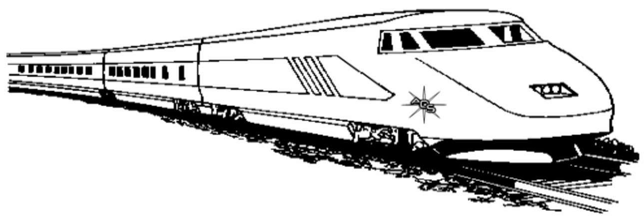
The Opal Express



Published monthly by The American Opal Society

April 2008

Volume 41 Issue 4

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President's Message

By Jim Lambert

What a great presentation at our March meeting by Stan McCall on how to make a piece of inlayed jewelry. Thank you Stan! For those of you that missed it, hopefully you can catch another presentation by Stan at our next Opal Show in November.

We expect another great speaker at our regular meeting in April. Jack Liu will give a talk about a stone cutting service in China. This will be a great opportunity for all to learn about the potential benefits of services provided by this company.

Oh yes, about the Opal Show in November - don't forget, we really need people to volunteer their time to help this show be a great success. Sometimes, the board get's so busy in planning the show that we may forget to ask some people to help. Please don't feel that we are not interested in your help. Just jump in and volunteer. We really appreciate any help that you can give.

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Members Only Website Password

To log onto the website's members only area at: http://opalsociety.org/aos_members_only_area.htm type: Name: "member" and Password: "hyalite".

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April's Speaker – Jack Liu

This month's speaker will be Mr. Jack Liu on his stone cutting service in China. Jack's talk will include the following:

1.) Introduction about China, population, geography and culture.
2.) Cutting stone factory history for about 30 years.
3.) Cutting stone service and Jewelry factory in China for western countries.
4.) Cutting stone service detail and price information.

Jack Liu was born and raised in Beijing, China. Mr. Liu obtained a bachelor degree in geology from the University of Petroleum, China. He immigrated to American in 1991 and obtained a Masters Degree in geology from the University of Wyoming in Laramie, Wyoming.

Jack founded the Land C Corp in 1998. He has a partner factory in Mainland China which conducts cutting stone services such as faceting and cabbing. Jack and his company now focus on the cutting stone service for American gemstone miners, gemstone dealers, professional jewelers and gemstone collectors.

If you need any details about cutting stones, please feel free to contact Mr. Liu. Here is his contact information:

Mr. Jack Liu, Land C Corp.
2275 Huntington Drive, #315, San Marino, CA 91108
Tel: 626-578-0988, Fax: 626-578-1098
Email: landcco98@aol.com

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Last Month's Speaker – Stan McCall

Stan McCall gave an excellent presentation about how to inlay gemstones and opals. Stan had a slide show on the techniques that he had developed to allow him to make fantastic pendants. See some of his creations below.

Inlayed Pendant	Opal, Tiger Eye & Dinosaur Bone Pendant

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Opal Society Workshop

The American Opal Society's workshop is open in April, starting Jan. 7th. The shop is located at Ball Jr. High School and will occur every Monday from 7:00 to 9:30 p.m. The school is located at 1500 W. Ball Road in Anaheim. Room 37 is in the center of the campus. Instruction will be given in cutting opal, wax models, lost-wax casting, fabrication, and setting stones. The workshop will furnish machines to cut and polish stones as well as a centrifuge for casting and a kiln for burnout. Please bring a roll of PAPER TOWELS with you for clean-up as the room is a science lab and needs to be kept spotless. To attend, membership in the American Opal Society is a must due to insurance. A nightly fee of $2 is asked to help keep the equipment in good running condition. Please contact Pete Goetz at (714) 345-1449 if you have any questions.

The Great Opal Hunt!
What I discovered while looking for and buying an opal on the Internet

By Wayne Schmidt

When I told my wife I wanted to purchase a really nice piece of jewelry for her, she surprised me by saying she wanted an opal. All the opals I'd ever seen where uninteresting white milky things with little or no color in them. She said she'd seen some that had a lot of color but that they were few and far between. I scented a challenge.

We decided to spend a couple of months researching opals and hunting down the one she wanted, making the search a hobby. Here's how it went:

The first step was to find out what good opals look like. As I said, all the opals I'd seen were dull, white stones with barely-discernable hints of color. I opened an opal book from the library and almost fell out of my chair. The opals in it burned with the brightest iridescent colors imaginable. I couldn't believe it. Next I did an Internet search for opals and discovered that brightly-colored opals really were available... and something else quite surprising.


Figure 1 – White Opal

Good opals are rare. I mean *extremely* rare. Diamonds aren't rare. Go into any mall and on average there will be a dozen jewelry stores and each of these will have hundreds of diamonds on display and hundreds more in storage. Millions of diamonds are sold every year. This is not a rare stone. The inflated prices we pay for them is artificial, the result of effective advertising. Look in those same jewelry stores and you'll be lucky to turn up a handful of opals, and those will all be the boring milk opals or cheap doublets or triplets. (Thin slices of real opal sandwiched onto or between other materials)

I started the great opal hunt in my own mall I didn't see a single solid opal with good color. Even more interesting was that when I showed the sales people pictures of the type of opal I wanted, many of them didn't even know opals came in such brilliant colors. Below is a picture of what most stores carry (See Figure 1):

This is a common white or milk opal. It's about all that's available in jewelry stores. This, and the following pictures, are larger than the actual stones. Good opals are clear and filled with brilliant, multicolored fire, such as the following images of Lightning Ridge black opals borrowed from various sources (See Figure 2): (These images are 2 to 3 times larger than actual size.)

So, my first attempt to find and buy a good opal from local jewelry stores failed; no one had them. On to phase II of the great opal hunt.


Figure 2 – Lightning Ridge Black Opals

I asked each store if they had other sources they could contact to get opals like I was interested in and have them shipped. Eight of the twelve stores said, "yes," and promised to call me back within three days. After two weeks only one called back to say they had found some stones. One other called to say they couldn't get anything and the rest dropped me cold. Not getting courtesy return calls from those who couldn't find anything surprised me. You'd think in the retail jewelry business, like car sales, follow-up calls would be made simply to keep on the customer's good side. Then something occurred to me.

As I said, good opals are scarce. If jewelers displayed the good opals, interest would quickly drop for white or milk opals. Since there are so many more white opals than good opals, it makes sense that jewelers want to keep the public ignorant of the good stones to preserve the demand, and market price, of the poorer stones. In a way, we're being conned.

However, one dealer did get in a stone for me. Here's what they had: (see Figure 3)

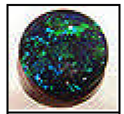
Figure 3 – Black Opal

Again, this picture is an enlargement. The actual opal was half this diameter, about 5.6 carats. It was nice, very clear and bright, but had too much green in it (My wife wanted a blue stone.), wasn't oval enough, flat, and a little small. Still, it was pretty and by far the best we'd seen. But, the store was asking $4,000 for it and at that time we erroneously thought that was over-inflated. We declined.

Next we went to a large jewelry and gem show on the Orange County (Southern California) Fairgrounds. Although there were close to 100 stalls, we only saw four solid opals and none of them was the size, color or quality we wanted.

Our options for sources were running out. Time to give the Internet a try.

My first stop was that great font of everything money can buy: Ebay. Most of the opals available were doublets, triplets, of a color that didn't interest us. Next I searched the Internet for opal sources and hit pay dirt. I found twenty sites that offered a wide range of what appeared to be good opals at reasonable prices. After looking through them we found what we thought was the perfect opal. It was bright and filled with brilliant blue fire.

We decided to order it after making sure the company had a money-back guarantee. It was a good thing they did because here's what the opal looked like (See Figure 4):


Figure 4

Actually, this is slightly better than the real thing. At arm's length in normal room lighting it was virtually featureless with a dull brown-blue color. Under no conditions of bright sun, incandescent, or fluorescent lighting could we get it to look anything like its photo. Needless to say we were dumbfounded.

Was the seller purposely misleading us by posting a fraudulent picture of a different opal? No. We were able to determine that the color patterns matched those in the picture. Then I took a picture of it and couldn't believe what I saw (See Figure 5):

This is very close to the image on the seller's website. If I'd had a little more light on it they would be identical. What is going on?

What's "going on" has to do with the fact that when a picture is displayed on a CRT, or LCD if you're using a laptop computer, the picture tube shows it as a source of light, like a stained glass window, instead of a reflection of light as from a painting. The difference is that this stained-glass effect can greatly enhance the brightness and intensity of colors. The lesson I learned from this is that through no fault of the sellers, opal pictures on the Internet sometimes may not accurately indicate what the opal really looks like, as my purchase proves.


Figure 5

Fortunately, the company cheerfully honored their return policy. I take this as an indication that the opal selling industry is a responsible one.

(By the way, if you ever purchase an opal, here's a trick that might be useful (See Figure 6).

I shined a bright light sideways through the stone and discovered three cracks. The one on the upper right wasn't serious but the two on the bottom appeared to connect and surround a wedge of stone. It's possible this wedge might pop out over time.)


Figure 6

After the Internet experience, my wife and I paid a visit to the three most expensive jewelry stores in Southern California. All together, they only had three opals that showed the clarity and brilliance we were looking for... and price tags that would bankrupt most third-world countries. Needless to say, we left empty-handed.

So, what did we learn from this quest? First, that good, clear, bright opals are rarer than we ever imagined. So much so that it's not a question of how much they cost but whether you can find one regardless of the cost. Second, expect to pay at least $500 to $1000 per carat retail for a good opal. (One possible exception to this would be opals available on such forums as Ebay, where many bargains can be found. However, it's always a good idea to make sure the seller has a no-questions-asked, money-back guarantee.) Third, pictures on the Internet probably will not accurately represent what an opal actually looks like.

If you're interested in what opal mines look like or the history of opal mining, I recommend you log onto http://www.opalmine.com/opal-mines/opal-mines-1.html.

If you are interested in purchasing an opal, you might try http://www.queen-of-gems.com. I haven't tried purchasing from them myself so I can't comment on their services. However, because they deal directly with the miners they can offer the opportunity of letting purchasers know who discovered the opal, where, when, and who polished in. Having such a provenance would add considerable interest to owning a good opal.

Another interesting source for opals is Murray Donovan's site ***Opal Below Wholesale*** at http://www.opalrough.ca/home.htm.

Again, before purchasing an opal get a written promise that it comes with a no-questions-asked, money-back guarantee. If you do buy, then return an opal, always send it insured, registered, and with a signed and returned receipt so you have proof the seller received it.

If you have any comments, suggestions, or questions please **email** them to me. I look forward to hearing from you.
From http://www.waynesthisandthat.com/opal.htm
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Editor – there's opal in each of us!

How Does Nature Process Silicon?

There is increasing evidence that organosilicon complexes play a pivotal role in living systems

By Michael Freemantle, C&EN London

Until recently, no organosilicon compounds had ever been detected in living systems or even under biologically relevant conditions in the laboratory.

"This complete absence of evidence that silicon forms compounds with the carbon-based materials found in living systems has led some workers to conclude that the field of silicon biochemistry is, essentially, a contradiction in terms," says Christopher T. G. Knight, a research scientist at the University of Illinois, Urbana-Champaign, who has been studying the aqueous chemistry of silicon for more than 20 years. The element's biological importance, he points out, is attributed by these workers simply to its role in producing solid oxide support structures along with an ability to alter toxic metal activity.

Over the past few years, Knight and a group at Lakehead University, Ontario, led by chemistry professor Stephen D. Kinrade, have been studying aqueous silicate chemistry in an attempt to unravel silicon's role in living systems. Last year, for example, they showed that stable silicon-carbohydrate complexes can form in aqueous solutions at biologically relevant pH and silicon concentrations. And last month they provided "the first direct evidence of an organosilicon complex formed during the life cycle of an organism" [J. Chem. Soc., Dalton Trans., 2002, 307].

Knight

"These results are startling," comments William H. Casey, professor of aqueous geochemistry at the University of California, Davis. "They suggest that Mother Nature may employ organosilicon complexes to modify the chemistry of silicon in solution."

Silicon is known to be present in all living organisms. The element occurs in the form of hydrated amorphous silica, referred to as **opal**, and is required for the production of structural materials in single-celled organisms through to higher plants and animals, explains biosilicification expert Carole C. Perry, who is a reader in bioinorganic chemistry at Nottingham Trent University, England. For many life forms, she continues, silicon can even be considered to be an essential element. It is required, for example, in certain higher plants for strengthening cell walls and in higher animals for bone and cartilage.

Diatoms, radiolaria, some sponges, the Equisetaceae--commonly known as horsetail or scouring rushes--and other plants all require silicon to complete their life cycle. Agriculturally important plants such as rice, beans, wheat, soy, maize, and cucumbers depend on silicon for healthy growth and are adversely affected by silicon depletion.

"Generally, a lack of silicon reduces crop yields; causes the plants to lean or fall over; and reduces their resistance to pests, disease, drought, frost, and other types of stress," Knight says.

An understanding of the molecular- level mechanism of silicon "may lead to the realization of such sci-fi concepts as biologically engineering microcomputers and sensors."

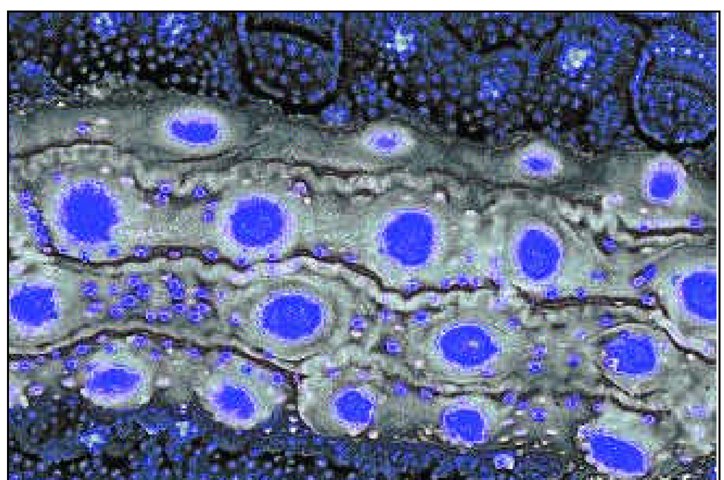
IN MAMMALS, silicon deficiency has been linked to bone and heart disease, cancer, and neurodegenerative disorders.

"One of the big questions is: How do plants isolate, transport, and deposit silicon?" Knights tells C&EN. "Since they readily do so at room temperatures and atmospheric pressures, the hope is that an understanding of the molecular-level mechanism involved will provide low-energy, and thus low-cost, synthetic routes to novel materials, as well as allowing us the ability to investigate the creation of nanostructural molecular architecture. Ultimately, this may lead to the realization of such sci-fi concepts as biologically engineering microcomputers and sensors, for example."

Casey points out that the dominant form of silicon in natural waters is the aqueous monomer silicic acid (H_4SiO_4), in which silicon is tetrahedrally coordinated to four oxygen atoms, as it is in most of Earth's minerals. "The aqueous chemistry of silicon(IV), however, is enragingly simple yet difficult to modify," he says. "Only in the very high pressure mineral stishovite does silicon change its coordination number to oxygens from four to six.

"Most chemists know much more about the chemistry of square-planar platinum complexes than they do about the chemistry of their own planet, Earth," Casey observes wryly, pointing out that Earth's crust is made of a rich array of aluminosilicate compounds.

"There is evidence for extraordinarily rich silicon biological chemistries," he says. "But we still haven't discovered how plants manipulate silicon. People have suspected for a long time that they do it by changing the coordination number of the element.



ESSENTIAL ELEMENT Scanning electron microscopy image shows silicon (blue) in young equisetum leaf

"In organic-rich environments such as swamps, for example, the concentrations of silicon in solution are higher than you would predict from the equilibrium between solid silica and an aqueous solution containing only silicic acids," Casey continues.

Hydrated silica and other biominerals usually exist in biological organisms as composite phases consisting of the mineral phase and organic components such as membranes or proteins and carbohydrates.

Kinrade points out that silicates and carbohydrates are, respectively, the two most abundant classes of compounds in the inorganic and organic worlds. "That silicates and carbohydrates interact to form soluble organosilicon complexes has often been assumed when addressing issues of mineral weathering, biosilicification, and the apparent biological activity of silicon in higher plants and animals," he says. "Yet proof was always lacking."

USING SILICON-29 nuclear magnetic resonance (NMR) spectroscopy as their primary analytical tool, Knight, Kinrade, and their coworkers have, over the past few years, characterized a number of organosilicon complexes resulting from the interaction of dissolved silicon with organocations. In 1999, for example, the group reported that addition of aliphatic polyhydroxy compounds --such as threitol, xylitol, mannitol, and sorbitol--to aqueous silicate solutions under strongly alkaline conditions yielded high concentrations of stable polyoate complexes containing five- or six-coordinated silicate anions [Science, 285, 1542 (1999)]. The formation of these hypervalent anions depends on the location of the hydroxy groups in the polyalcohols.

AQUEOUS SILICATES Lakehead chemists attempt to explain how plants manipulate silicon. Shown are Eric Deguns (left), Gillson, Kinrade, and Robin J. Hamilton.

"The remarkable ease by which these simple sugar like molecules react to form hypervalent silicon complexes in aqueous solution supports a longstanding supposition that such species play a significant role in the biological uptake and transport of silicon and in mineral diagenesis," the authors note.

According to Casey, the discovery that simple polyalcohols cause Si(IV) to switch to Si(V) and Si(VI) in aqueous solution is remarkable.

"Prior to this work, catechol (1,2-dihydroxybenzene) was the only common natural ligand that could change the coordination number of aqueous silicon," he says. "Catechol is a common moiety in plant and microbe exudates and causes silicon to become six-coordinated in aqueous solutions."

More recently, Kinrade, Knight, and coworkers reported ^{29}Si NMR evidence that silicon-sugar acid complexes are so stable that they can be formed under the dilute neutral conditions of most groundwaters and biofluids [Chem. Commun., 2001, 1564].

"The silicon concentrations in such solutions are at the very limits of detection by ^{29}Si NMR spectroscopy, even using materials isotopically enriched in ^{29}Si and more than a week of NMR acquisition time," Kinrade points out. "Nonetheless, we detected at least two different pentaoxosilicon-carbohydrate complexes."

Kinrade and Knight are now using ^{29}Si NMR spectroscopy to examine living systems to see if they can detect any organosilicon compounds in vivo. In their Dalton Transactions paper last month, the two chemists revealed evidence of a transient hexavalent silicon complex in the freshwater diatom Navicula pelliculosa. They carried out the work with Lakehead undergraduate chemistry student Ashley-M. E. Gillson.

"A form of algae, diatoms are single-celled aquatic plants found by the billions in lakes and oceans," Knight explains. "Each cell possesses a beautiful, delicate, and precisely engineered shell of pure silica. One of nature's enduring mysteries is how diatoms and other plants actually build these unique silicate structures."

Diatoms must isolate silicon from water, transport it across the cell membrane, and then deposit it as a solid," he continues. "To do this in the laboratory requires high temperatures, high pressures, or extreme pH levels. But diatoms somehow manage under normal physiological conditions."

The group forced colonies of the diatom into a single stage of their life cycle by silicon starvation, fed them with ^{29}Si-enriched silicate solution, and then recorded the ^{29}Si NMR spectra of the diatoms in vivo.

"Although it is impossible to determine its molecular structure, the complex does not contain the tetravalent silicon commonly found in aqueous systems, but instead contains a penta- or hexavalent silicon center," Knight explains. "Nitrogen-15 isotopic enrichment experiments also suggest, although the evidence is circumstantial, that nitrogen occupies one of the coordination sites."

He points out that the signal-to-noise ratios of the spectra are poor. "The point is that there is a signal there, although there is not very much of the compound, and it isn't there for very long," he says.

Perry comments that claims for the detection of a transient organosilicon complex containing hexavalent silicon coordinated to at least one nitrogen in an organism, if true, are groundbreaking and could provide the basis for the development of the biochemistry of the element.

Knight believes that his work with Kinrade and colleagues shows that the field of silicon biochemistry is no longer a contradiction in terms. "It is finally beginning to take shape," he concludes.

From SCIENCE & TECHNOLOGY, February 11, 2002, Volume 80, Number 6, CENEAR 80 6 pp. 27-28, ISSN 0009-2347
http://pubs.acs.org/isubscribe/journals/cen/80/i06/html/8006sci1.html

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MinFact 9, Dec. 2000

Mining at Lightning Ridge

Lightning Ridge is famous for its precious black opal. But the Ridge also has potential for the discovery of black gold.

Geology

Lightning Ridge lies in a large geological feature called the Surat Basin, which is part of the vast Great Australian Basin. The Great Australian Basin covers 1.7 million square kilometres of eastern Australia.

It was formed during the Cretaceous period about 140 million years ago, when dinosaurs walked the Earth and the sediments of the Basin lay at the bottom of a large inland sea. It is these sediments that later hosted the formation of precious opal.

The sedimentary host rocks are essentially horizontal. This is because they were deposited on the floor of the inland sea and have not been deformed.

The rocks which host the opal at Lightning Ridge were deposited in shallow water near the edge of the Basin, probably in an estuary. Overlying the Cretaceous sedimentary rocks are sandstones and conglomerates that were deposited by streams and rivers in the Tertiary period, about 15 million years ago.

Many of these younger rocks have hardened to form silcrete and are often quarried for road materials.

Most opal is found between 6 and 18 metres from the surface - not so deep that they are out of the reach of smaller miners, but deep enough to make their mining hard work.

Petroleum potential

The sedimentary rocks of the Lightning Ridge region may also contain petroleum deposits. The Surat Basin stretches beyond New South Wales into Queensland, where it hosts a large number of oil and gas fields.

While no commercial oil or gas discoveries have been made in the New South Wales part of the basin, the lack of exploration success does not reflect the potential that is there. Most exploration effort has focused on Queensland. Only six wells have been drilled in New South Wales and large areas remain virtually unexplored.

Water samples collected from deep artesian bores in the New South Wales section of the basin have contained methane gas accompanied by varying amounts of carbon dioxide. Most samples record small quantities of ethane and a few bores contain traces of propane and butane.

Plane conducting aeromagnetic survey near Walgett - part of the recently completed 'Discovery 2000' exploration initiative. It is hoped that 'Discovery 2000' and its successor, 'Exploration NSW', will lead to the discovery of commercial petroleum deposits in NSW

The Department of Mineral Resources is conducting ongoing studies to determine the source of the gas in the artesian water. About $3 million of the Department's recently completed $35 million 'Discovery 2000' exploration program was spent searching for oil and gas in the Surat Basin.

Funding from the new $30 million 'Exploration NSW' program will see a further $1 million spent on oil and gas exploration in the Surat Basin over the next three years.

Opal

In New South Wales the most important seams of opal are found in sedimentary rock, with the opal lying at shallow depths, usually less than 30 metres. Its formation occurs this way:

Silica weathered from overlying rock percolates down through the rock mass to a cavity or fault where it is deposited as a gel. Gradual loss of water from the gel results in hardening of the material and the formation of opal, the whole process taking hundreds of thousands of years.

Opals are made up of minute spheres of silica which have grown around a central nucleus. Precious opal consists of larger silica spheres arranged in a regular pattern.

The orderly arrangement of the spheres creates a regular three-dimensional array of spaces and voids between the spheres. Diffraction and interference of light waves traveling through the transparent spheres and voids produce the brilliant play of colours of precious opal.

Precious opal

Precious opal is usually classified on the basis of the background colour of the stone and the type of colour pattern.

Black opal shows a play of colours in a dark background, accentuating the colour flashes. Lightning Ridge is the world's major producer of black opal.

Light opal has a background colour ranging from clear to milky. The clear varieties are known as crystal or jelly opal. Beautiful light opal is found at White Cliffs.

Fire opal is a transparent to translucent stone with a red to honey-yellow background, and usually with a bright play of colours in red and green.

Opal mining history

1877 - Mining for precious opal in igneous rocks begins at Rocky Bridge Creek, a tributary of the Abercrombie River, in the Central West.

1881 - Opal is discovered at Milparinka, near Tibooburra in the Far West.

1884 - Opal is discovered in sedimentary rock at White Cliffs in the Far West.

1889 - Precious opal is discovered at White Cliffs.

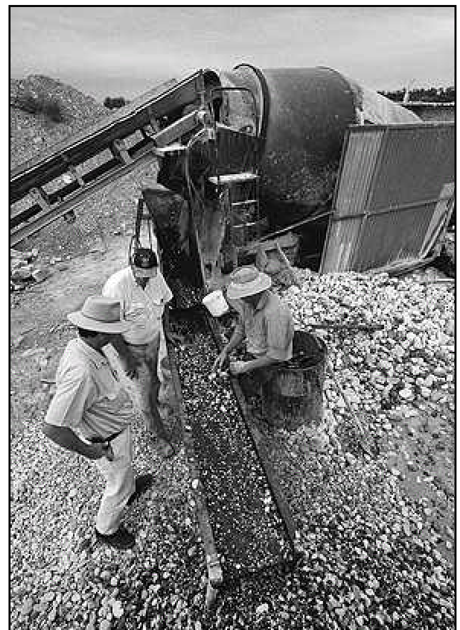
1880s or 1891 - Opal is discovered in sedimentary rock at Lightning Ridge (Wallangulla) and other localities in the area, but its commercial value is not recognised.

1890 - Precious opal mining begins at White Cliffs (continuing to 1915 then going into decline).

1896 - Opal is discovered at Purnanga and Grenville-Bunker Field. These occurrences are near White Cliffs and so extend the size of that opal-bearing district.

1897 - Opal is discovered in igneous rock at Tooraweenah, near Coonabarabran. **1901** - Opal is discovered in igneous rock at Tintenbar, on the Far North Coast.

1901-1905 - Opal mining begins at Lightning Ridge. The first shaft was put down around 1901 or 1902 by Jack Murray, a boundary rider who lived on a property nearby. Some time later, possibly a few months, a miner from Bathurst named Charlie Nettleton arrived and commenced shaft sinking. It was he who in 1903 sold the first parcel of gems from the field for $30, not a fiftieth of the price that could have been obtained five years later.



Officer from the Department's Lightning Ridge office providing safety advice to opal miners

1908 - Opal mining begins at the Grawin-Sheepyard Field in the Lightning Ridge area, increasing the importance of the opal fields in the district.

1919 - Opal mining begins at Tintenbar, continuing to 1922.

1920 - The Newfield opal area is discovered.

1985 - Seminal work by the Geological Survey of New South Wales leads to better, more scientifically controlled exploration for opals.

1989 - The Coocoran opal area is discovered in the Lightning Ridge district.

1998-1999 - The estimated value of opal production in the State is about $44 million. New South Wales (and Australia) is a leading world producer of opals.

The role of the Department

The New South Wales Department of Mineral Resources is responsible for: __Assessing and reporting on the geology of New South Wales, especially by preparing geological maps and notes.

- Ensuring that exploration and mining companies comply with environmental requirements.
- Issuing exploration and mining titles.

- Monitoring health and safety at mines.
- Encouraging development of the mining industry in the State and value adding to mineral products.

Lightning Ridge Office

The Department's Lightning Ridge Office provides a variety of services to the mining industry in the region:

- Processing of exploration and mining titles, including mineral claims and opal prospecting licenses. There are currently 6400 mineral claims covering the Lightning Ridge region. Between 1500 and 2500 mineral claims and from 50 to 100 opal prospecting licenses are processed by the office each year.
- Monitoring of mine safety and environmental management.
- Mine safety courses. Almost 80 courses have been conducted by the Department's Mines Inspection Branch since July 1993, with about 2000 opal miners attending. The courses cover subjects such as pegging claims, above and below ground surveying, safety planning, ground support and control, ventilation and legal responsibilities. Courses are also conducted in the use and handling of explosives.

Further information on minerals, mining and exploration in NSW can be obtained from the Information and Customer Services Branch, NSW Department of Mineral Resources, PO Box 536, St Leonards NSW 1590 Telephone, (02) 9901 8269, Facsimile, (02) 9901 8247 E-mail, webcoord@minerals.nsw.gov.au www.minerals.nsw.gov.au

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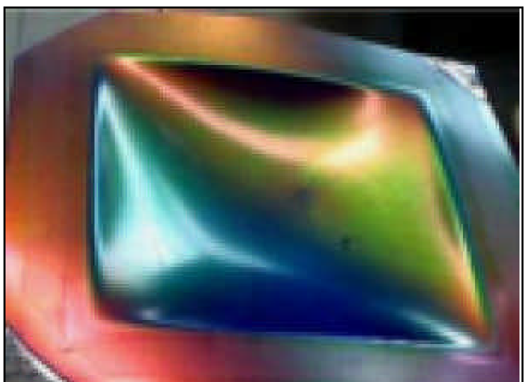
Polymer Opal Films
New Color-changing Technology Has Potential Packaging, Military, Aerospace Applications

Science Daily (Jul. 25, 2007) — Imagine cleaning out your refrigerator and being able to tell at a glance whether perishable food items have spoiled, because the packaging has changed its color, or being able to tell if your dollar bill is counterfeit simply by stretching it to see if it changes hue. These are just two of the promising commercial applications for a new type of flexible plastic film developed by scientists at the University of Southampton in the United Kingdom and the Deutsches Kunststoff-Institut (DKI) in Darmstadt, Germany. Combining the best of natural and manmade optical effects, their films essentially represent a new way for objects to precisely change their color.



Example of a polymer opal (compression molded). (Credit: Department of Physics and Astronomy, University of Southampton)

These "polymer opal films" belong to a class of materials known as photonic crystals. Such crystals are built of many tiny repeating units, and are usually associated with a large contrast in the components' optical properties, leading to a range of frequencies, called a "photonic bandgap," where no light can propagate in any direction. Instead, these new opal films have a small contrast in their optical properties.

As with other artificial opal structures, they are also "self-assembling," in that the small constituent particles assemble themselves in a regular structure. But this self-assembly is not perfect, and though meant to be periodic, they have significant irregularities. In these materials, the interplay between the periodic order, the irregularities, and the scattering of small inclusions strongly affect the way the light travels through these films, just as in natural opal gem stones, a distant cousin of these materials. For example, light may be reflected in unexpected directions that depend on the light's wavelength.

Photonic crystals have been of interest for years for various practical applications, most notably in fiber optic telecommunications but also as a potential replacement for toxic and expensive dyes used for coloring objects, from clothes to buildings. Yet much of their commercial potential has yet to be realized because the colors in manmade films made from photonic crystals depend strongly on viewing angle. If you hold up a sheet of the opal film, Baumberg explains, "You'll only see milky white, unless you look at a light reflected in it, in which case certain colors from the light source will be preferentially reflected." In other words, change the angle, and the color changes.

These photonic crystals are apparent in the natural world as well but are more consistent in color at varying angles. Opals, butterfly wings, certain species of beetle, and peacock feathers all feature arrays of tiny holes, neatly arranged into patterns. Even though these natural structures aren't nearly as precisely ordered as the manmade versions, the colors produced are unusually strong, and depend less on the viewing angle.

Until now, scientists believed that the same effect was at work in both manmade and natural photonic crystals: the lattice structure caused the light to reflect off the surface in such a way as to produce a color that changes depending upon the angle of reflection. Baumberg, however, suspects that the natural structures selectively scatter rather than reflect the light, a result of complex interplay between the order and the irregularity in these structures.

Given that hunch, Baumberg's team developed polymer opals to combine the precise structure of manmade photonic crystals with the robust color of natural structures. The polymer opal films are made of arrays of spheres stacked in three dimensions, rather than layers. They also contain tiny carbon nanoparticles wedged between the spheres, so light doesn't just reflect at the interfaces between the plastic spheres and the surrounding materials, it also scatters off the nanoparticles embedded between the spheres. This makes the film intensely colored, even though they are made from only transparent and black components, which are environmentally benign. Additionally, the material can be "tuned" to only scatter certain frequencies of light simply by making the spheres larger or smaller.

In collaboration with scientists at DKI in Darmstadt, Germany, Baumberg and his colleagues have developed a solution for another factor that traditionally has limited the commercial potential of photonic crystals: the ability to mass-produce them. His Darmstadt colleagues have developed a manufacturing process that can be successfully applied to photonic crystals and they now can produce very long rolls of polymer opal films.

The films are "quite stretchy," according to Baumberg, and when they stretch, they change color, since the act of stretching changes the distance between the spheres that make up the lattice structure. This, too, makes them ideal for a wide range of applications, including potential ones in food packaging, counterfeit identification and even defense.

The researchers will publish their findings in the July 23 issue of Optics Express, an open-access journal of the Optical Society of America.

Article: Otto L. J. Pursiainen, Jeremy J. Baumberg, Holger Winkler, Benjamin Viel, Peter Spahn, Tilmann Ruhl, "Nanoparticle-tuned Structural Color from Polymer Opals," Optics Express, Vol. 15, Issue 15, adapted from materials provided by Optical Society of America, via EurekAlert!, a service of AAAS.

Optical Society of America (2007, July 25). New Color-changing Technology Has Potential Packaging, Military, Aerospace Applications. ScienceDaily.

From http://www.sciencedaily.com/releases/2007/07/070723163522.htm.

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Lapis Lazuli

By Chuck Boblenz, SCVGMS member

Introduction

Lapis Lazuli has intrigued people around the world for centuries. Its vivid, exciting blue color has mesmerized those admiring the works of art and jewelry. The list of admirers includes people from every walk of life and includes kings and emperors. This intrigue is caused by the spectacular deep, vivid blue color. In fact, it is so distinct a color that it is hard not to notice it when worn in jewelry or seen in the rough.

History

In the early years of 3300 B.C., in the country we know as Iraq and along the Euphrates River which flows through the country, pieces of Lapis Lazuli were found. The pieces being found at this time were finished gems and jewelry found in Sumerian tombs from earlier civilizations. These pieces had been carved into the forms of birds, deer, and rodents, having been made into dishes, vases, beads, and cylindrical seals used in the times of the Sumerians.

Later in the 1300 B.C. years, thousands of similar jewelry items were buried with King Tut. These pieces used Lapis Lazuli extensively, making use of the contrast of gold and the deep blue color to attract one's eye. Many of these were items that were displayed in a traveling display several years ago.

Pliny writes of sapphires of both "light and dark blue" in the year 79 A.D.. It is believed that his reference to sapphires of dark blue was aimed at describing Lapis Lazuli. In fact, so little had been written till this time, allowing some historians to be concerned about interpretations of these early writings which have been found.

In the years of the 1200's, the Pope had heard of vast lands to the east called the Mongol Empire. He learned from the many traders and adventurers returning to Rome of this vast land and its people. This information caused him to follow his tradition and to introduce these peoples to Christianity.

In 1245 the Pope selected Giovani de Piano Carpini to go to the east and seek the lands of Genghis Khan. Carpini was able to travel to the northern reaches of the Gobi Desert. In these travels he did meet the Khan, but was not successful in converting him to Christianity. Upon hearing of Carpini's return to Rome and receiving his report, the Pope sent Guilliame de Rubrouck with the same charter: to locate the Great Khan and to convert him to Christianity. Rubrouck traveled further east surpassing Carpini in his travels and succeeded in getting to Karakorum, the capital of the Mongol Empire; however, he was equally not successful in converting the Khan before returning to Rome.

In 1260 two brothers, Niccolo and Maffeo Polo, set out from Venice eastward toward Constantinople. Soon after they started their journey, they decided to extend their trip and to allow geography and economics to direct the direction that they went.

This decision was monumental in that it allowed them to be the first "Latins" to cross the full Asian continent.

These travels allowed the brothers to meet Kublai Khan's cousin, Barka. This friendship caused them to spend a year in Barka's domain dealing in fine gems and jewels from the area. As the second year was beginning, a war was brewing, causing the brothers to continue their journey.

As they were leaving, they found that their way was blocked by the war, so chose to go north into an area governed by the Khan of Turkistan. They then remained in this area for three years.

Barka's domain included the present country of Afghanistan and slowed the Polo brothers to see the many mines in the northern part near the Oxus River. This is the locale where early Lapis Lazuli is found. The brothers' keen interest in gems and jewelry caused them to barter and trade for this fine material.

During the brothers' stay in this part of the Mongol Empire, they succeeded in meeting the Great Khan. During one of their meetings, the great Khan gave them a message to be given to the Pope and he assured their safe passage back with a golden tablet with the mark of his seal upon it.

With the passport, they safely returned to Venice with great wealth and many stories of adventure. They were soon preparing for a return trip to the Khan's Empire. On this trip Niccolo's son, Marco, joined the brothers and found great acceptance into the Mongol Empire by the Khans. This began a number of trips for Marco over the next two decades where he acquired and traded the prized Lapis Lazuli throughout these journies.

Leonardo de Vinci sought honest paint dealers that would take Lapis Lazuli powder and mix it into their paints which he sought for that particular blue in his paintings.

It should be noted that there were also dishonest paint dealers during this time. They found that they could substitute Azurite for the bluing agent and sell a similar colored paint. The unfortunate thing that happens to the paint mixed with Azurite is that after a period of time it will turn a very bright green, much to the embarrassment of the artisan and causing a deep concern for the paint dealer. This green color is caused by the copper in Azurite turning it to Malachite over time.

Detail

Lapis Lazuli is pronounced Lap'is Laz-yoo'le. The first word has the emphasis placed on the lap' and the smaller emphasis on the is; the second word Laz has a long a and the yoo' sounds like you and le sounds like lay. Go ahead and try it. It's easy to pronounce, isn't it?

The dictionary describes it as: 1. an opaque, azure-blue to deep blue gemstone of Lazurite; 2. A mineral, Lazurite. [Latin Lapis, stone + Medieval Latin Lazuli, genitive of Lazulum, Lapis Lazuli, from Arabic Lazaward, from Persian Lazhuward.]

Lapis Lazuli is a rock. The blue material that first strikes our eye is Lazurite. It is the midnight blue material and is sodium aluminum silicate. The next attractive material is metallic and looks very bright and shiny. It is Pyrite and the remaining white streaks are Calcite.

The most prized of this material is extremely dark blue in color, in fact, almost midnight black; is very hard and takes a very good polish; has very small amounts of pyrite and almost no calcite. This dark blue of Lapis Lazuli is much more intense than Sodalite or Azurite and is much more valued.

Each of the lesser grades of Lapis Lazuli will have varying amounts of Pyrite and Calcite in each piece and can have varieties in color from light blue to the most vivid of blues.

The Chilean and Russian Lapis Lazuli is often lighter in color due to the higher content of calcite and results in a lower value. All material shows an amount of pyrite, but if too much is prevalent, then the stone can gain a green patina with age.

Lapis Lazuli

Formula: Na8 (Al6Si6O24) S2 Sodium Aluminum Silicate
Color: Blue
Hardness: 5-6
Specific Gravity: 2.4-2.9
Streak: Light Blue
Fracture: Conchoidal, Grainy
Localities:
Afghanistan: West Hindu Kush Mountains
Russia: Baikal Lake, southwest end of lake
Chile: North of Santiago

Lapidary Treatment

Use normal lapidary treatment through the number of grit sizes; however, use caution when going above 600 grit of heat buildup. Too much heat can cause the piece to fracture and/or shatter, so use caution.

Lapis Lazuli can be used in any silver, gold, or platinum jewelry and will provide instant appeal in its contrast to the metal work.

Conclusion

I hope that you have now been introduced to Lapis Lazuli. 'Tis a stone through the ages and is fun to work with. I hope this will cause you to find the pieces you may have stashed away and to get them out and decide to work them into some super piece of jewelry. As you have noted here, it would undoubtedly draw much attention to you wherever you may wear or show it. So take that step right now, and I believe you will find it very enjoyable.

From the Breccia, 3-2008

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April 2008 Gem & Mineral Shows

4-6--BAKERSFIELD, CA: 6th annual show, "Rock and Gem Rendezvous"; San Joaquin Valley Lapidary Society; Kern County Fair Grounds Carnival lot, 1142 South P. St., corner of Belle Terrace and P. St.; Fri. 9-7, Sat. 9-5, Sun. 9-5; free admission; contact Lynne, (661)323-2663, or Lew Helfrich, (661) 323-2663 or (661) 378-4450; e-mail: lewsrocks@bak.rr.com

5-6--HAMBURG, NY: Show, "Jade--Stones of Heaven"; Buffalo Geological Society; Hamburg Fairgrounds Market & Grange Bldgs., 5600 McKinley Pkwy.; Sat. 10-6, Sun. 10-5; adults $5, children 12 and under free; mini-mine for ages 12 and under, kids' bead crafting, sand art, and more, more than 25 dealers, fossils, minerals, geology, books, equipment, lapidary, wire wrapping, cabochons, gems, jewelry, minerals, lapidary, fossils; contact Steve Birtz, 2230 Fix Rd., Grand Island, NY 14072, (716) 773-6386; e-mail: SBirtz@aol.com

11-13--EUREKA, CA: 7th annual show, "Lost Coast Jewelry, Gem, Bead & Mineral Show"; Kasey Enterprises; Redwood Acres Fairgrounds, 3750 Harris St.; Fri. 12-7, Sat. 10-7, Sun. 10-5; adults $3, students and seniors $1.50, children 12 and under free with adult; contact John or Diana LaVelle-Usrey, P.O. Box 2927, McKinleyville, CA 95519, (707) 839-1358; e-mail: kaseyent@sbcglobal.net

12-13--PARADISE, CA: Show; Paradise Gem & Mineral Club; Paradise Elk's Lodge, 6309 Clark Rd.; Sat. 10-5, Sun. 10-4; adults $1, children free; raffle, silent auction, kids' zone, treasure hunt, door prizes; contact Shirley Thompson, 1802 El Toro Court, Paradise, CA 95969, (530) 872-1846; e-mail: shirley1846@comcast.net; Web site: www.goldnuggetweb.com/PGMC/

18-20--SAN DIEGO, CA: Show; Gem Faire; Scottish Rite Center, 1895 Camino del Rio S; Fri. 12-7, Sat. 10-7, Sun. 10-5; $5 weekend pass; contact Yooy Nelson, (503) 252-8300; e-mail: info@gemfaire.com; Web site: www.gemfaire.com

19-20--WALNUT CREEK, CA: Show, "The Great Contra Costa Crystal Fair"; Pacific Crystal Guild; Civic Park Community Center, 1375 Civic Dr., at Broadway; Sat. 10-6, Sun. 10-4; adults $5, children under 12 free; gems, jewelry, crystals, beads, psychics; contact Jerry Tomlinson, (415) 383-7837; e-mail: sfxtl@earthlink.net; Web site: www.crystalfair.com

25-27--SANTA ROSA, CA: Show; Gem Faire; Sonoma County Fairgrounds/Grace Pavilion, 1350 Bennett Valley Rd.; Fri. 12-7, Sat. 10-7, Sun. 10-5; $5 weekend pass; contact Yooy Nelson, (503) 252-8300; e-mail: info@gemfaire.com; Web site: www.gemfaire.com

26-27--FRANKLIN, NJ: 36th annual show, swap and sell; N.J. Earth Science Association, Sterling Mining Museum, Franklin-Ogdensburg Mineralogical Society; Franklin School; Sat. 9-5:30, Sun. 10-5; children's activities, more than 24 fluorescent and white-light mineral exhibits, Sat. night banquet at the Sterling Mine, hourly door prizes; contact Sterling Mine, (973) 209-7212

26-27--LANCASTER, CA: Show; Antelope Valley Gem & Mineral Club; Lancaster High School, 44701 32nd St. W.; Sat. 9-5, Sun. 9-5; free admission; dealers, silent auction, raffle drawing; contact Jules Ficke, 4233 West Ave. L-4, Lancaster, CA 93536, (661) 943-5157; e-mail: Av_Gem@Yahoo.com; Web site: www.geocities.com/av_gem

26-27--SANTA CRUZ, CA: 56th annual show; Santa Cruz Gem & Mineral Society; Santa Cruz Civic Auditorium, Center and Church St.;Sat. 10-5, Sun. 10-5; adults $3, children under 12 free with adult; contact Eleanor or Hubert Drake, (831) 688-8086; e-mail: hmdrake@pacbell.net

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The Opal Express is published monthly by
The American Opal Society.

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PLEASE CHECK YOUR ADDRESS LABEL. If your label shows **the** current month/year your dues are DUE NOW. If the date is older, your dues are overdue.

A Renewal Grace Period of two months will be provided. If your dues are due now you will receive two additional issues of the newsletter. Please note, however, that as the system is now set up, if your renewal is not received you will be AUTOMATICALLY dropped from membership thereafter. It is your responsibility to assure your dues are current.

Thank you,
The Editor

The Opal Express

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Volume #41 Issue #4
April 2008

TO:

Some Topics In This Issue:

- **The Great Opal Hunt!**
- **Mining at Lightning Ridge**
- **How Does Nature Process Silicon?**
- **Mining at Lightning Ridge**
- **Polymer Opal Films**
- **Lapis Lazuli**

Important Info:
Board Meeting – April 1st

General Meeting - April 10th

Speaker: Mr. Jack Liu on his stone cutting service in China.

April 10th - Mr. Jack Liu on Stone Cutting in China

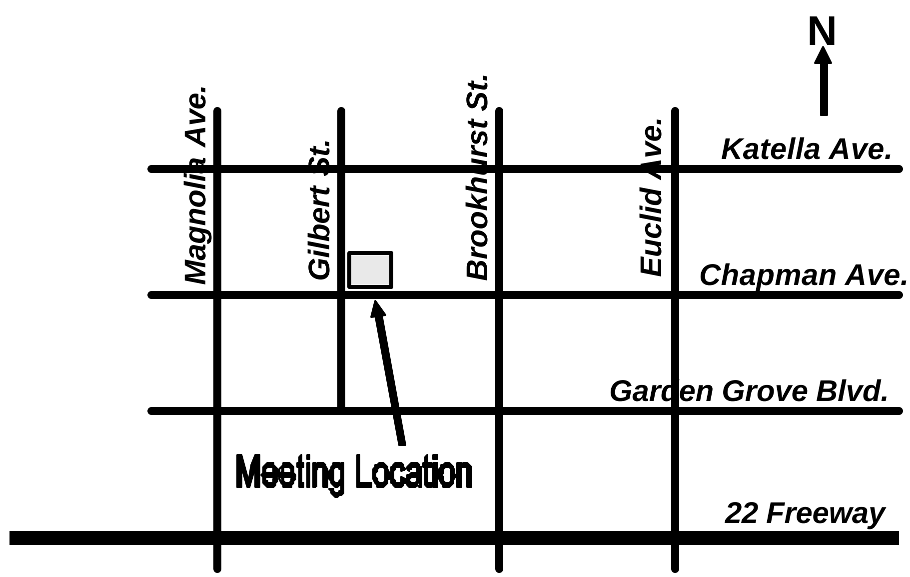
— GENERAL MEETINGS —

2nd Thursday of the Month
7:00 pm - 9:00 PM

Garden Grove Civic Women's Club
9501 Chapman Ave.
Garden Grove, CA 92841

(NE corner of Gilbert & Chapman)

MEETING ACTIVITIES
Opal Cutting, Advice, Guest Speakers, Slide Shows, Videos, Other Activities



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