers are paying less for energy, but lower energy prices are hindering the government's battle against deflation. — **Elaine Kurtenbach, Tokyo; Joe McDonald, Beijing**

**EUROPE** - Low oil prices are a boost to the European economy, which is a net importer of oil and gas. It helps consumers in two ways: by making fuel cheaper and lowering the cost of making goods. That lower cost feeds through to help bring down consumer prices in shops. Analysts at Capital Economics say lower oil prices boosted GDP in the 19-country union by about 1 percentage point last year. That's significant, considering the European Central Bank forecasts the Eurozone economy grew 1.5 percent in 2015. However, the low prices hinder the European Central Bank's effort to get inflation back up toward to around 2 percent. Some fear that a prolonged period of low inflation can encourage consumers to put off spending in the knowledge that goods won't get more expensive. — **Carlo Piovano, London; David McHugh, Frankfurt, Germany**

**RUSSIA** - Russia's economy shrank by 3.7 percent last year, its worst contraction since 2009. Oil and gas together contribute about half of state revenues. The government now anticipates cuts to the budget for fiscal 2016, which is based on an oil price of \$50 per barrel. Poorer Russians are already feeling the squeeze from falling wages and last year's rapid rise in food prices, driven by Russia's "anti-sanctions" ban on Western food. There is government talk of partly privatizing state companies, but powerful state corporation bosses likely would object. Meanwhile, costly plans to drill in the Arctic, once a source of pride for the Russian government, are on ice. Even so, Russian oil production hit a post-Soviet high of 11.1 million barrels a day in 2015, according to the International Energy Agency, which expects production to tail off somewhat as 2016 proceeds. — **James Ellingworth, Moscow**

**LATIN AMERICA** - Across Latin America, drilling projects are being shelved and governments are slashing spending. The IMF is predicting a second straight annual contraction in the region's

**(CONTINUED - CHEAP OIL BUOYS CONSUMERS, SHAKES UP GLOBAL GOVERNMENTS)**

economies. The last time growth was negative for two straight years was in the debt crisis of the 1980s, which was partly fueled by an oil bust. Venezuela is the nation hardest hit. The government earns 95 percent of its export income from oil — and its economy was already unraveling before the plunge in oil prices. Long lines for food and other scarce goods are commonplace. In Colombia, oil income is expected to be practically nil in 2016. For smaller countries in Central America and the Caribbean that import oil, the lower prices are a relief. — **Joshua Goodman, Bogota, Colombia**

**AFRICA** - These are sobering times for Africa's two biggest oil producers. Oil previously provided 80 percent of government revenue in Nigeria and 70 percent in Angola. Nigeria's 2016 budget is double that of 2015 and based on \$38 oil, so the government plans to borrow heavily. Angola's budget is based on a price of \$40, down from an earlier benchmark of \$81. Both countries' currencies have plunged against the dollar. The depreciation has resulted in higher food prices. Now both countries are trying to diversify their economies. Nigeria's government has vowed to focus more on agriculture, mining and massive infrastructure developments to create jobs. The two countries will reap some savings by cutting fuel subsidies. — **Michelle Faul, Lagos, Nigeria; Lynsey Chutel, Johannesburg**

**(YEAH, BUT WHAT ABOUT...)  
GAS PRICES RISE SHARPLY**

Motorists are seeing sharply higher prices at the pumps in New Jersey. AAA Mid-Atlantic says the average price of a gallon of regular gas in the state on Friday was \$1.65, up 8 cents from last week. But that's still much lower than the price from a year ago, when motorists were paying \$2.27.

The national average price on Friday was \$1.87, up 6 cents from last week. But that's still much lower than the national average from a year ago, when motorists were paying \$2.45.

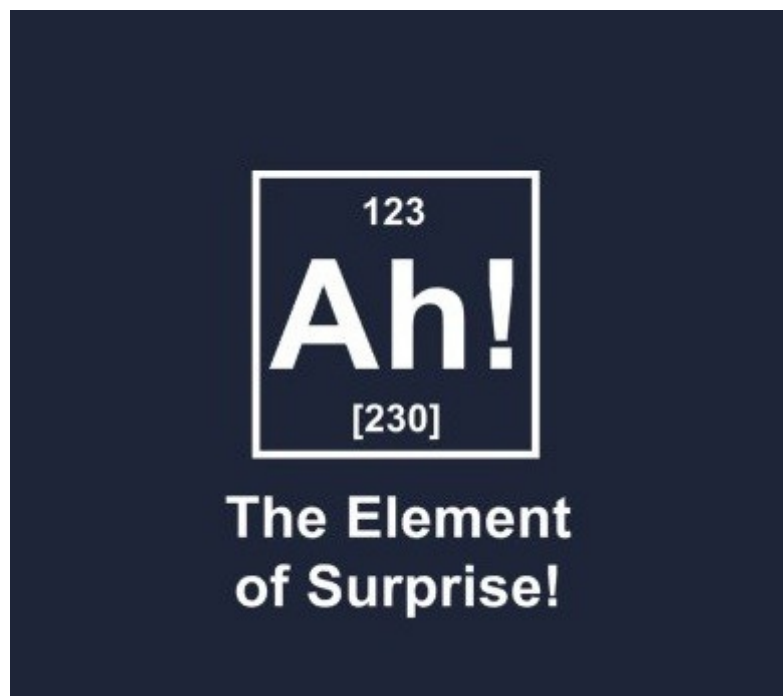
Analysts say gas prices may continue to rise in the coming weeks, as refineries continue their annual maintenance. Some refineries also have cut production due to abundant supplies of gasoline.

[http://www.nj.com/news/index.ssf/2016/03/new\\_jersey\\_gas\\_prices\\_rise\\_sharply.html](http://www.nj.com/news/index.ssf/2016/03/new_jersey_gas_prices_rise_sharply.html)

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Don't forget to pay your dues. Membership renewal was January 1<sup>st</sup>.

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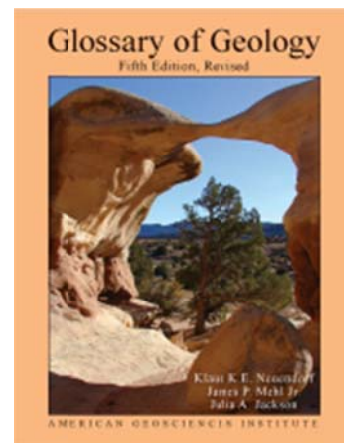
## AGI'S GLOSSARY OF GEOLOGY NOW AVAILABLE FOR ANDROID

<http://www.americangeosciences.org/pubs/glossary#top>

The American Geosciences Institute is pleased to announce the release of its Glossary of Geology app for the Android platform. The AGI Glossary of Geology has long been considered the definitive reference by geoscientists and other students and professionals needing fully-supported and detailed definitions of earth science terms. Traditionally published as an 800+ page [hardcover](#) book, the app version provides all of the rich and detailed content with portability and the power of full-text searching of the entire glossary. In addition to definitions, many entries include background information on origin and usage. The Glossary draws its authority from the expertise of the more than 100 geoscientists in many specialties who reviewed definitions and added new terms. This is a must-have for all geoscientists, engineers working with earth-related issues, and students and other professionals that have questions about our planet.

Special enhancements for this version of the app include: Full-text search; Hyperlinked See-Also; flag and store terms; share terms and definitions; and special access to AGI's GeoWord of the Day with a simple touch. Go to [Google Play](#) for more information.

The entire contents of the Glossary is also available as a [Kindle](#) or [Nook](#) E-Book. With all content and formatting from the hardcopy version faithfully reproduced, you get the browsing experience of the hardcopy with the searchability and portability of an E-Book.



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## THE NH GEOLOGICAL SURVEY GROUND WATER LEVEL NETWORK SUMMARY

Submitted by Lee Wilder of the NHGS

**December 2015** - NH Groundwater level measurements were collected by the NH Geological Survey staff and volunteers from December 28, 2015 – January 02, 2016. The statewide December 2015 average groundwater level for **wells in the overburden** (in soils on top of the bedrock) showed an increase of +0.37 feet from November 2015. When compared with December 2014, the statewide average groundwater level for December 2015, in these wells, decreased -0.88 feet. The December 2015 average groundwater level in the new **bedrock wells** showed an increase of +1.48 feet when compared with November 2015. When compared with December 2014, the bedrock wells showed a decrease of -0.59 feet for December 2015.

**January 2016** - NH Groundwater level measurements were collected by the NH Geological Survey staff and volunteers from January 25, 2016 – January 29, 2016. The statewide January 2016 average groundwater level for **wells in the overburden** (in soils on top of the bedrock) showed an increase of +0.18 feet from December 2015. When compared with January 2015, the statewide average groundwater level for January 2016, in these wells, decreased -0.45 feet. The January 2016 average groundwater level in the new **bedrock wells** showed an increase of +0.31 feet when compared with December 2015. When compared with January 2016, the bedrock wells showed a decrease of -0.76 feet for January 2016.

**February 2016** - NH Groundwater level measurements were collected by the NH Geological Survey staff and volunteers from February 22, 2016 – February 29, 2016. The statewide February 2016 average groundwater level for **wells in the overburden** (in soils on top of the bedrock) showed an increase of +0.21 feet from January 2016. When compared with February 2015, the statewide average groundwater level for February 2016, in these wells, increased +0.22 feet. The February 2016 average groundwater level in the new **bedrock wells** showed an increase of +0.60 feet when compared with January 2016. When compared with February 2015, the bedrock wells showed an increase of +0.20 feet for January 2016.

The groundwater level measurements for the deeper of the two Concord bedrock wells (CVWB-1) are **not** presently available in real-time. Past data are on the USGS website at: [http://waterdata.usgs.gov/nh/nwis/uv/?site\\_no=431034071340501&PARAMeter\\_cd=72019](http://waterdata.usgs.gov/nh/nwis/uv/?site_no=431034071340501&PARAMeter_cd=72019).

The data for all of the wells in the NH Groundwater Level Network are shared with and posted on the USGS website at: <http://groundwaterwatch.usgs.gov/statemap.asp?sc=33&sa=NH>.

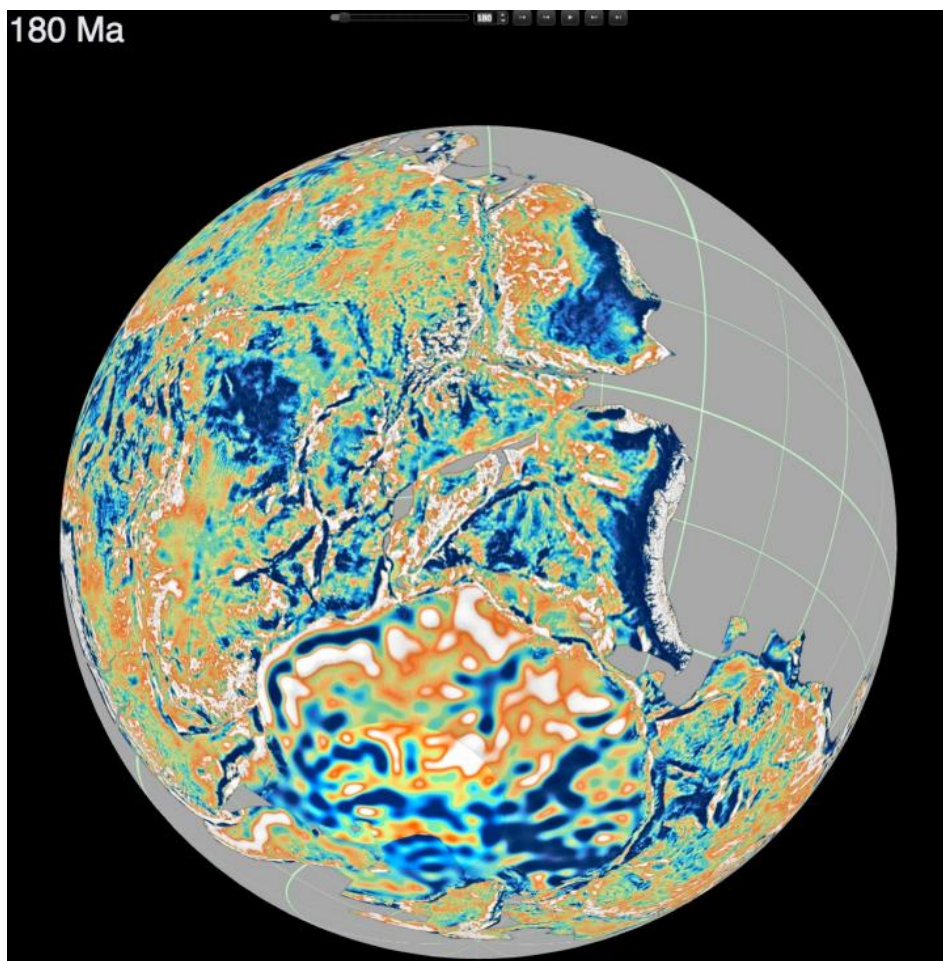
## VIRTUAL TIME MACHINE OF EARTH'S GEOLOGY NOW IN THE CLOUD

UNIVERSITY OF SYDNEY - 9-Mar-2016

[http://www.eurekalert.org/pub\\_releases/2016-03/uos-vtm030716.php](http://www.eurekalert.org/pub_releases/2016-03/uos-vtm030716.php)

How did Madagascar once slot next to India? Where was Australia a billion years ago? Cloud-based virtual globes developed by a team led by University of Sydney geologists mean anyone with a smartphone, laptop or computer can now visualize, with unprecedented speed and ease of use, how the Earth evolved geologically. Reported in *PLOS ONE*, the globes have been gradually made available since September 2014. Some show Earth as it is today while others allow reconstructions through 'geological time', harking back to the planet's origins.

Uniquely, the portal allows an interactive exploration of supercontinents. It shows the breakup and dispersal of Pangea over the last 200 million years. It also offers a visualization of the supercontinent Rodinia, which existed 1.1 billion years ago. Rodinia gradually fragmented, with some continents colliding again more than 500 million years later to form Gondwanaland.



This is a reconstruction of the supercontinent Pangea 180 million years ago. The colors correspond to fluctuations in the continental gravity field, which reflect the deep continental structure such as roots of ancient mountain chains, basins and fold belts. These features are used to solve the puzzle of re-arranging all continents from today's positions to their ancient placement in Pangea.

"Concepts like continental drift, first hypothesized by Alfred Wegener more than a century ago, are now easily accessible to students and researchers around the world," said University of Sydney Professor of Geophysics Dietmar Müller. "The portal is being used in high schools to visualize features of the Earth and explain how it has evolved through time." The virtual globes includes visual

depictions of a high-resolution global digital elevation model, the global gravity and magnetic field as well as seabed geology, making the amazing tapestry of deep ocean basins readily accessible.

The portal also portrays the dynamic nature of Earth's surface topography through time. It visualizes the effect of surface tectonic plates acting like giant wobble boards as they interact with slow convection processes in the hot, toffee-like mantle beneath Earth's crust. "When continents move over hot, buoyant swells of the mantle they bob up occasionally causing mountains," said Professor Müller. "Conversely the Earth's surface gets drawn down when approaching sinking huge masses of old, cold tectonic slabs sinking in the mantle, creating lowlands and depressions in the earth's crust."

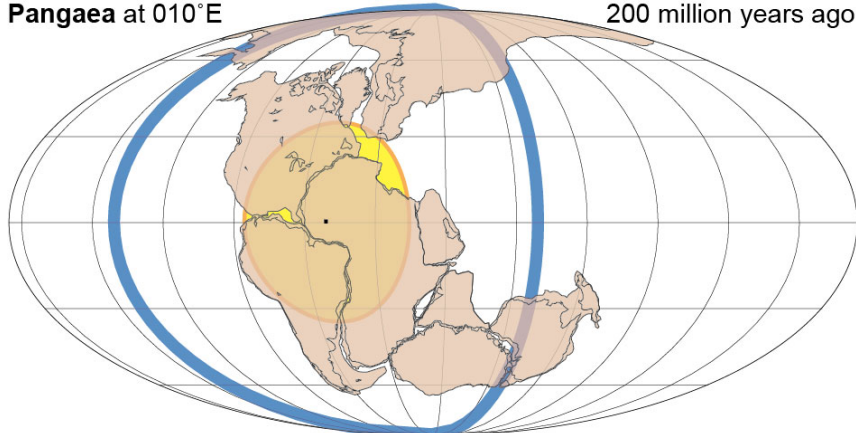
"These cloud-based globes offer many future opportunities for providing on-the-fly big data analytics, transforming the way big data can be visualized and analyzed by end users," said Professor Müller. The interactive globes can be viewed on any browser at: [portal.gplates.org](http://portal.gplates.org)

## I DON'T REMEMBER THIS—IT MUST HAVE BEEN BEFORE MY TIME

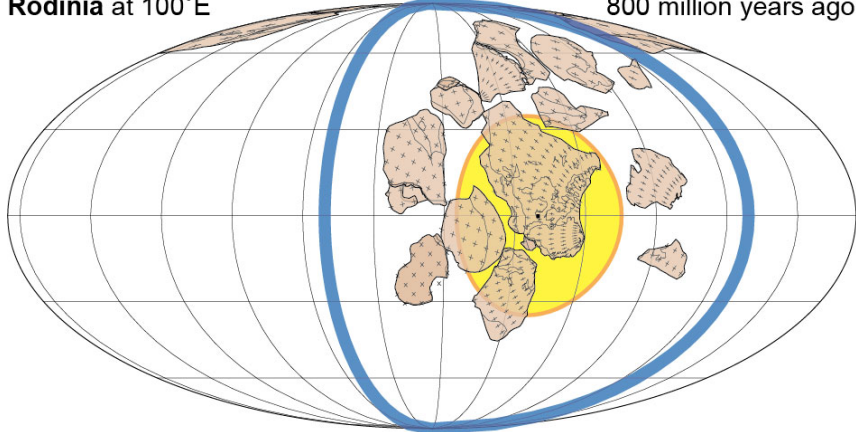
<http://www.madsci.org/posts/archives/1998-12/913866772.Sh.r.html>

Rodinia and Pangea were two different supercontinents, rather than two different names for the same supercontinent. They were both formed from some of the same continental fragments, but they formed at different periods in time. The information below was obtained from Dr. Christopher Scotese's excellent website on plate motions, called "The Paleomap Project". Dr. Scotese is one of the world's leading researchers on paleogeography (the study of the ancient positions of different land masses and their characteristics). Go to the web site at : <http://www.scotese.com/> and click on the links to the different times and look at the maps then click on the link to "More Info" in the upper left of each screen.

**Pangaea at 010° E** 200 million years ago



**Rodinia at 100° E** 800 million years ago



Rodinia was a supercontinent formed about 1100 million years ago (that's 1,100,000,000 years). 750 million years ago, Rodinia broke into three pieces that drifted apart as a new ocean formed between the pieces. Then, about 600 million years ago, those pieces came back together with a big crunch known as the Pan-African orogeny (mountain building event). This formed a new supercontinent, with the name of Pannotia. By about 550 million years ago, Pannotia was breaking up into several small fragments, Laurentia (the core of what is now North America), Baltica (northern Europe), and Siberia, among others, and one very large piece. This large piece, containing what would become China, India, Africa, South America, and Antarctica, was called Gondwana. It is considered a supercontinent in its own right because it is so big, but it is only part of the earlier

supercontinents. Over the next 200 million years many of the small pieces came together to form another large continent called Laurasia. Laurasia and Gondwana joined approximately 275 million years ago to form the supercontinent of Pangea. The breakup of Pangea is still going on today and contributes in the formation of the Atlantic Ocean. Eventually a new supercontinent will form and then it will break apart and so on.

As you can see, the earth's continents have seen a lot of action over time. There were probably some supercontinents formed in the 4300 million years of earth's history that came before Rodinia was formed, however, we have a much harder time understanding the history of rocks that old because there were not very many life forms to help determine the age of the rocks and because so much has happened to the rocks since they formed that the record of the original events is not very clear any more (imagine that five different people each taped over different parts of your favorite video and then from the little pieces that were left of the original, you had to go back and try to put the whole story together - geologists who do this work are a lot like detectives).

Davis Smith, Ph.D., La Salle University, Philadelphia, PA - Smith is a former Associate Professor at LaSalle University in Philadelphia, Pa., and Director of Academic Operations for LaSalle's Institute for the Advancement of Mathematics and Science Teaching (IAMST). Smith holds a doctorate in Geology from Stanford University in Palo Alto, Ca. <http://www.davincisciencecenter.org/about/dsc-people/staff/david-smith-ph-d/>



The [Barnard Glacier](#) in the [Saint Elias Mountains](#) near [McCarthy, Alaska](#) widens with every ice river that flows out of one of the side valleys. Each time another [valley glacier](#) merges with the Barnard the numbers of [lateral moraines](#), the strips of darkened debris, increases as does the mass of material that the Barnard carries with it. Note that much of the ice is covered with dust in this late summer scene. Aerial photo taken in August of 2005, at an altitude of approximately 11,000 ft. Photographer: [Bernhard Edmaier](#) – <http://epod.usra.edu/blog/2016/03/barnard-glacier.html>

## **DATES TO REMEMBER**

**April 13, 2016 - Southeastern NH Mineral Club** – 2nd Wednesday of each month, St John's Methodist Church, 28 Cataract Ave., Dover, NH – 7:00 PM <http://www.senhmineralclub.org>

**April 21, 2016 – GSNH Spring Dinner Meeting** at the Puritan Back Room, Manchester. Directions at <http://www.puritanbackroom.com/contact-us/location-directions.php>. Please, have your reservations in by April 15 to **Lea Anne Atwell** [LeaAnne.Atwell@des.nh.gov](mailto:LeaAnne.Atwell@des.nh.gov).  
<http://www.gsnh.org/>

**May 7, 2016 – Capital Mineral Club** – regular meeting – Meetings are held on the first Saturday of the month September through May from 2 to 5 pm at the Salvation Army Building, 58 Clinton Street, Concord, NH. <http://www.capitalmineralclub.org/>

**June 25-26, 2016** - The 52nd annual **Gilsum Rock Swap & Mineral Show** – See article in this newsletter. <http://www.gilsum.org/rockswap>

**June 26-29, 2016 - 50th US Rock Mechanics/Geomechanics Symposium** to be held in Houston, Texas. For information on the symposium, accommodations and sponsorship, visit [www.armasyposium.org](http://www.armasyposium.org).

**August 6, 2016 – GSNH Summer Field Trip** to the Mt. Washington summit, observatory and new museum. Stops on ride to summit. Barbeque. Rain or shine. Look for details at <http://www.gsnh.org/>.

**October 12, 2016 – GSNH Fall Dinner Meeting** – TBA – This meeting will be held on **WEDNESDAY** night so you can make it to NEIGC Friday am. <http://www.gsnh.org/>

**October 14-16, 2016 – NEIGC - New England Intercollegiate Geological Conference -** Geology of the Maine Coast from Maquoit Bay to Muscongus Bay  
<http://w3.salemstate.edu/~lhanson/NEIGC/Conference.html>

**November 12-15, 2017 - Mount Washington Observatory Regional Climate Science Colloquium** – Bringing together climate scientists and related educators to assess the status of climate science investigations and education. See more at <https://www.mountwashington.org/educational-programs/regional-climate-science-colloquium/>.

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## **GLACIOGRAM VOLUME 47 PUBLISHED**

John Rayburn, Department of Geology at SUNY New Palz, announced December 17, 2015 that the 47<sup>th</sup> volume of Glaciogram has been published. Glaciogram is an annually compiled collection of informal notes concentrating on Quaternary work that relates to New York State either directly or indirectly. Volumes going back to 1966 from back when they were typewritten on mimeograph stencils are available via the website at <http://www2.newpaltz.edu/glaciogram/>, where you can also subscribe to the Glaciogram email list. Volume 47 is available at [http://www2.newpaltz.edu/glaciogram/Glaciograms/NYGlaciogram\\_2015\\_47.pdf](http://www2.newpaltz.edu/glaciogram/Glaciograms/NYGlaciogram_2015_47.pdf).

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The rotation of the Earth really makes my day!

**THE 52ND ANNUAL GILSUM ROCK SWAP & MINERAL SHOW** Submitted by Robert Mitchell  
President, Gilsum Recreation Committee

Gilsum, NH -- The town of Gilsum, located in the scenic Monadnock Region in southwestern NH, will once again host thousands of people from all over the U.S. who will attend the Gilsum Rock Swap and Mineral Show. Here more than 65 dealers, swappers, distributors, wholesalers and collectors can buy, sell, or swap beryl, quartz crystals, semi-precious stones, and rocks and minerals of all sorts. Displays range from newly found specimens in the rough to fossils, prized collector's pieces and hand-crafted jewelry.

The event takes place at the Gilsum Elementary School grounds, Route 10 in Gilsum. Show hours are 8:00 AM to 6:00 PM Saturday and 8:00 AM to 4:00 PM Sunday.

This year's event includes a two special presentations. Saturday, June 27th at 1:00 PM, geologist and collector Nancy Swing will discuss "Rockhounding in New England." Swing is a former professor of Geology and Oceanography at the Community College of Rhode Island, has been the featured speaker at the East Coast Gem and Mineral show for the last 14 years, and is a regular at the Gilsum Rock Swap & Mineral Show. Prized specimens will be on display. The presentation will be held at the Elementary School gymnasium adjacent to the field.

In addition, noted collector Steve Garza will also offer a prospecting for beginners demonstration, including the proper way to break a rock to uncover the minerals or precious stones within. That takes place at 2:00 PM at space #40 on the field.

Gilsum's many mines operated until the 1940s and yielded feldspar, mica and beryl. Most are now abandoned, although one, the Beauregard mine, is available to mineral clubs through prior arrangement. Today collectors prize other minerals such as beryl. Maps showing locations of local mines are available during the show.

Since the show's inception, the town of Gilsum has opened its doors for the event. Activities include a presentation on prospecting Saturday, daily pancake brunch, bake sale, book sale, a traditional Saturday night New England ham and bean supper with homemade pies and a chicken barbeque dinner Sunday afternoon.

Admission is free, although donations are graciously accepted. All proceeds go to youth recreation and community programs.

For more information please contact Robert Mitchell at the Gilsum Recreation Committee, P.O. Box 76, Gilsum, NH, 03448; call 603.357-9636; or send e-mail to [gilsumrocks@gmail.com](mailto:gilsumrocks@gmail.com).

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**AGI ANNOUNCES EARTH SCIENCE WEEK THEME -**

<http://www.earthsciweek.org/mission-and-theme>

Earth Science Week will be October 9-15, 2016. American Geosciences Institute is pleased to announce that the theme of Earth Science Week 2016 is "Our Shared Geoheritage." This year's event will promote awareness of the many ways that science helps us understand, appreciate, and make the most of our geoscience heritage, or, as it is commonly known worldwide, "geoheritage." Geoheritage is the collection of natural wonders, landforms, and resources that have formed over eons and come to this generation to manage, use, and conserve effectively.

Since October 1998, the American Geosciences Institute has organized this national and international event to help the public gain a better understanding and appreciation for the Earth Sciences and to encourage stewardship of the Earth. Teachers kits for Earth Science Week covering Mapping, Careers, Changing Earth and Earth's Connected Systems are available for a nominal fee.

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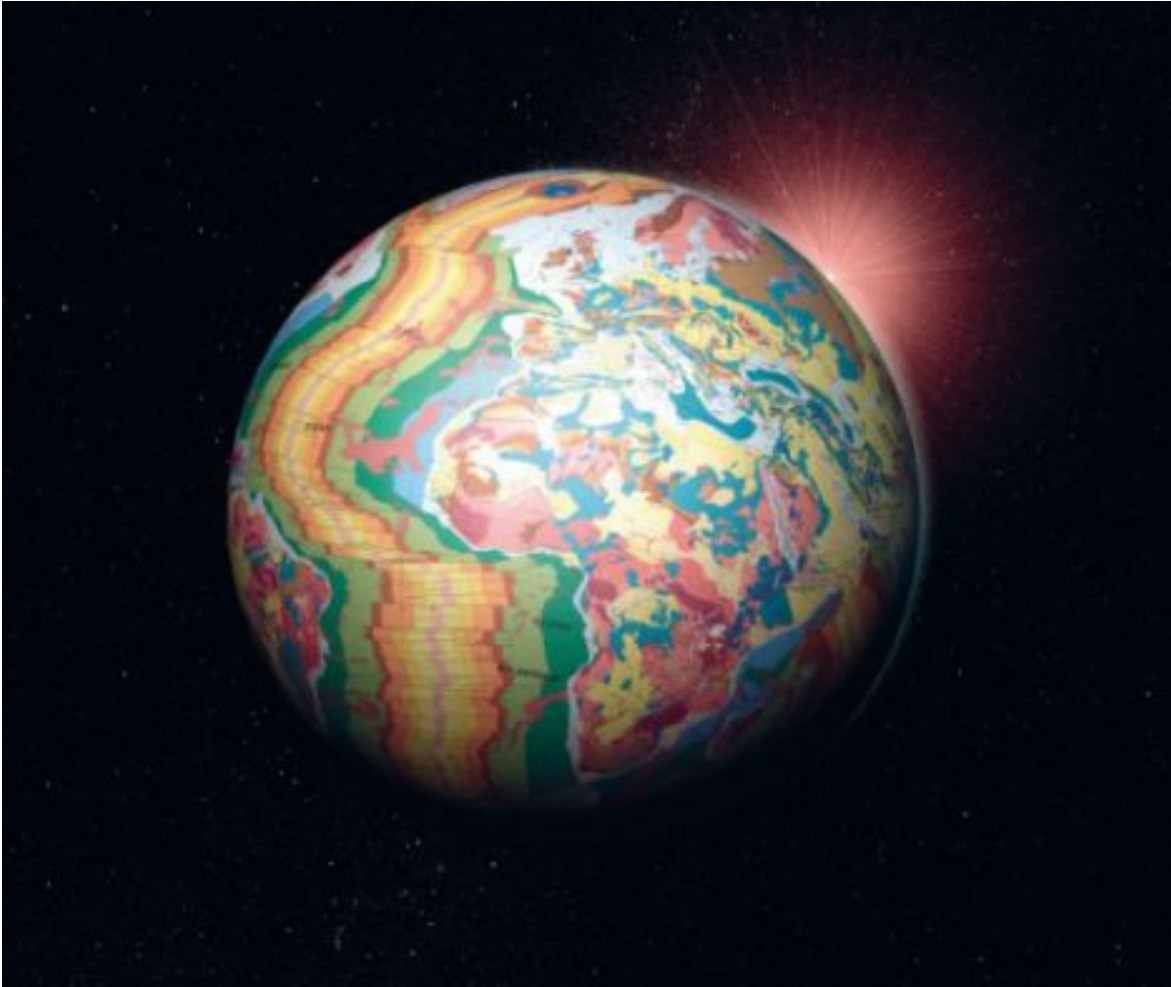
**There are two types of people in the world. Those who can extrapolate from incomplete data.**

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## WHAT THE WORLD LOOKS LIKE NAKED: EARTH'S GEOLOGY LAID BARE

By DAILY MAIL REPORTER **UPDATED:** 08:02 EST, 1 AUGUST 2008

This amazing image reveals what our world looks like when it is stripped bare - shorn of all its plants, topsoil, water and man-made structures. Along with other never-seen-before images of the Earth, the picture has been unveiled at OneGeology - the world's biggest ever geological mapping project. Scientists behind the project hope it will do for the ground beneath our feet what Google has done for the Earth's surface with its Google Maps, Earth and Street utilities.



**Inner space: What the Earth looks like shorn of its surface structures. KEY: pale yellow - alluvium; red - granites or basalts; green - chalk; pink - sandstones; purple - slates; blue - mudstones and limestones**

But unlike Google Maps, which runs from a single centralized internet server, OneGeology's information will be held on 50 servers run from individual countries. The data will be continuously updated. OneGeology, supported by Unesco and six other international organizations, is the flagship project for UN International Year of Planet Earth 2008 - and posting global geological maps on the internet is one of its key achievements. The project has also seen the development of a new web language for geology which allows nations to share data with each other and the public.

Some 15,000 scientists from 79 nations came together to produce the first digital geological map of the world. Because all the participating countries provided information for free - and paid their own costs - the start-up price of the project was only £500,000.

The map was completed in little over a year.

Read more: <http://www.dailymail.co.uk/sciencetech/article-1040256/What-world-looks-like-naked-The-amazing-image-Earths-geology-laid-bare.html#ixzz3urjKiMDx>

## FIRST MICROWHIP SCORPION FROM MESOZOIC PERIOD FOUND IN BURMESE AMBER

New minute fossilized microwhip scorpion named after South Asian nature spirits - It's smaller than a grain of rice, yellowish, trapped in amber and lived 100 million years ago alongside dinosaurs.

Meet *Electrokoenenia yaksha*, a newly described type of microwhip scorpion, or palpigrade, from Myanmar, whose minute fossilized remains have been found, trapped in Burmese amber. It has been described by an international team led by Michael S. Engel of the University of Kansas and the American Museum of Natural History in the US and Diyang Huang of the Nanjing Institute of Geology and Palaeontology in the People's Republic of China in Springer's journal *The Science of Nature*.

Many of the finer details commonly used to compare fossilized remains with those of living microwhip scorpions are not visible in the sample. This is because it is contained in amber and it is obscured by microscopic fractures and debris.

Nonetheless, the researchers believe the sample to be that of a yellowish female of 1.47 millimeters long that lived some 100 million years ago during the Mesozoic period. It is the first microwhip scorpion fossil from this period to be found, and also the only one of its order known of to be contained in amber. The only other fossil record from this order is encased in limestone from the Onyx Marble Formation, and is therefore in geological terms between 94 and 97 million years younger than *Electrokoenenia yaksha*. Because it looks so similar to other microwhip scorpions still found today, it most probably shared the same habitat and preferences as its modern-day kin.

The fossilized microwhip scorpion's name is partly derived from *electrum*, which means "amber." The research team further acknowledged that the fossil was found resting in Burmese amber by naming it after "yaksha." These nature spirits in South Asian mythology are said to have held stewardship over the wonders hidden in the earth.

It is hoped that similar examples might yet be discovered to further the study of these tiny, soft-bodied arthropods in more detail. Because of their minute size, they are easily overlooked, particularly if placed near other fossilized items, debris, or when situated among fissures in the material it is trapped in. In the case of *Electrokoenenia yaksha*, it was initially overlooked owing to its placement among a series of reflective fractures, and appeared to be a slightly darker, thick area. It was discovered upon more careful examination.

"Preservation in amber is perhaps the only medium through which such minute animals could be adequately characterized, their fine features and fragile forms too readily destroyed or rendered unidentifiable in sediments," says Engel. He believes that further specimens might be discovered in amber deposits from India, the Dominican Republic, Lebanon, eastern North America and Archingeay in France.

Reference: Engel, M.S. *et al* (2016). The first Mesozoic microwhip scorpion (*Palpigradi*): a new genus and species in mid-Cretaceous amber from Myanmar, *The Science of Nature*. DOI 10.1007/s00114-016-1345-4 [http://www.eurekalert.org/pub\\_releases/2016-03/s-fms030916.php](http://www.eurekalert.org/pub_releases/2016-03/s-fms030916.php)









MEMBERSHIP & RENEWAL APPLICATION

# Geological Society of New Hampshire

PO Box 401, Concord, NH 03302

Name: \_\_\_\_\_ (Please print clearly)

E-mail: \_\_\_\_\_

**Renewing Members:** Only update this section if you have changes to your contact information (including email) or educational history.

**New applicants:** please complete this section.

Preferred address/email to receive GSNH Communication: \_\_\_Home or \_\_\_Business

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 \_\_\_\_\_

**Business Address:**

(Employer): \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

Home Telephone: \_\_\_\_\_

Office Telephone: \_\_\_\_\_

New Hampshire PG # (if applicable) \_\_\_\_\_

**Education:** Degrees received or in progress:

<u>Year</u>	<u>Degree</u>	<u>Major</u>	<u>College or University</u>
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____

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|---|--|---|
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| <input type="checkbox"/> Legislative Committee      | <input type="checkbox"/> Education Committee   | (Newsletter or Website, circle preference)        |
| <input type="checkbox"/> Giving a talk at a meeting | <input type="checkbox"/> Events Committee      | <input type="checkbox"/> Other:                   |

**Membership Category:**

- \_\_\_\_\_ Regular Member (Annual Dues \$20.00)  
 \_\_\_\_\_ Student Member (Annual Dues \$10.00)...Please complete Education section above.

Make checks payable to "**Geological Society of New Hampshire.**" Note that GSNH dues are not deductible as a charitable contribution, but may be deductible as a business expense. Please return this completed application form with any necessary corrections and a check for the appropriate dues to the GSNH at the address above. The Society's membership year runs from January 1 to December 31.

Signature: \_\_\_\_\_ Date: \_\_\_\_\_