

Bulletin of the New York Mineralogical Club

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Celebrating the International Year of Light

May 2015

May 13th Meeting:

Renée Newman: "Exotic Gems Today"



While working as an international tour director, Renée was exposed to beautiful gems in Asia, South America, and the South Pacific. She saw gems everywhere—in hotels, airports, tourist attractions and, naturally, in shopping areas. Her passengers wanted to know how to get good buys on them and spot quality, so she searched libraries and bookstores for help. Although there was information on gem identification, history, mining and lore, there was little about judging the quality of pearls and colored gems.

When she heard about a colored gem grading class at the Gemological Institute of America (GIA), she decided to enroll. The enthusiasm of the instructors inspired her to sign up for the gemology program there. Two years later, she obtained a GIA Graduate Gemologist diploma and began work as a gemologist at a wholesale firm in Los Angeles. It was a great opportunity because she worked with a wide variety of diamonds, rubies, sapphires, emeralds and pearls. She was also involved in jewelry quality control.

Ever since she had become aware of the need for affordable information on gem evaluation, she wanted to write a consumer guide to buying gems. Gradually, writing, research and book promotion became a full-time occupation.

After graduating from the University of California at Santa Barbara, she taught English in France, Spain and Japan. To do that, she had to learn to communicate in clear, simple English so foreign students could understand her. This in turn helped her write about gems in an easy-to-read style that lay people can understand.

If You Can't Stand the Heat, Get Out of the Universe

By Steven Newton

The *New York Times* ran an interesting article back in January by Adam Frank titled "Is Climate Disaster Inevitable?" This piece posed an intriguing answer to this puzzling question: Where are all the extraterrestrials?

(If you think the answer is "Roswell, New Mexico," go sit with Bigfoot and be quiet – adults are talking.)

The Drake equation gives us an order of magnitude feel for how many advanced civilizations there could be in the universe by looking at parameters such as the percentage of stars that have planets, the percentage of those planets which have the right conditions to support life, etc. There are a lot of unknowns in these parameters, but the upshot is that even if one assumes conservative conditions, there should be millions of advanced civilizations out there right now.

Enrico Fermi famously phrased the question: "So where are they?" thus spawning the eponymous Fermi paradox. With so many potential civilizations, why is the cosmos not saturated with radio signals, with extraterrestrial equivalents of *Keeping Up With the Kardashians* streaming into space from a thousand different tacky cultures? Despite the implications of the Drake equation, we have never encountered even the slightest hint of extraterrestrial life, not the faintest wisp of a stray radio signal from a distant civilization. SETI is listening diligently, but so far, the universe is sepulchral quiet.

One answer to Fermi's paradox is dark. Uranium is ubiquitous. There's so much uranium in the Earth that it's played an important role in keeping our mantle hot, and hence keeping plate tectonics functioning. (We're the only planet we know of with both life and plate tectonics. The recycling of the crust and its essential elements through tectonics suggests this isn't a coincidence.) Because uranium is everywhere in the universe, any advanced

civilization would inevitably discover the basics of fission and learn how to create an atomic bomb. So perhaps the solution to Fermi's paradox is that advanced

civilizations inevitably annihilate themselves with nuclear war, as we came so close to doing (and still have the potential to achieve). We don't see UFOs buzzing around because given enough time, each

nascent civilization enters a nuclear age – and they don't make it out.

That seems unlikely. Sure, it's reasonable to assume that warfare and conflict are not unique to humans, but would that be universally true for all possible civilizations? Millions of them? Surely one would develop along the lines of *The Big Lebowski*, a civilization populated with alien versions of The Dude, aspiring not to warfare, but only to abide on a comfortable couch, pontificating about how well the rug tied the room together, while sending radio waves into space proclaiming this slacker anthem.

(Continues on page 8)



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President's Message

By Mitch Portnoy

At each meeting for a few years now we have played a **mineral or gem ID game** based on color, crystal system, state minerals, etc. I compiled all of these games and burned them on CD-ROMS. I then gave them to **Cheryl Neary** for distribution to other EFMLS clubs at the recent convention in March. I am glad to know that all this work will have more life and our brother and sister clubs will have a good time with them.

Years ago we had many young members (kids) and for a few years they formed a club within our club called the **Tourmaline Troop**. On several weekends, we developed programs and activities just for them. The Troop was discontinued as their homework burden increased and they eventually went to college. Is there any interest in resuscitating this group?

Donations Being Accepted for the Annual Benefit Auction Wednesday, June 10, 2015

Minerals, Gems, Jewelry, Meteorites,
Lapidary Arts, Crystals, Magazines,
Books, Ephemera, Fossils

Club Meeting Minutes for April 8, 2015

By Vivien Gornitz, *Secretary*

Attendance: 43

President Mitch Portnoy presided.

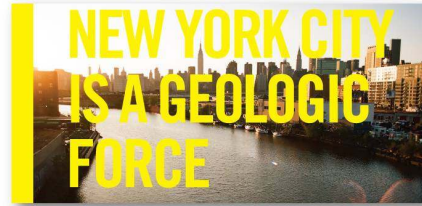
Announcements:

- ◆ The raffle was held.
- ◆ After the "usual" historical meeting day notices, the #3 Minerals & Light game, about iridescence, was played.
- ◆ The items available (both free and for pay) at the meeting were listed.
- ◆ The Club donated ten CD-ROMS of all the meeting games to the EFMLS for distribution to other clubs at the annual convention.
- ◆ **Janice Kowalski** presented the results of the EFMLS 2015 Article Contest.
- ◆ A video about Earth's layers and a fun presentation set to music about the periodic table were played.
- ◆ Upcoming club events were previewed again with the addition of the possibility of a charter bus to the Springfield Mineral Show and the December lecture by **John Sanfaçon**.

Special Lecture: **Jamie Kruse: "New York City is a Geological Force"**

To raise awareness of the geological forces that formed the materials surrounding us, Jamie Kruse and Elizabeth Ellsworth have created a novel field guide to New York City, in which they investigate

the underlying "geoarchitecture." Inspired by the human imprint on age-old geological formations in Utah, Jamie Kruse set out to examine more closely the myriad ways people channel and reshuffle earth materials in the city.



In her presentation, Jamie mentioned several illustrative examples from among the 20 field sites in the guidebook. We now live in the Anthropocene¹, she pointed out, a period in which humans have become a major geologic force, a period of unprecedented rapid population growth, extraction and consumption of earth materials, of waste production, and of climate change. The numerous ways in which we transform ancient rocks makes New York City a "geological hot spot."

To drive home important points, Jamie and Elizabeth invented a special geovocabulary. On the walking tour, one can visit "Brownstone National Park", populated by blocks of dinosaur-age Triassic and Jurassic sandstone buildings in Brooklyn and other city neighborhoods. The mounds of 8 to 10 million-year old salt from Chile's arid Atacama desert, used to melt snow on city roadways, become a "desert moraine." "No zero exists in the geologic city" because of constant remixing, in which, for example, concrete—a mix of sand, cement, stone, and water—remix into new "conglomerate." Wastes at the Fresh Kills Staten Island dump site generate methane for energy use, while the site gradually morphs into a park. Other scrap yards accumulate the "wreckage of former worlds", referring to piles of rusting metals whose elements were created in cosmic events long before the origin of the Solar System.

The geopoetry of Robert Simpson envisioned Central Park a million years ago, buried under a vast ice sheet, up to 2,000 feet thick. "Under the frozen depths, where the carousel now stands, you would not notice the effect on the bedrock as the glacier dragged itself along." Perhaps not then, but today the observant stroller will notice the scrapes and grooves gouged by the now-vanished glaciers on smoothly-scoured rock outcrops throughout the park.

Jamie concluded her talk with a visit to the Buddhist temple on Riverside Drive and

108 St, where the "Wandering Pole", a statue of a wandering Buddhist monk stands. The pocked and scarred bronze statue holds deep memories of its ancient pre-solar origins and a more recent cataclysmic event—the bombing of Hiroshima in 1945—an apt symbol of the stark contrasts inherent in the Anthropocene.

The curious New Yorker can find out more about the city as a geological force in "Geologic City: A Field Guide to the Geoarchitecture of New York" by Jamie Kruse and Elizabeth Ellsworth.

(1) A term popularized by Paul Crutzen, a Nobel Prize-winning atmospheric chemist and discoverer of the ozone hole.

Members in the News

- ◆ Both **Gail Brett Levine** and **Branko Deljanin** will be speakers at the Mediterranean Gemological and Jewelry Conference in Greece during June 27-28, 2015.
- ◆ Congratulations to **Cheryl Neary**, elected president of Island Rock Hounds mineral club!
- ◆ Articles by **Charles Snider** (advice about mineral shows and rockhounding/cell phones) appeared in the March 2015 issue of *Rock Bottom Facts*, bulletin of the Island Rock Hounds, Inc.
- ◆ Worthy.com named former Tiffany & Co. EVP **Peter Schneirla** as President in March 2015.
- ◆ **Mitch Portnoy** will be delivering a presentation to the Stamford Mineralogical Society on May 12, 2015.

Coming Next Month!

When: Wednesday, June 10, 2015
Viewing Begins at 5:00 pm
Auction Begins at 6:15 pm
Where: Holiday Inn Midtown



To Benefit the New York Mineralogical Club, Inc. • Founded 1886 • New York City

Assemblywoman Alison McHose introduced legislation that would designate Franklinite as the official mineral of New Jersey.

Franklinite is named after McHose's (R-Sussex) hometown of Franklin Borough, which is the only place on the planet it's found. "I wanted to do it as sort of a recognition of the fact that it's an unusual mineral, but yet very prominent in geology,"

McHose said.

The World of Minerals

The *World of Minerals* is a monthly column written by Dr. Vivien Gornitz on timely and interesting topics related to geology, gemology, mineralogy, mineral history, etc.



Part II: Nanominerals — Nanodiamond Gems

Will synthetic nano-polycrystalline diamond become the gem of the future? Although never of gem quality, natural polycrystalline diamonds¹ exist as *bort* and *carbonado*—generally opaque, dark, and unattractive materials that are tougher than single crystals. Thus, they are widely used in industry as abrasives. Synthetic nano-polycrystalline diamonds find additional uses in hi-tech applications. However, recently, gem-quality lab-grown nano-polycrystalline diamonds are entering the scene. One specimen, a transparent brownish-yellow 5 mm-diameter sphere, consists of a tightly-packed mass of nano-crystals, forming a nearly flawless gem. The sphere fluoresces a bright reddish-orange in long-wave UV light, with a weaker reaction under short-wave UV. Published sources indicate that the diamond was created from graphite at extremely high temperatures and pressures. The tightly interlocking nature of the miniscule crystallites greatly reduces or nearly eliminates breakage along grain boundaries. Furthermore, because of the random orientation of the individual grains, no particular cleavage direction is favored. These characteristics make nano-polycrystalline diamonds much stronger than their single crystal counterparts, opening the door to novel applications.



The ability to fabricate transparent, very slightly included diamonds opens a new chapter in the jewelry trade. One brownish-yellow, slightly included 0.88 ct round brilliant, ~6 mm across, appears fairly clear to the naked eye, but under closer inspection reveals faint patchy clouds and color zoning; also some evidence of strain under crossed polarized light. The stone absorbs strongly in the blue region of visible light, which causes the brownish-yellow color. Two small absorption peaks appear at 612 and 667 nm, whose origin remains to be determined.

Further Reading

Skalwold, E. A., 2012. Nano-polycrystalline diamond sphere: a gemologist's perspective. *Gems & Gemology*, Summer, 2012, p. 128-131.
 Skalwold, E. A. et al., 2012. Characterization of a synthetic nano-polycrystalline diamond gemstone. *Gems & Gemology*, Fall, 2012, p. 188-192.

¹ But not necessarily at the nano-scale.

Banquet 2015 Preview

The Garnet Group

Aluminum Members	Mixed Varieties
<ul style="list-style-type: none"> ● Almandine ● Pyrope ● Spessartine 	<ul style="list-style-type: none"> ● Rhodolite Pyrope + Almandine ● Malaya Pyrope + Spessartine
Calcium Members	Color Varieties
<ul style="list-style-type: none"> ● Andradite ● Grossular ● Uvarovite 	<ul style="list-style-type: none"> ● Demantoid ● Melanite ● Topazolite ● Hessonite ● Leuco Garnet ● Hydrogrossular ● Merelani Mint ● Mali ● Tsavorite

This chart summarizes the members of the garnet group that are most important as gemstones. The aluminum garnets are normally red in color with a higher specific gravity and hardness. The calcium members are usually green in color and have a lower hardness.

Garnet on Worldwide Postage Stamps

NYMC BANQUET

6 PM - 11:00 PM
WEDNESDAY
OCT 14 2015

ADMIT ONE

MEZZANINE HOLIDAY INN MIDTOWN
440 WEST 57 ST. NEAR TENTH AVE.

6 PM - 11:00 PM
WEDNESDAY
OCT 14 2015

Jade's Journey Marked by Drugs and Death

By Dan Levin

MYITKYINA, Myanmar — At 16, the gem trader's son set out for the jade mines to seek his fortune in the precious stone that China craves. But a month in, the teenager, Sang Aung Bau Hkum, was feeding his own addiction: heroin, the drug of choice among the men who work the bleak terrain of gouged earthen pits, shared needles and dwindling hope here in the jungles of northern Myanmar.

Three years later he finally found what he had come for — a jade rock “as green as a summer leaf.” He spent some of the \$6,000 that a Chinese trader paid him on a motorcycle, a cellphone and gambling.



“The rest disappeared into my veins,” he said, tapping the crook in his left arm as dozens of other gaunt miners in varying states of withdrawal passed the time at a rudimentary rehabilitation clinic here. “The Chinese bosses know we’re addicted to heroin, but they don’t care. Their minds are filled with jade.”

Mr. Sang Aung Bau Hkum, now 24, is just one face of a trade — like blood diamonds in Africa — that is turning good fortune into misery.

Driven by an insatiable demand from the growing Chinese middle class, Myanmar's jade industry is booming and should be showering the nation, one of the world's poorest, with unprecedented prosperity. Instead, much of the wealth it generates remains in control of elite members of the military, the rebel leaders fighting them for greater autonomy and the Chinese financiers with whom both sides collude to smuggle billions of dollars' worth of the gem into China, according to jade miners, mining companies and international human rights groups.

Such rampant corruption has not only robbed the government of billions in tax revenue for rebuilding after decades of military rule, it has also helped finance a bloody ethnic conflict and unleashed an epidemic of heroin use and H.I.V. infection among the Kachin minority who work the mines.

The drug and jade trades have become a toxic mix, with heroin — made from opium poppies that long ago turned Myanmar into a top producer of illicit drugs — keeping a pliant work force toiling in harsh conditions as the Burmese authorities and Chinese business people turn a blind eye.

At a time when Myanmar is experimenting with democratic governance after nearly 50 years of military dictatorship, its handling of the jade industry has become a test of the new civilian leaders and their commitment to supporting human rights and rooting out corruption, as well as an early check on whether they will reject the former junta's kleptocratic dealings with China.

So far, experts say, they have failed.

Washington is worried enough about the link between jade and violence — and the effect on democratic change — that it kept in place a ban on the gem from Myanmar, also known as Burma, even after it suspended almost every other sanction against the country since the civilian government came to power in 2011. But critics say the sanctions are useless because China attaches no such conditions.

“The multibillion-dollar jade business should be driving peaceful development in Kachin and Myanmar as a whole,” said Mike Davis from Global Witness, an anticorruption organization. “Instead it is empowering the same elite that brought the country to its knees and poses the biggest threat to peace and democratic reform.”

Poverty Amid Riches

The fountainhead of Myanmar's jade wealth is here in the mountains of Kachin State, which is rich in natural resources and poor in just about everything else. The country's northernmost territory, Kachin shares a long border with China and is home to the Kachin ethnic group, a largely Christian minority with ambitions to gain more autonomy.

Myitkyina, the down-and-out state capital, is the gateway to the most active mining region, containing what experts say is the world's biggest and most valuable trove of jade. With its broken sidewalks, stray dogs and cemeteries littered with syringes, Myitkyina is a potent symbol of the region's ills.

The city's tea shops have a thriving illegal side business in selling heroin, one of the few trades that have grown alongside the jade industry.

“In every house, there is an addict,” said Gareng Bang Aung, a local heroin user.

The city is the closest Westerners can get to the mining area, Hpakant. The government says it keeps the area closed because of sporadic fighting with the Kachin rebel army, but activists see a darker purpose: to hide the illegal jade and drug trades flourishing there. The only foreigners allowed past the military checkpoints, they say, are the Chinese who run the mines or go there to buy gems.

The lack of access adds to the mysteries of the jade industry, whose inner workings are deliberately obscured. Even the simplest information is not publicly available — including which companies operate the mines and how many are Chinese-run or financed despite laws banning foreign ownership. But interviews with jade miners and executives in Myitkyina, and with gem traders, diplomats and nongovernmental organizations elsewhere, reveal a dizzyingly corrupt and brutal industry funded almost completely by Chinese trade.



Their descriptions of the harsh conditions at the mines were corroborated by rare footage filmed there by a local journalist hired by The New York Times.

The video from inside the checkpoints shows lush rolling hills scarred by craters that descend for hundreds of feet into pits. There, hundreds of men worked in the searing heat, picking through rocks with rudimentary shovels, or their hands, in search of the gem.

In some cases, the miners shoot water from high-powered hoses to break up the rock walls, a dangerous practice that sometimes triggers landslides.

Also visible in the footage: an open-air heroin shooting gallery, hard up against a mine.

Corruption Fuels Conflict

Myanmar's jade industry took off in the 1980s after the introduction of market reforms in China. For the first time since Mao Zedong began banning private enterprise in 1949, entrepreneurs betting that the gemstone would become big business in China started jumping into the trade. Their financing helped build an industry that churns out the Buddha figurines and thick bracelets that have become status symbols for China's middle class. The burgeoning market transformed the Kachin insurgency, which had started in 1961 as a fight mostly about political independence, into a raging battle that extends to natural resources. A 1994 cease-fire stopped the violence, but gave the Burmese junta and its Chinese backers control over the best tracts in Hpakant.

The cease-fire fell apart in 2011, with jade fueling the conflict by funneling money to both sides. Local news media say about 120,000 people have been displaced by the fighting that included military airstrikes in Kachin; the death toll remains in dispute.

In an interview, Dau Hka, a senior official with the political wing of the rebel Kachin Independence Army, described a sophisticated revenue collection system in which mining companies that want to operate in areas under the rebels' control "donate" money to them, providing half their operating budget.

"The donations aren't exactly legal," he acknowledged.

The K.I.A. also makes money by working with Chinese companies to smuggle jade through the jungle into China, according to activists and a Chinese jade importer. "They'll call us beforehand, and we'll come in a convoy to pick up the goods," said the trader, who would give only his surname, Chun. The rebels, he added, demand cash on delivery.

Yet the fighters' spoils pale in comparison to those enjoyed by the powerful Burmese military elite, whose companies receive the choicest tracts of mining land from the government, according to miners and international rights groups. Like the K.I.A., some military officers are also involved in smuggling, extracting bribes to allow the illicit practice, activists say.

"The top dogs are the Burmese military," said Mr. Davis of Global Witness, which has investigated the Burmese jade trade.

Perhaps half or more of the jade that is mined, those who study the industry say, vanishes into the black market. The Ministry of Mines, in an email response to detailed questions, denied that smuggling is a major problem. Although official jade sales generate significant tax revenue, David Dapice of Harvard University's Ash Center for Democratic Governance and Innovation, which did an extensive study of the jade trade, estimated that the government is losing billions a year to illegal trading. Possibly the greater tragedy, however, is the heroin epidemic ravaging a new generation of Kachin.

Heroin's High Toll

For decades, heroin was rare in Kachin State. The surge in the jade trade changed all that, creating a market for drugs among the thousands of Kachin laborers who flocked to the mines seeking an escape from poverty.

But Ze Hkaung Lazum, 27, said the mines proved to be a trap. Heroin, he said, is sold in bamboo huts "like vegetables in a market" for between \$4 and \$8 a hit. Miners squat in the open, next to piles of used needles, with syringes hanging from their arms. If the drug fails to take the workers' meager earnings, the prostitutes waiting nearby are happy to oblige for \$6 per 20-minute session. Within months, Mr. Ze Hkaung Lazum was a frequent customer of both.

Some miners, like Bum Hkrang, a 24-year-old recovering addict, say they need the drug to steel themselves for the backbreaking and dangerous work their Burmese and Chinese bosses demand; others say they simply fell into addiction because the drug was so available, with some heroin dealers accepting jade as payment.

"Try digging all day with an iron rod and see how you feel," he said, adding that he had abandoned his university studies for the promise of fast riches. Heroin, he discovered, gave him enough energy to work 24 hours straight.

Miners say at least four out of five workers are habitual drug users. Users who overdose are buried near the mines, amid groves of bamboo.

Over time, heroin abuse spilled into the broader population.

Like many locals, Tang Goon, who works on an antidrug project, believes the government is distributing heroin to weaken the ethnic insurgency, with the military allowing pushers past their checkpoints. "Heroin is their weapon," he said.

But whether the trade is driven by politics or simple greed, the toll has been devastating.

Kachin activists estimate that a sizable majority of Kachin youths are addicts; the World Health Organization has said about 30 percent of injecting drug users in Myitkyina have contracted H.I.V.

With virtually no funding from a central government focused on other priorities, the Kachin rely on church rehabilitation centers that preach a spiritual, if controversial, solution to addiction.

At one, the Change in Christ center outside Myitkyina, the founder, Thang Raw, runs a treatment program based on rapturous hymnal sessions and baptismal-like dunks in a concrete water tank that are meant to soothe the agony of withdrawal.

The treatment did little to help Mung Hkwang, 21, who despite the sweltering heat lay shivering recently inside the center's thatch-roofed dormitory. His ankle, tattooed with a marijuana leaf, was shackled to his bed to keep him from running away to feed his habit.

"It ruined my life and destroyed my education," he said.

Just weeks later, Mr. Mung Hkwang ran away and died from a heroin overdose.

The Hand of China

There are plenty of culprits in Myanmar's illicit jade and drug trades. But many human rights activists reserve their harshest criticism for China, which they say is content to profit from the mounting chaos that has engulfed Myanmar's jade industry.

"China prioritizes naked greed over any concern for the local population or how the jade is extracted," said David Mathieson, a senior researcher on Myanmar for Human Rights Watch.

Jade has fired the Chinese imagination for thousands of years. According to legend, the birth of Confucius was prophesied by a

unicorn who gave his mother a jade tablet heralding his destiny. To this day, many Chinese believe the stone wards off misfortune and heals the body.

“Jade, from ancient to modern times, is a symbol of grace to Chinese people,” said Zhi Feina, 34, a civil servant and repeat customer at the Beijing Colorful Yunnan Company, an opulent three-story jade emporium in Beijing where she was trying on bracelets.

The state-affiliated Gems & Jewelry Trade Association of China estimates that annual sales of jade are as high as \$5 billion, more than half of which comes from Burmese jade.

In a rare admission, China’s ambassador to Myanmar, Yang Houlan, confirmed that some Chinese are breaking Burmese laws, but he said Beijing was trying to clamp down.

“There are some businessmen engaged in illegal activities who, attracted by outside profits, cross the border to mine or smuggle jade,” he said in an email, adding that the two nations have stepped up cooperation on border controls and money-laundering investigations. “But there are some parts of this illicit trade that, like drugs, can’t be stamped out.”

Activists dispute the notion that the governments are serious about cracking down. Without a stronger push for reform from China, they say, they have little hope that conditions will improve.

So far, there does not appear to be an appetite for major change. During an interview, Shi Hongyue, vice secretary general of the Gems & Jewelry Trade Association of China, refused to even discuss the ills plaguing the Burmese jade trade.

When pressed about heroin at the mines, Mr. Shi was dismissive. “Honestly,” he said, “the amount of drugs they’re using isn’t really that much.”

Source: New York Times Dec. 1, 2014

Tales from a Martian Rock

By Susan Brown for UCSD News

A new analysis of a Martian rock that meteorite hunters plucked from an Antarctic ice field 30 years ago this month reveals a record of the planet’s climate billions of years ago, back when water likely washed across its surface and any life that ever formed there might have emerged.

Scientists from the University of California, San Diego, NASA and the Smithsonian Institution report detailed measurements of minerals within the meteorite in the early online edition of the Proceedings of the National Academy of Sciences this week.

“Minerals within the meteorite hold a snapshot of the planet’s ancient chemistry, of interactions between water and atmosphere,” said Robina Shaheen, a project scientist at UC San Diego and the lead author of the report.

The unlovely stone, which fell to Earth 13 thousand years ago, looked a lot like a potato and has quite a history. Designated ALH84001, it is the oldest meteorite we have from Mars, a chunk of solidified magma from a volcano that erupted four billion years ago. Since then something liquid, probably water, seeped through pores in the rock and deposited globules of carbonates and other minerals.

The carbonates vary subtly depending on the sources of their carbon and oxygen atoms. Both carbon and oxygen occur in heavier and lighter versions, or isotopes. The relative abundances of isotopes forms a chemical signature that careful analysis and sensitive measurements can uncover.

Mars’s atmosphere is mostly carbon dioxide but contains some ozone. The balance of oxygen isotopes within ozone are strikingly weird with enrichment of heavy isotopes through a

physical chemical phenomenon first described by co-author Mark Thiemens, a professor of chemistry at UC San Diego, and colleagues 25 years ago.



Robina Shaheen searches a globe of Mars for the likely origin of the Mars rock she and colleagues analyzed for traces left by the planet’s early climate. Image courtesy Susan Brown, UC San Diego.

“When ozone reacts with carbon dioxide in the atmosphere, it transfers its isotopic weirdness to the new molecule,” said Shaheen, who investigated this process of oxygen isotope exchange as a graduate student at the University of Heidelberg in Germany. When carbon dioxide reacts with water to make carbonates, the isotopic signature continues to be preserved.

The degree of isotopic weirdness in the carbonates reflects how much water and ozone was present when they formed. It’s a record of climate 3.9 billion years ago, locked in a stable mineral. The more water, the smaller the weird ozone signal.

This team measured a pronounced ozone signal in the carbonates within the meteorite, suggesting that although Mars had water back then, vast oceans were unlikely. Instead, the early Martian landscape probably held smaller seas.

“What’s also new is our simultaneous measurements of carbon isotopes on the same samples. The mix of carbon isotopes suggest that the different minerals within the meteorite had separate origins,” Shaheen said. “They tell us the story of the chemical and isotopic compositions of the atmospheric carbon dioxide.”

ALH84001 held tiny tubes of carbonate that some scientists saw as potential evidence of microbial life, though a biological origin for the structures has been discounted. On December 16, NASA announced another potential whiff of Martian life in the form of methane sniffed by the rover Curiosity.

Carbonates can be deposited by living things that scavenge the minerals to build their skeletons, but that is not the case for the minerals measured by this team.

“The carbonate we see is not from living things,” Shaheen said. “It has anomalous oxygen isotopes that tell us this carbonate is abiotic.”

By measuring the isotopes in multiple ways, the chemists found carbonates depleted in carbon-13 and enriched in oxygen-18. That is, Mars’s atmosphere in this era, a period of great bombardment, had much less carbon-13 than it does today.

The change in relative abundances of carbon and oxygen isotopes may have occurred through extensive loss of Martian atmosphere. A thicker atmosphere would likely have been required for liquid water to flow on the planet’s chilly surface.

“We now have a much deeper and specific insight into the earliest oxygen-water system in the solar system,” Thiemens said. “The question that remains is when did planets, Earth and Mars, get water, and in the case of Mars, where did it go? We’ve made great progress, but still deep mysteries remain.”

Planetary scientists Paul Niles of NASA’s Johnson Space Flight Center in Houston and Catherine Corrigan of the Smithsonian Institution, and former UC San Diego chemistry student Kenneth Chong, now at California State Polytechnic University, Pomona, co-authored the paper.

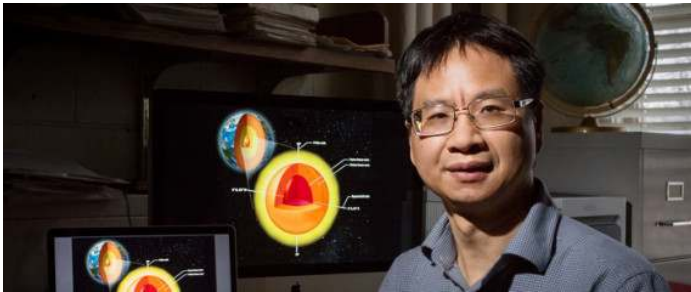
Thiemens and Shaheen thank the National Science Foundation’s Atmospheric Chemistry division, which provided partial support for Shaheen’s work on this project. Funding was also provided by NASA’s Mars Fundamental Research program (to Niles), and the Zonta International Foundation and Ohio Space Grant Consortium (to Corrigan).

Source: Marsdaily.com from December 26, 2014

Scientists Find Big Surprise In Earth’s Core

By Jacqueline Howard

An international team of researchers has discovered one of Earth’s deepest, darkest secrets: our planet’s inner core – once thought to be a ball of solid iron – has a hidden inner core of its own. And this so-called “inner-inner core” seems to have some very peculiar properties.



Illinois geology professor Xiaodong Song led a research team that used seismic waves to look at the Earth’s inner core. They found that the inner core has surprisingly complex structure and behaviors.

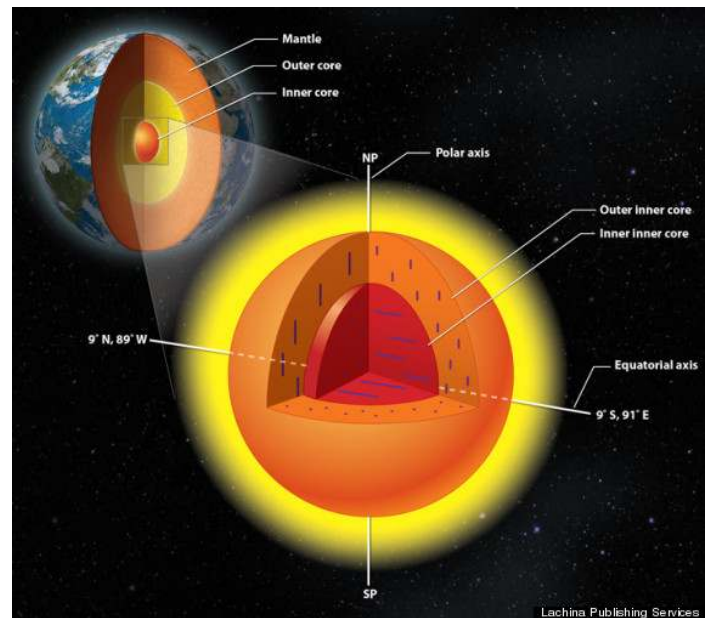
“The fact that we have two regions that are distinctly different may tell us something about how the inner core has been evolving,” Dr. Xiaodong Song, a professor of geology at the University of Illinois and co-author of a new paper about the discovery, said in a written statement. “For example, over the history of the earth, the inner core might have had a very dramatic change in its deformation regime. It might hold the key to how the planet has evolved. We are right in the center – literally, the center of the Earth.”

For their study, the Illinois researchers and their counterparts at China’s Nanjing University measured how seismic waves resonated and traveled through the earth in the aftermath of earthquakes that occurred between 1992 and 2012. Analyzing an earthquake’s coda (the train of seismic waves that follow that quake) offers clues about what’s inside Earth.

“The basic idea of the method has been around for a while, and people have used it for other kinds of studies near the surface. But we are looking all the way through the center of the earth,” Song said in the statement.

What did the researchers find? The seismic wave data suggests that iron crystals in the innermost regions of the inner core point east-west, whereas iron crystals in the inner core’s outer regions point north-south. The researchers deduced that there must be a distinct inner-inner core that takes up about half the diameter of the whole inner core.


“People have noticed differences in the way seismic waves travel through the outer parts of the inner core and its innermost reaches before, but never before have they suggested that the alignment of crystalline iron that makes up this region is completely askew compared to the outermost parts,” Dr. Simon Redfern, a professor of Earth Sciences at the University of Cambridge in England, who was not involved in this research, told BBC News. “If this is true, it would imply that something very substantial happened to flip the orientation of the core to turn the alignment of crystals in the inner core north-south as is seen today in its outer parts.”



An illustration of the earth’s inner-inner core, which has crystals aligned in a different direction than the inner core.

The study was published online in the journal *Nature Geoscience* on Feb. 9.

YOU ARE INVITED



**Annual Banquet Meeting of the
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Wednesday, October 14, 2015
6:00 PM Silent Auction
7:00 PM Dinner & Meeting

Holiday Inn Midtown
Theme: Subway & Garnet
Tickets: \$30.00 Each

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Collector's Series – “The 100” (On a Spring Break! – Back Next Month!)

The 100 is a monthly feature of interest to mineral collectors written by Bill Shelton, based upon his many years of experience as a mineral collector, educator, author, appraiser, philanthropist and dealer. Comments as well as suggestions for new topics are most welcome. Contact him at LAELIASON@msn.com.



Hot Universe

(Continued from page 1)

So maybe the real answer to Fermi's paradox is climate change. Adam Frank's piece in the *New York Times* put it this way:

From climate change to resource depletion, our evolution into a globe-spanning industrial culture is forcing us through the narrow bottleneck of a sustainability crisis. In the wake of this realization, new and sobering answers to Fermi's question now seem possible.

Maybe we're not the only ones to hit a sustainability bottleneck. Maybe not everyone – maybe no one – makes it to the other side.

An interesting thought. While we can't assume life on other planets employs the same chemistry as our M-class planet, with its nitrogen-oxygen atmosphere, the issue of energy would still come up. In any variety of energy-providing chemical reactions, organisms would still generate and have to deal with waste products. As Frank puts it, “There are no planetary free lunches.”

It's notable that Earth's atmosphere has already undergone a major shift due to the activities of organisms. Over three billion years of photosynthesizing bacteria transformed the atmosphere from oxygen depleted to our current 21 percent. The oxygen you breathe now is the waste product of biology that stripped carbon from oxygen to form carbohydrates, some of which were later altered into the hydrocarbons now spewing out the tailpipes of stretch Humvees.

On a vast scale our species pushes this in the other direction, taking carbon and recombining it with oxygen. So far we've been fortunate that our carbon dioxide waste is absorbed in the oceans and used by many other things – plants, diatoms, mineral weathering – meaning anthropogenic increases have not been as steep as they could have been. But those natural reservoirs are not infinite, and the rate of carbon dioxide increase is dramatically accelerating. From 1965 to 1974, the rate of carbon dioxide increase averaged 1.06 ppm per year; from 2005 to 2014, the rate doubled to 2.11 ppm per year.

As we continue this planetary-scale geoengineering experiment of pumping carbon dioxide into the atmosphere and seeing what happens, it's worth considering that maybe this path has already been taken by predecessors a long time ago, in galaxies far, far away. Why don't we hear them now?

Maybe Adam Frank's proposal is right, and our current climate crisis is so intractable that other civilizations have tried and failed and collapsed. But we humans did get through the most dangerous phase of the nuclear era, which for so long seemed guaranteed to end us all. At the very least we have the potential to get through our climate conundrum, which, like the nuclear danger, is a failing of our political systems, not our scientific knowledge. Just as Neo in *The Matrix* had five predecessors who failed, the universe might need a few tries

before finally solving the difficult problem of maintaining a civilization without destroying its planet.

Source: Huffingtonpost.com April 2, 2015

Steven Newton is Programs and Policy Director for the National Center for Science Education

Dealer Donations for the June '15 Benefit Auction

The following list includes all the donations that the March 2015 NYC Show dealers made to the Club this year:

Amazon Imports

◆ (2) Faceted Sapphires. Brazil

Aurora Minerals

◆ Fluorite Turtle Carving. China

AYS International

◆ Hematite Bead Necklace. India

Bary Gems

◆ Peridot & Silver Ring. India

John Betts Fine Minerals

◆ Large Scolecite. India

China South Seas (Carolyn Lee)

◆ Gemstone Pendant. China

Crystal Circle

◆ (12) Worldwide Minerals! (Tsumeb!).. Misc

The Essence

◆ Chrysocolla and Vorbothite. Chile

Excalibur Minerals

◆ (10) Worldwide Minerals. Misc

Exotic Russian Minerals

◆ Marcasite/Limonite Pseudomorph. Russia

Joe Garriti Gems

◆ (4) Moonstones. India

Gems Art Studio

◆ (5) Misc Russian Minerals. Russia

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◆ Fluorite Obelisk; Tourmaline in Matrix. China/Brazil

Malachite & Gems of Africa

◆ Malachite Pyramid. Congo

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◆ Mounted Sliced Amethyst Stalactite. Uruguay

Alfredo Petrov Rare Minerals

◆ Copper ps. “Progression”.. Bolivia

Raj Minerals

◆ Stilbite. India

Rocko Minerals

◆ Herkimer Diamond Scepter. New York State

Howard & Betsy Schlansker

◆ Large Labradorite. Madagascar

Some things

◆ Huge Jewelry Selection. NA

◆ Herkimer Diamond Book. By M. Walter

Topics in Gemology

Topics in Gemology is a monthly column written by Diana Jarrett, GG, RMV, based on gemological questions posed to her over the years by beginners and experts alike. Contact her at dianajarrett.com.



Crazy for Crystal Clear . . . Crystal

Good ol' quartz; the second most abundant mineral on the planet. Only feldspar takes the lead in our earth's plentiful components. This copious material has been the stuff of jewelry and carving for centuries.

monochromatic and neutral look to their accessories will embrace this ever popular stone with its broad updated vibe.



Mark Schneider Quartz Cufflinks, Courtesy Mark Schneider Design.



Chinese Carved Natural Rock Crystal Scholar's Brush Rest.

Although celebrated for the profuse variety of colors it has, quartz also comes in pure colorless (called rock crystal) and translucent milky quartz which can be an attractive jewel for modern designers to embrace. Actually, milky quartz is probably the most common variety of crystalline quartz. Interestingly, its milky effect is the result of minute gas, liquid, or both trapped within the crystal, rendering a dreamy cloud-like appearance to the stone.



Rock Crystal Casket, Burgundy, Late 1400s



Crystal Cluster from Tibet.



Herkimer "Diamonds" (Quartz), Upstate New York

Both colorless and milky quartz are found in imaginative designers creations. Its interesting, appealing qualities make it ideally suited for selections in both stylish manufactured jewelry lines and couture one-offs. Your customers who prefer the

Russian Meteor's Origin Remains Mysterious

By Elizabeth Howell

Two years after an asteroid exploded over Russia and injured more than 1,200 people, the origin of the space rock still puzzles scientists.



Trail of the asteroid that exploded over Chelyabinsk, Russia, on Feb. 15, 2013

The 66-foot-wide (20 meters) asteroid broke up over the city of Chelyabinsk, Russia, on Feb. 15, 2013, shattering windows across the area and sending many people to the hospital with lacerations from the flying glass.

Originally, astronomers thought that the Chelyabinsk meteor came from a 1.24-mile-wide (2 kilometers) near-Earth asteroid called 1999 NC43. But a closer look at the asteroid's orbit and likely mineral composition, gained from spectroscopy, suggests few similarities between it and the Russian meteor.

"These two bodies shared similar orbits around the sun, and initial studies suggested even similar compositions," lead study author Vishnu Reddy, a scientist with the nonprofit Planetary Science Institute in Tucson, Arizona, said in a statement.

However, "the composition of [the] Chelyabinsk meteorite that was recovered after the event is similar to a common type of meteorite called LL chondrites," he added. "The near-Earth asteroid has a composition that is distinctly different from this."

More generally, Reddy and his colleagues' work showed that it is difficult to make predictions about what particular asteroid could have shed pieces that slammed into Earth. Because most asteroids are so small and their orbits are "chaotic," it's hard to make a firm link, the authors said.

A paper based on the research appears in the journal *Icarus*.

The Russian meteor explosion has generated a great deal of interest in the search for potentially hazardous asteroids, sparking the creation of a new asteroid warning center at the European Space Agency, among other initiatives.

In a statement this week, the B612 Foundation, a nonprofit organization that seeks to reduce the threat from asteroids, urged agencies worldwide to step up their search for dangerous space rocks. The group plans to add to that effort with the asteroid-hunting Sentinel Space Telescope, which B612 hopes to launch in 2018.

"The fact of the matter is that asteroid impacts can be prevented using technology we can employ right now," B612 co-founder Ed Lu, a former space shuttle astronaut, said in a statement.

"And unlike other potentially global-scale catastrophic events, the solution is nearly purely a technical one, and with a relatively small and known cost," Lu added. "So as my friend, former Apollo 9 astronaut and co-founder of the B612 Foundation Rusty Schweickart says, 'Let's get on with it.'"

Source: Space.com from February 15, 2015

Mysterious Metal Balls Found on Ocean Floor

By Macrina Cooper-White

What *are* those things?

Scientists dredging the seafloor in the Atlantic Ocean several hundred miles east of Barbados in January were surprised when their sled got snagged – and, after freeing it from the seafloor, even more surprised at what it brought up.

The sled's nets were filled with heavy metal orbs ranging in size from golf balls to softballs. Images captured by the sled showed an entire field of what turned out to be manganese nodules – researchers say it's the largest such deposit ever found in the Atlantic.



The manganese nodules, discovered in January during a recent scientific expedition in the Atlantic, are up to 10 million years old.

"Manganese nodules are found in all oceans," Dr. Colin Devey, a geologist at the GEOMAR Helmholtz Centre for Ocean Research in Kiel, Germany and the expedition's chief scientist, said in a written statement. "But the largest deposits are known to occur in the Pacific. Nodules of this size and density in the Atlantic are not known."

The nodules were found during a 42-day expedition through Jan. 26 aboard the German research vessel SONNE, which explored the ocean between South America and Africa, Live Science reported.

Some of the nodules may date back as far as 10 million years, as they tend to grow one to five millimeters every million years. That means they may provide insight into Earth's ancient environmental past, according to the researchers.

As to how the nodules form, the researchers said that's still a bit of a mystery.

Along with manganese, the nodules consist of copper, nickel and cobalt – and may contain the rare earth elements used in smart phones and other high-tech electronics. For that reason, they're raising a debate over the risks and potential for deep-sea mining.

"Many questions about potential ore mining in the deep sea, however, are still unanswered," Dr. Matthias Haeckel, a GEOMAR researcher who is coordinating a three-year project to explore the potential environmental impact of deep-sea mining, said in a written statement. "We should get to know the deep sea better before we start to change it on potentially large scale."

Source: The Huffington Post from February 19, 2015



KA-BOOM! Scientists Solve Mystery of Earth's Tectonic Plates

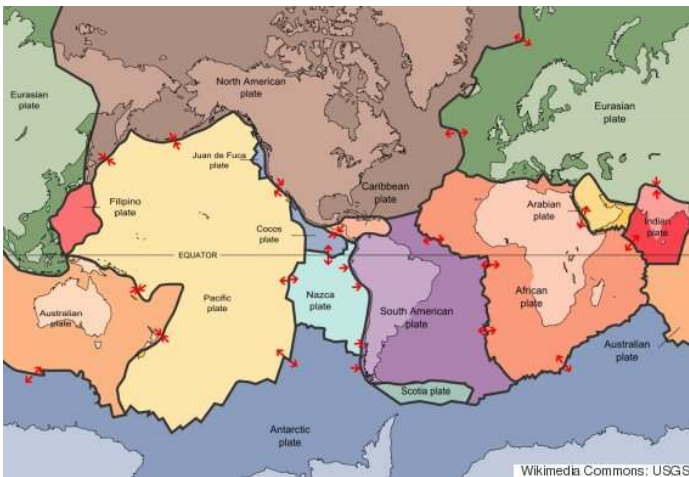
By Jacqueline Howard

Scientists have long known that the Earth's crust consists of at least 15 tectonic plates—continent-sized slabs of rock on the surface of the Earth that shift about to create mountains, volcanoes, and earthquake zones. But the exact mechanism by which the plates move has remained a mystery.

Until now.

A new study suggests that the plates glide about on a six-mile-thick hidden channel of “soft” rock located between the base of the plates and the upper portion of the Earth's mantle (the layer of molten rock above the planet's core), Live Science reported.

“The idea that Earth's surface consists of a mosaic of moving plates is a well-established scientific paradigm, but it had never been clear about what actually moves the plates around,” study co-author Dr. Tim Stern, a professor of geography, environment and earth sciences at Victoria University of Wellington in New Zealand, said in a written statement. “To work this out requires an understanding of what happens at the bottom of a tectonic plate.”



This Map Shows 15 of the Largest Plates

To glimpse the underbelly of a tectonic plate, the researchers used dynamite explosions to generate seismic waves across the southern part of New Zealand's North Island, which sits above the so-called Pacific Plate. The researchers mapped the waves as they traveled through the plate and then used the data to create what Stern called “the most detailed image yet of an oceanic tectonic plate.”

The data showed that the seismic waves slowed abruptly at the base of the plate—which suggests that they must have hit a hidden layer of jelly-like rock, Cosmos magazine reported.

The researchers hypothesize that the soft rock creates a slippery base upon which plates drift when they are pushed or pulled—though exactly what is doing the pushing or pulling is still up for debate.

According to Cosmos magazine, some scientists think that extruding magma or slowly creeping convection currents may push the plates apart. Others think that as a thick, heavy plate dives beneath a thinner plate, it pulls on the plate behind it—and the jelly-like rock found at the base of a tectonic plate may lend support to the pulling theory.

“Understanding this boundary between the base of cold, rigid tectonic plates and the underlying hot, convecting mantle underneath is central to our knowledge of plate tectonics and the very formation and evolution of our planet,” Stern said in the statement.

The study was published online Feb. 5, 2015 in the journal *Nature*.

Scientists Sound Alert Over Mysterious Holes

By Macrina Cooper-White

Scientists were baffled last July when they discovered three giant holes in the ground in the Yamal Peninsula in northern Siberia.



Now, with the help of satellite imagery, researchers have located four additional craters—and they believe there may be dozens more in the region. That has them calling for an urgent investigation to protect residents living in the area.

“I am sure that there are more craters on Yamal, we just need to search for them... I suppose there could be 20 to 30 craters more,” Prof. Vasily Bogoyavlensky, a corresponding member of the Russian Academy of Sciences and deputy director of the Moscow-based Oil and Gas Research Institute, told The Siberian Times. “It is important not to scare people, but to understand that it is a very serious problem and we must research this.”

Researchers ventured deep inside one of the holes last November, collecting data in an effort to learn why the holes formed. The leading theory is that the holes were created by gas explosions triggered by underground heat or by rising air temperatures associated with climate change, the Siberian Times reported last December.

Since scientists can't predict when or where gas explosions will occur, it's dangerous to study them, according to Bogoyavlensky. But he said his team is planning to launch a new expedition, and to put stations in the area to detect earthquakes that might strike when the craters open up.

“We need to answer now the basic questions: what areas and under what conditions are the most dangerous?” he told the Siberian Times. “These questions are important for safe operation of the northern cities and infrastructure of oil and gas complexes.”

Experts in the U.S. echoed that sentiment.

Dr. Carolyn Ruppel, a research geophysicist at the Woods Hole Field Center in Massachusetts and chief of the U.S. Geological Survey's Gas Hydrates Project, told The Huffington Post in an email that she was not surprised that new holes had been found.

Ruppel, who is not involved in the Siberian research effort, called for more research on the holes.

“The processes that are causing them to form likely occur over a wide area of the continuous permafrost in this part of Siberia,” she said in the email. “Scientists should definitely conduct more research on these features to determine the processes that cause their formation, how they evolve with time, and whether it is possible to predict where new ones will occur.”

See below for photos from the November's expedition into one of the craters.

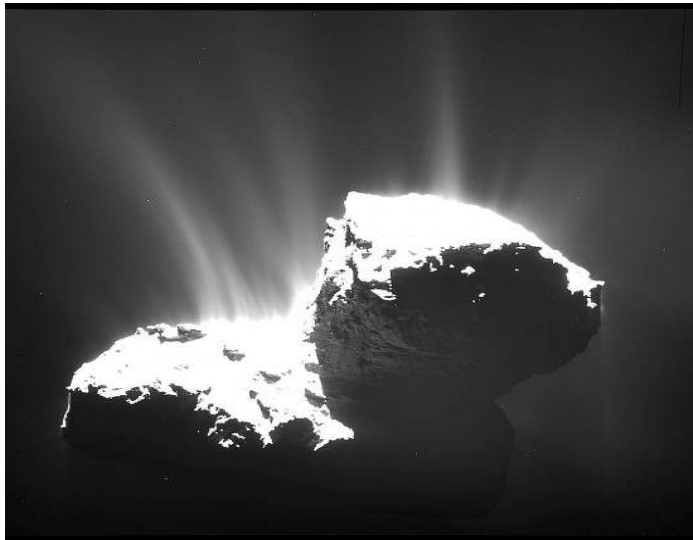
Source: Huffington Post Science Feb. 23, 2015

Crystal Comet

The “dusty snowball” theory of comets needs attention, since there are crystals that need high temperatures to form in the matrix of at least two.

By Stephen Smith

Recently, the composition of comet 67P/Churyumov-Gerasimenko (67P/C-G) was discussed in the scientific press. It is only in the last few months that dust grain distribution in 67P/C-G’s coma, and an analysis of dust lost from the comet, has been obtained. Other reports indicate a surprising result: minerals that are normally found in conditions similar to a blast furnace are seen in the comet. It is a significant result for Electric Universe advocates.



Photogenic comet 67P/Churyumov-Gerasimenko. Credit: ESA/Rosetta/MPS for OSIRIS Team MPS/UPD/LAM/IAA/SSO/INTA/UPM/DASP/IDA

By way of background, NASA scientists launched the Stardust mission on February 7, 1999. Its primary task was to collect dust particles from the coma of comet Wild 2 and then return to Earth. After a five year journey, Stardust finally intersected Wild 2’s orbit on January 2, 2004, passing through its coma at the metaphorical hair’s breadth distance of 240 kilometers. The aerogel dust-capture system worked perfectly, scooping up fine bits of rock and trapping them inside for their return journey to Earth on January 15, 2006.

After the aerogel was delivered to a team of researchers for analysis, the surprises began. Minerals such as anorthite and forsterite were found embedded in the aerogel—compounds that form only at extremely high temperatures—along with olivine. Perplexed scientists wondered how an object that was supposed to be a remnant from the early nebular cloud out of which the Solar System condensed, and that should have been kept in frozen hibernation in a theoretical “Oort cloud” billions of kilometers from the Sun, could exhibit crystalline structures that would require a blast furnace to create.

Stardust mission team leader Donald Brownlee said at the time, “In the coldest part of the solar system we’ve found samples that formed at extremely high temperatures.”

Electric Universe advocates see things differently. Stars and comets share common characteristics. They are both born of similar parentage: Stars are nodes in vast electrical circuits connected by Birkeland current filaments within galaxies, while planets, moons, asteroids, and comets are electrically charged, existing within a radial electric current that surrounds stars like our own Sun.

Comets, specifically, have nothing to do with an ancient nebular cloud of cold gas and dust that became gravitationally unstable and collapsed into the Solar System of today. Comets and their asteroid sisters are relative newcomers to the solar family and might have been blasted out of larger bodies by tremendously powerful electric discharges in the recent past. They are not “snowballs” or blobs of muddy slush, they are solid, rocky, cratered, electrically charged objects. Whatever water or hydroxyl compounds that can be found in cometary comas is created there, since ionized oxygen from the comet reacts with hydrogen ions streaming out from the Sun. No “jets” of water vapor spew from comets, and no icy plains have ever been observed. It is electric effects that are seen—discharges and arcs form the comet phenomena.

Source: Thunderbolts.info posted on February 13, 2015

Fabergé Pearl Egg Unveiled

In celebration of the forthcoming centenary of the last Fabergé Imperial Eggs ever delivered, Fabergé has crafted an extraordinary masterpiece in collaboration with the Al-Fardan family, one of the world’s most renowned collectors of pearls.

The Fabergé Pearl Egg is the first egg created in the “Imperial Class” since 1917 where the Fabergé name and the Fabergé family have been united.

The Fabergé Pearl Egg draws inspiration from the formation of a pearl within an oyster, and the egg’s mother-of-pearl exterior opens to reveal a unique grey pearl of 12.17 carats, sourced from the Arabian Gulf and exhibiting exceptional purity and a highly unusual shade of grey, the company said in a press release.



Harnessing 20 highly skilled workmasters, the objet embodies 139 fine white pearls with a golden lustre, 3,305 diamonds, carved rock crystal and mother-of-pearl shell set on white and yellow gold. Each pearl adorning the Fabergé Pearl Egg was hand-selected by Hussain Ibrahim Al-Fardan from his private collection. An ingenious mechanism enables the entire outer shell to rotate on its base, simultaneously opening in six sections to unveil its treasure.

The Pearl Egg is accompanied by a Fabergé necklace of white pearls, diamonds and mother-of-pearl shell featuring a scallop motif, and finished with a 19.44-carat white pearl drop.

Hussain Ibrahim Al-Fardan, chairman of the Alfardan Group, commented, “I have a passion for natural pearls and it took me many years to build my current collection gathering some of the most extraordinary pearls in the world. Fabergé has a great history in making jewellery for royalty and a truly precious Fabergé Egg is a luxury treasure and the symbol of a long-gone era of opulence. This is why I partnered with Fabergé to combine these two traditional treasures: the Fabergé Egg and natural Arabian Gulf pearls, to create an exceptional piece.”

Fabergé President Robert Benvenuto added, “We are delighted to be sharing this historic moment – the unveiling of the Fabergé Pearl Egg – with Mr. Hussain and Mr. Ali Al-Fardan in Doha. It is a distinct pleasure and privilege for me and the Fabergé team to have collaborated with them in sourcing some of the finest pearls in the world for this creation.”

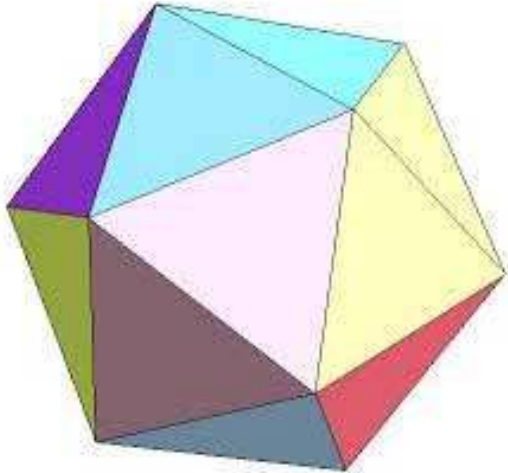
The Fabergé Pearl Egg is being showcased at the six-day Doha Watch and Jewellery Exhibition, which kicked off on February 23.

Source: JewelleryNewsAsia.com February 25, 2015

Second Natural Quasicrystal Found in Ancient Meteorite

By Staff Writers

A team from Princeton University and the University of Florence in Italy has discovered a quasicrystal – so named because of its unorthodox arrangement of atoms – in a 4.5-billion-year-old meteorite from a remote region of northeastern Russia, bringing to two the number of natural quasicrystals ever discovered. Prior to the team finding the first natural quasicrystal in 2009, researchers thought that the structures were too fragile and energetically unstable to be formed by natural processes.



The first naturally occurring quasicrystal exhibited five-fold symmetry, where each point has a five-fold axis of symmetry.



The recently discovered new quasicrystal has ten-fold symmetry and resembles stacked ten-sided structures.

The top panel shows the symmetry of the first natural quasicrystal, icosahedrite. The lower panel shows the symmetry of the recently discovered quasicrystal, which has not yet been named. Image courtesy Paul Steinhardt et al.

“The finding of a second naturally occurring quasicrystal confirms that these materials can form in nature and are stable over cosmic time scales,” said **Paul Steinhardt**, Princeton’s Albert Einstein Professor in Science and a professor of physics, who led the study with Luca Bindi of the University of Florence. The team published the finding in the March 13 issue of the journal *Scientific Reports*.

The discovery raises the possibility that other types of quasicrystals can be formed in nature, according to Steinhardt. Quasicrystals are very hard, have low friction, and don’t conduct heat very well – making them good candidates for applications such as protective coatings on items ranging from airplanes to non-stick cookware.

The newly discovered quasicrystal, which is yet to be named, has a structure that resembles flat 10-sided disks stacked in a column. This type of structure is impossible in ordinary crystals, in which atoms are packed closely together in a repeated and orderly fashion. The difference between crystals and quasicrystals can be visualized by imagining a tiled floor: Tiles that are 6-sided hexagons can fit neatly against each other to cover the entire floor. But 5-sided pentagons or 10-sided decagons laid next to each will result in gaps between tiles. “The structure is saying ‘I am not a crystal, but on the other hand, I am not random either,’” Steinhardt said.

Crystals with these forbidden symmetries had been created in the laboratory, but it wasn’t until 2009 that Bindi, Steinhardt, Nan Yao of Princeton and Peter Lu of Harvard reported the first natural quasicrystal, now known as icosahedrite, in a rock that had been collected years before in Chukotka, Russia.

To confirm that this quasicrystal, which has the five-fold symmetry of a soccer ball, was indeed of natural origins, Steinhardt and a team of scientists including geologists from the Russian Academy of Sciences traveled to the region in 2011 and returned with additional samples which they analyzed at the University of Florence; the Smithsonian Museum in Washington, DC; the California Institute of Technology; and the Princeton Institute for the Science and Technology of Materials (PRISM) Imaging and Analysis Center.

The researchers confirmed that the quasicrystal originated in an extraterrestrial body that formed about 4.57 billion years ago, which is around the time our solar system formed. They published the results in the *Proceedings of the National Academy of Sciences* in 2012. “Bringing back the material and showing that it was of natural origins was an important scientific barrier to overcome,” Steinhardt said.

This new quasicrystal, which was found in a different grain of the same meteorite, has 10-fold, or decagonal, symmetry. It is made up of aluminum, nickel and iron, which normally are not found together in the same mineral because aluminum binds quickly to oxygen, blocking attachment to nickel and iron.

The researchers are now exploring how the mineral formed, “We know there was a meteor impact, and that the temperature was around 1000° to 1200° Kelvin, and that the pressure was a hundred thousand times greater than atmospheric pressure, but that is not enough to tell us all the details,” Steinhardt said.

“We’d like to know whether the formation of quasicrystals is rare or is fairly frequent, how it occurs, and whether it could happen in other solar systems. What we find out could answer **basic questions about the materials found in our universe.**”

The team included, from Princeton: Nan Yao, a senior research scholar at PRISM and director of the PRISM Imaging and Analysis Center; Chaney Lin, a graduate student in physics; and Lincoln Hollister, professor of geosciences, emeritus, and a senior geologist. Co-authors also included Christopher Andronicos of Purdue University; Vadim Distler, Valery Kryachko and Marina Yudovskaya of the Russian Academy of Sciences; Alexander Kostin of BHP Billiton; Michael Eddy of the Massachusetts Institute of Technology; Glenn MacPherson the Smithsonian Institution; and William Steinhardt, a graduate student at Harvard University.

Source: spacedaily.com March 18, 2015

Dr. Paul Steinhardt delivered a memorable and fascinating talk to the NYMC about this interesting topic at the January 2014 meeting. – Mütch

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 James & Susan Kelly, Halcottsville, NY
 Michael & Robin Kessler, E. Stroudsburg, PA
 Jennifer Kim, New York, NY
 Victor & Margaret Krasan, Jamaica, NY
 Saul Krotki, Seattle, WA
 Mark Kucera, Yonkers, NY
 Delores Lawton, Brooklyn, NY
 Delphine Leblanc, Hoboken, NJ
 James Lee, Bronxville, NY
 Steven Lester, Bronx, NY
 Gail Brett Levine, Rego Park, NY
 The Litvin Family, Englewood, NJ
 Eduardo Lopez, New York, NY
 Richard & Marion Lopus, Lords Valley, PA
 Immacula Louisime, Jamaica, NY
 Donna M. Luisi, Middle Village, NY
 Robert J. Martinchek, Newington, CT
 Sydney Mazur, New York, NY
 Antoinette McLain, New York, NY
 Dr. Charles Merguerian, Stone Ridge, NY
 William Meyer, West Rupert, VT
 Stephen Milne, New York, NY
 William Mirabello, Staten Island, NY
 Miriam Mopper, Forest Hills, NY
 Robbin C. Moran, Bronx, NY
 Ashley Moy, New York, NY
 Ethel Murray, New York, NY
 Diane L. Nadler, New York, NY
 Craig Nass, Forest Hills, NY
 Cheryl Neary, Patchogue, NY
 Jamie Newman, Brooklyn, NY
 Pamela Nicholson, Brooklyn, NY
 Nik Nikiforou, Astoria, NY
 Tony Nikischer, Keswick, VA
 Keith & Barbara Noyes, Blauvelt, NY
 Thomas W. Nugent, Woodside, NY
 Tim O'Meara, Reston, VA
 Christopher O'Neill, Brooklyn, NY
 William O'Neill, Brooklyn, NY
 Kristall O'Neill-Richardson, New York, NY
 Corinne Orr, New York, NY
 Peter Palese, Leonia, NJ
 James Peach, Brooklyn, NY
 Seymour Perlowitz, Brooklyn, NY
 Alfredo Petrov, Desert Hot Springs, CA
 Martin & Lillie Pope, Brooklyn, NY
 Mitchell Portnoy, New York, NY
 Alla Priceman, Larchmont, NY
 Elayne Prince, Westport, CT
 Eric Rampello, Levittown, NY
 Joaquin Ramsey, New York, NY
 George Rappaport, Staten Island, NY
 Daniel J. Record, Newington, CT
 James Regnante, Forest Hills, NY
 Carolyn C. Reynard, Poughkeepsie, NY
 Vesta Sue Rhodes, New York, NY
 Karen Rice, Rio Rancho, NM
 Susan Ritter, New York, NY
 Dominic Rocchio, Bronx, NY
 Deborah Steen Ross, Elmsford, NY
 Richard & Judith B. Rossi, Brooklyn, NY
 Olga Rubio, Chester, NY
 Susan Jane Rudich, New York, NY
 Oliver Sacks, M.D., New York, NY
 Jesus U. & Meyci Sanchez, Elizabeth, NJ
 John F. Sanfaçon, Morristown, NJ
 Victor Sapienza, Staten Island, NY
 Naomi Sarna, New York, NY
 Joe Sarneski, Fairfield, CT
 Roland Scal, New York, NY
 Nathan A. Schachtman, New York, NY
 Peter C. Schneirla, New York, NY
 Anna Schumate, New York, NY
 Jack Segall, Cedarhurst, NY
 Charles & Ruth Severson, Gwynedd, PA
 William Shelton, Tucson, AZ
 Michael Silver, Los Angeles, CA
 Candie Smith, Staten Island, NY
 Charles Snider, New York, NY
 Alma Barkey Sohmer, New York, NY
 Dimitrios Spanos, Woodside, NY
 Paul & Jeannine Speranza, N. Bellmore, NY
 Atida Stein, New York, NY
 Robin Sternberg, New York, NY
 Steven B. Stieglitz, New York, NY
 Linda Ultee, New York, NY
 Ann Vitiello, Brooklyn, NY
 Sam M. Waldman, Brooklyn, NY
 Lenore Weber, New York, NY
 Jeffrey P. Wiegand, New Rochelle, NY
 Susana Wilches, New York, NY
 Robin Wildes, New York, NY
 Kerry Yuen, New York, NY
 Leonid Zakinov, Forest Hills, NY
 Vanessa Zannis, New York, NY
 Theodore Zirnite, New York, NY
 Anne Marie Zumer, Wantagh, NY

2015-16 Club Calendar

Date	Event	Location	Remarks & Information
May 13	Meeting at 6:45	Holiday Inn Midtown	Special Lecture: Renée Newman – “Exotic Gems and the Jewelry Business Today”
June 10	Annual Benefit Auction	Holiday Inn Midtown Manhattan Mezzanine C	100+ diverse lots, not to be missed!
July ?	Officers’ Planning Meeting	TBD	Details to Follow
August ?		Open House Alla Priceman, Larchmont, NY	Details to Follow
September 9	Meeting at 6:45	Holiday Inn Midtown	Special Lecture: Steve Okulewicz – “Digging Gold in Alaska”
October 7	Annual Gala Banquet	Holiday Inn Midtown	Theme: NYC Subway / Garnet Lots More Details to Follow
November 11	Meeting at 6:45	Holiday Inn Midtown	Special Lecture: Fluorescence (H. Heitner) & Related Special Demo (R. Bostwick)
December 9	Meeting at 6:45	Holiday Inn Midtown	Special Lecture: John Sanfaçon – “Synthetic Minerals”
January 2016	Meeting at 6:45	Holiday Inn Midtown	Details to Follow

2015-16 Show or Event Calendar

Date	Event	Location	Remarks & Information
April 23-26	42 nd Annual Rochester Mineralogical Symposium	Radisson Hotel Rochester Airport, Rochester, NY	Lectures, Exhibits, Dealers, Presentations, Auctions, Banquet, etc.
April 25-26	43 rd Annual NJESA Gem & Mineral Show	Franklin School, Washington Ave, Franklin, New Jersey	For Information: Sterling Hill Mining Museum (913) 209-7212
May 16-17	Celinka Gem & Mineral Show	Our Lady of Mt. Carmel, Patchogue, Long Island, NY	17+ dealers; Info: Elaine Casani (631) 567-3342
July 18-19	Herkimer Gem Show 2015	United Methodist Church, Herkimer, NY	New Show! Info: (315) 717-4664 or info@herkimergemshow.com
July 25-26	LIMAGS Mineral Show	Cutchogue East Elementary School, Cutchogue, NY	New Location!
August 7-9	East Coast Gem, Mineral & Fossil Show	West Springfield, Massachusetts	Immense show with 200 dealers, wholesale section, lectures, train/bus access from NYC
October 23-24	AFMS Convention/Show	Austin, Texas	Details to Follow
November 14-15	Fall New York City Gem, Mineral & Fossil Show	Grand Ballroom, Holiday Inn Midtown, New York City	20+ diverse dealers; lectures; wholesale section (with credentials); Club Booth
July 27- Aug 1, 2016	AFMS Convention/Show	Albany, Oregon	Details to Follow
October 21-23	EFMLS Convention/Show	Rochester, New York	Article Contest Results; Details to Follow

*For more extensive national and regional show information check online:
AFMS Website: <http://www.amfed.org> and/or the EFMLS Website: <http://www.amfed.org/efmls>*

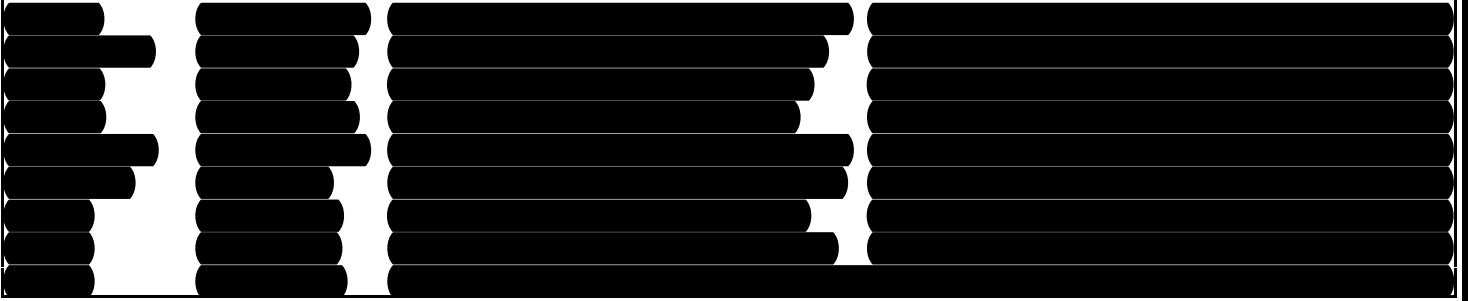


The New York Mineralogical Club, Inc.

Founded in 1886 for the purpose of increasing interest in the science of mineralogy through the collecting, describing and displaying of minerals and associated gemstones.

P.O. Box 77, Planetarium Station, New York City, New York, 10024-0077, <http://www.nymineralclub.org>

2015 Executive Committee



Dues: \$25 Individual, \$35 Family per calendar year. **Meetings:** 2nd Wednesday of every month (except July and August) at the Holiday Inn Midtown Manhattan, 57th Street between Ninth and Tenth Avenues, New York City, New York. Meetings will generally be held in one of the conference rooms on the Mezzanine Level. The doors open at 5:30 P.M. and the meeting starts at 6:45 P.M. (**Please watch for any announced time / date changes.**) This bulletin is published monthly by the New York Mineralogical Club, Inc. The submission deadline for each month's bulletin is the 20th of the preceding month. You may reprint articles or quote from this bulletin for **non-profit usage only** provided credit is given to the New York Mineralogical Club **and permission** is obtained from the author and/or Editor. The Editor and the New York Mineralogical Club are not responsible for the accuracy or authenticity of information or information in articles accepted for publication, nor are the expressed opinions necessarily those of the officers of the New York Mineralogical Club, Inc.

Next Meeting – Wednesday, May 13, 2015 from 6:00 pm to 10:00 pm

Mezzanine, Holiday Inn Midtown Manhattan (57th St. & Tenth Avenue), New York City

Special Lecture: Renée Newman, Author — “Exotic Gems Today”

New York Mineralogical Club, Inc.

Mitchell Portnoy, Bulletin Editor

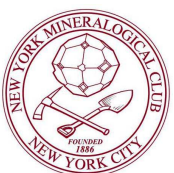
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Founder



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