The Mineral Minutes

Volume 79-04
April 2021

Zoom Meetings Continue

Please connect to our March program at our usual time and date: **Wednesday, April 7, 2021** at **7:30 pm Eastern Time**. You should receive a link in an email from the MSDC Treasurer, John Weidner. If you do not, please email John (jfweidner42@gmail.com) and he will send you the link.

April 7, 2021 Program Info: "Minerals of Cornwall" by Martin Held

by Yury Kalish, MSDC Vice President

Our presenter in April will be Martin Held, President of the Cleveland Micromineral Society, which is affiliated with the Cleveland Museum of Natural History. Martin moved to Cleveland from his native Germany in 2008. He is a Global Director for explosive products for Austin Powder Company that was founded in 1833, making it the oldest privately owned explosive company in the world. Both Martin and his wife have been systematic mineral collectors for over 40 years. Their collections are growing through annual visits to the Tucson show, as well as collecting in Germany, Switzerland, and England.

Martin's presentation will focus on geology, occurrence of metals, history, mining, and minerals. Cornwall is the southwestern tip of England and is one of the oldest mining areas and mineral localities in the world. Several local mining areas are now part of UNESCO World Heritage site called The Cornwall and West Devon Mining Landscape. Mining started in Cornwall in the Bronze Age with alluvial ore deposits of cassiterite (a major source of tin), followed by lead and copper. Over the centuries, mining moved underground, with mines reaching depth up to 100 meters. There were also open pit kaolin mines, some still operational. Cornwall miners were famous for their engineering skills. I recall presentations made at this club, describing contributions of Cornish miners to development of mining in the United States.

Cornwall is a source of over 500 minerals. Amazingly, new minerals are being discovered to this day. For example, in December 2020, a new mineral was discovered by scientists at the Natural History Museum in London on a rock mined in Cornwall over two centuries ago. The new mineral was named kernowite after the Cornish language word for Cornwall.

Issue Highlights:

Prez Says…

by Dave Hennessey, MSDC President

When I was a freshman in college, the theater department performed a Gilbert and Sullivan operetta called "The Pirates of Penzance." I played clarinet in the pit orchestra for the

(continued on p. 2)

("Pres Says…" continued from p.1)

production. I did not know then where Penzance was, but later learned it is in Cornwall, in the southwest corner of England. And Cornwall is an exciting place for mineral collectors.

Cornwall is well known for the fine mineral specimens that have come out of the copper and tin mines there. Mining in Cornwall dates back to the Bronze Age. Copper and tin both melt at relatively low temperatures, so Bronze Age kilns were hot enough to smelt the metals from their ores. Copper and tin are soft and malleable on their own, but make bronze when alloyed together. Bronze is still malleable, but it is much stronger and therefore more useful in making tools and weapons.

The copper and tin mines are no longer in operation, but in the 1800s they were mined extensively and the mining techniques developed by the Cornish miners were foremost in the world. As the mines in Cornwall closed because richer ore deposits were found in other parts of the world, the Cornish miners migrated to the new locales. Much of the mining done in America was performed by Cornish miners who migrated here and utilized the pillar and chamber mining technique developed back in Cornwall.

My favorite Cornish mineral is "cogs-wheel" bournonite, so named because the crystal habit is tabular with repeated twinning that results in a shape that resembles a cogwheel. Other classic Cornish mineral specimens include cassiterite and liroconite. I look forward to hearing about these minerals and others in our presentation this month.

One other interesting thing about Cornwall is that there are palm trees there! It seems the path of the Gulf Stream, with its origin in the warm Caribbean Sea, swings to the east as it heads north and delivers temperatures to Cornwall that are warm enough to support the growth of palm trees. Who knew?

Sharing Time

by Dave Hennessey, MSDC President

Minerals from Merry Olde England would be a good pairing with our presentation this month. But as always, we will enjoy seeing any mineral you wish to share with the group. If you find it interesting, we will enjoy seeing and hearing about it.

March 2021 Business Meeting

by Andy Thompson, MSDC Secretary

Summary: MSDC President Dave Hennessey called the meeting to order, welcomed and thanked everyone for joining the Zoom meeting. He especially warmly welcomed the many guests who were attending from many clubs and states across the country. On behalf of MSDC, he also thanked for their service the former MSDC presidents who were attending the meeting.

Old Business: No issues were outstanding or raised for discussion.

New Business: There was one special item of new business, the **2021 annual Foshag-Hronik-Dhyse-Payne Award** of financial support for a university student's research in geological studies. Dave asked Andy Thompson, MSDC Secretary, to introduce Dr. Richard Tollo of George Washington University's Geological Sciences Program to tell us about this year's recipient.

Richard began by noting that "twenty years is a great MSDC legacy" of the club's support which makes it possible for a student to conduct original geological field research. "The significance of this is not simply in the long list of names of graduates who have made contributions to the field or gone on to complete advanced studies and today are geology professors. It is more about the impact the award has on the way the students see themselves and the affirmation they experienced."

With that, Richard introduced the 2021 award recipient, Doug Robbins, a very promising third-year geology student with a special interest in volcanology and high temperature chemistry. Doug thanked the MSDC club for its generous support. Like many students, Doug was participating in university studies remotely because of COVID-19 and was connecting to the meeting from Hawaii.

In response to a question, Dr. Tollo mentioned that many of his students were very familiar with Dr. William Foshag, after whom the award has been named. For many decades until his death 1956, he was a curator with the Smithsonian's Department of Mineral Sciences. To this day, he is widely known for his field research into the volcanic minerals in Mexico and in the western U.S. Because the study of Dr. Foshag's findings are an integral part of the GWU volcanology course, students like Doug are already very familiar with his geological contributions.

Dave Hennessey thanked Dr. Tollo for his years of assisting MSDC in finding students who are serious about doing research and he wished Doug success at finding an interesting geology research project.

Geology in the News: Dave invited attendees to share any interesting news events they have recently seen in the media. A discussion ensued concerning the Japanese probe, Hayabusa 2, which landed for 30 seconds on the asteroid Ryugu and, in December, returned to earth and safely landed in Australia with carbon rich samples.

No additional news items were presented for discussion.
Dave then turned the meeting over to Yury, Vice President for Programs, to introduce the evening's presenter.

Discovery of the Returned Capsule (photo credit: JAXA)

Pocket Watch Carved from a Single Emerald Crystal

by Ken Rock, MSDC Editor

The watch shown in the photos was made from a single Colombian emerald crystal more than 350 years ago. It is an exceptional item that likely would have been commissioned for a member of aristocracy or royalty.

The watch was part of a hoard of almost 500 pieces uncovered by laborers working under a cellar floor more than 100 years ago. The collection is believed to predate the Great Fire of London in 1666.

The questions of who buried it and why remain a mystery. The emerald watch is just one item in the "Cheapside Hoard" that was on display in London from October 2013 to April 2014. You can learn more about the Cheapside Hoard in a book that was written to accompany the exhibition which marked that 100th anniversary of the original public display.

March 3rd MSDC Program Presentation:

"Biominerals: Discovering their Structural and Biochemical Secrets"

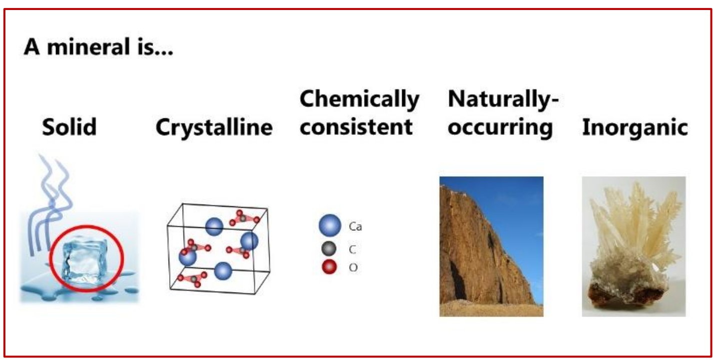
Presented by Gabriela Farfan, Ph.D.
Coralyn W. Whitney Curator of Gems and Minerals,
Smithsonian Museum of Natural History

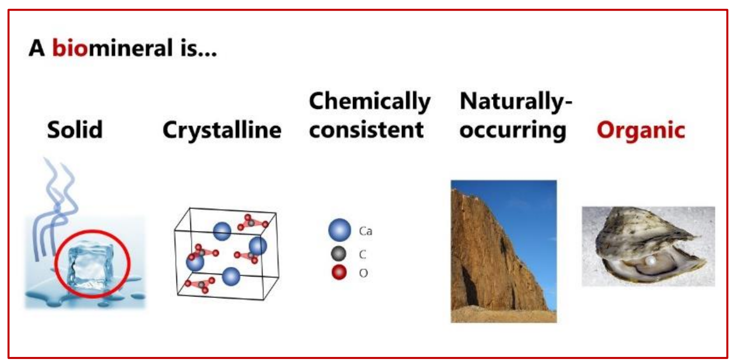
Synopsis by Andy Thompson, MSDC Secretary, with the kind assistance of Dr. Gabriela Farfan

Dr. Gabriela Farfan came to the Smithsonian by way of M.I.T. where she earned her doctorate in a combined program with the Woods Hole Oceanographic Institution. Her presentation to MSDC shared some of her research on the crystal structures and chemistry of minerals formed by biological organisms. By examining the different environmental conditions under which the biominerals were formed, she discovered insights into the crystal structures made by those organisms such as mussels (pearls) and corals. Her discoveries allowed her to make projections about the health of these biomineral-producing organisms in light of our globe's changing environment.

Gabriela began by explaining she would be talking about biominerals, which are minerals produced by organisms. Those biominerals meet the four basic criteria for all minerals, noted in the two slides below, except biominerals are produced by a living organism rather than by inanimate chemical processes.

Definitions



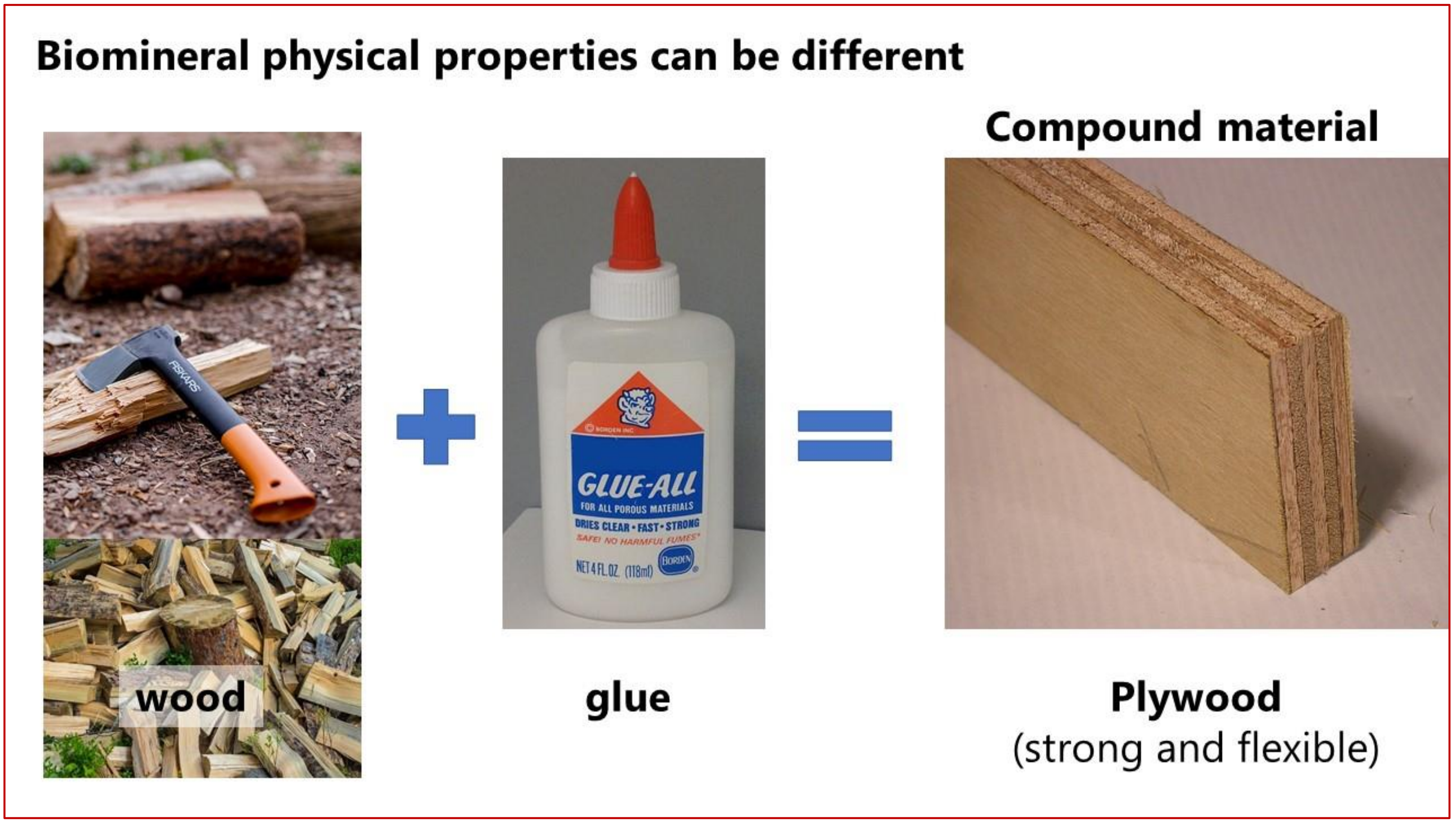


Simply put, organics help to produce a wide range of minerals. Gabriela mentioned manganese oxides with the fungi, protodolomite, that grows on the skeletal bodies of leaf-cutter ants; carbonates and silica in 3.5-billion-year-old stromatolites; apatite (Ca5(PO4)3) and aragonite (CaCO3) found in skeletal bones, corals, and mollusk shells; and silica found in diatoms (algae) and terrestrial plants.

Properties of Biominerals

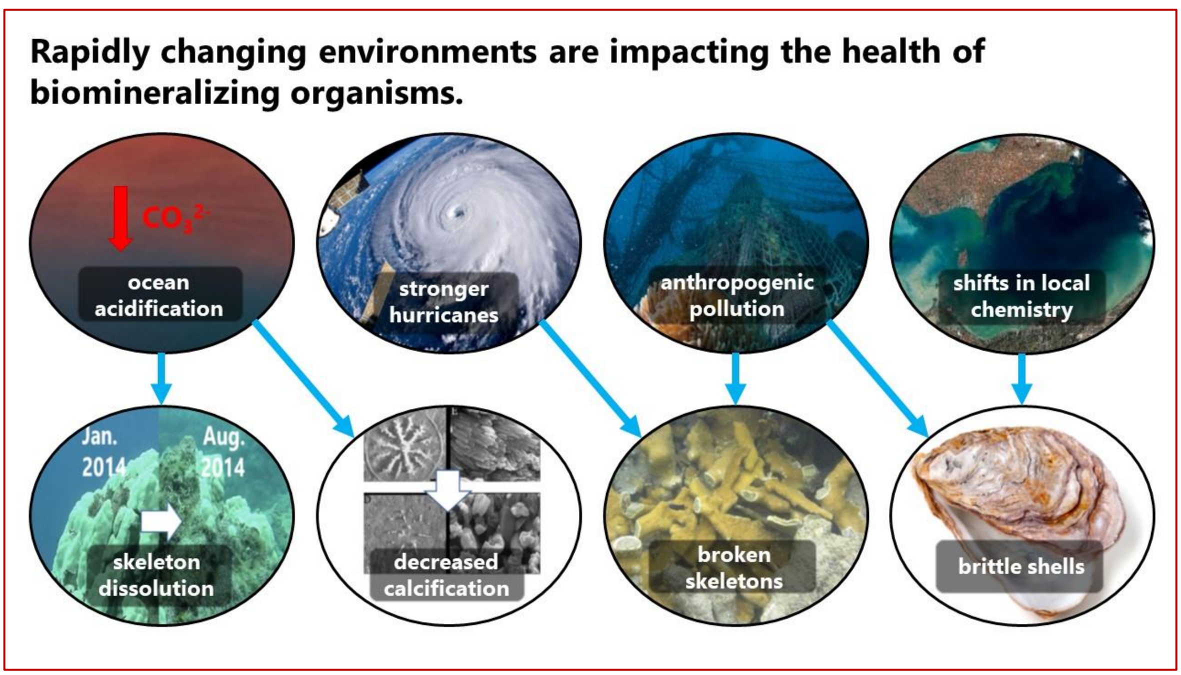
Gabriela used an analogy to suggest one reason why biominerals are so fascinating -- namely their special physical properties. Wood, like most materials, has certain weaknesses which allows wood to be splintered. But when glue is added and the pieces of wood are stacked in brick-like layers, the end product, plywood, has extraordinary strength.

Biominerals often exhibit some of these same extraordinary structural characteristics. She noted that the biomineral apatite, a phosphorous-bearing mineral, is similar to wood because it also has a plane of weakness. But when the organism adds collagen, a glue-like protein, to the rigid apatite, it generates a new compound, bone, and does so in layers having extraordinary strength and flexibility

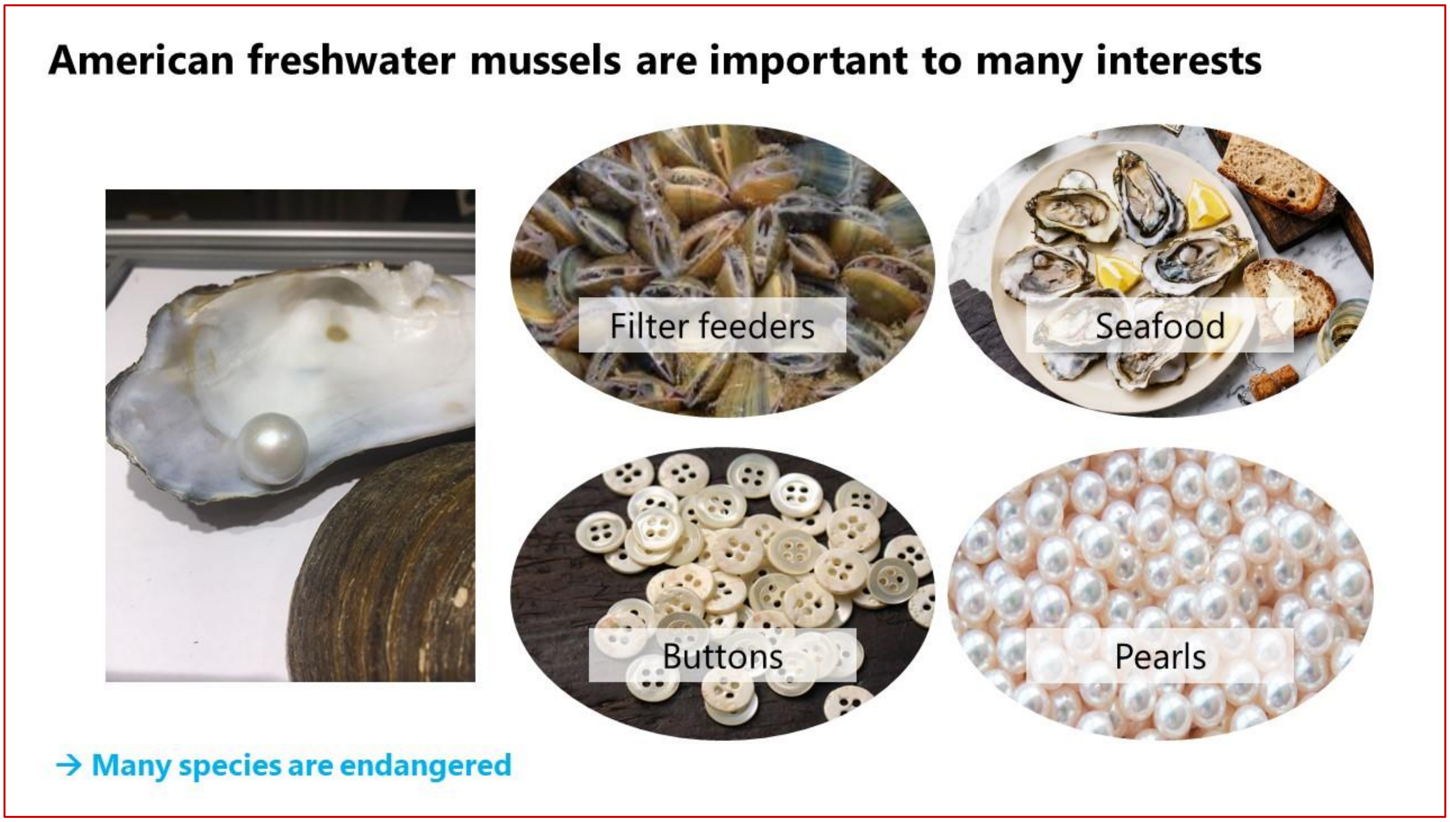


Environmental Influences on Biominerals

Gabriela then described how four major rapid changes in our environment can adversely affect the health of the organisms that have been producing biominerals.



As indicated in the top row of the slide above, ocean acidification, stronger hurricanes, pollution caused by humans and shifts in local chemistry, all can and do negatively impact biominerals in at least four ways. She mentioned weakening skeletal coral reefs and the integrity of shell creatures shown in the bottom row above. The damage done to these organisms also endangers human food sources as well as a wide range of commercial interests including the pearl industry, as shown in the following slide.



Because scientists have documented the processes of biomineralization in various shell and organic life forms, they are now able to predict how biominerals will change due to ongoing changes in the world's environment.

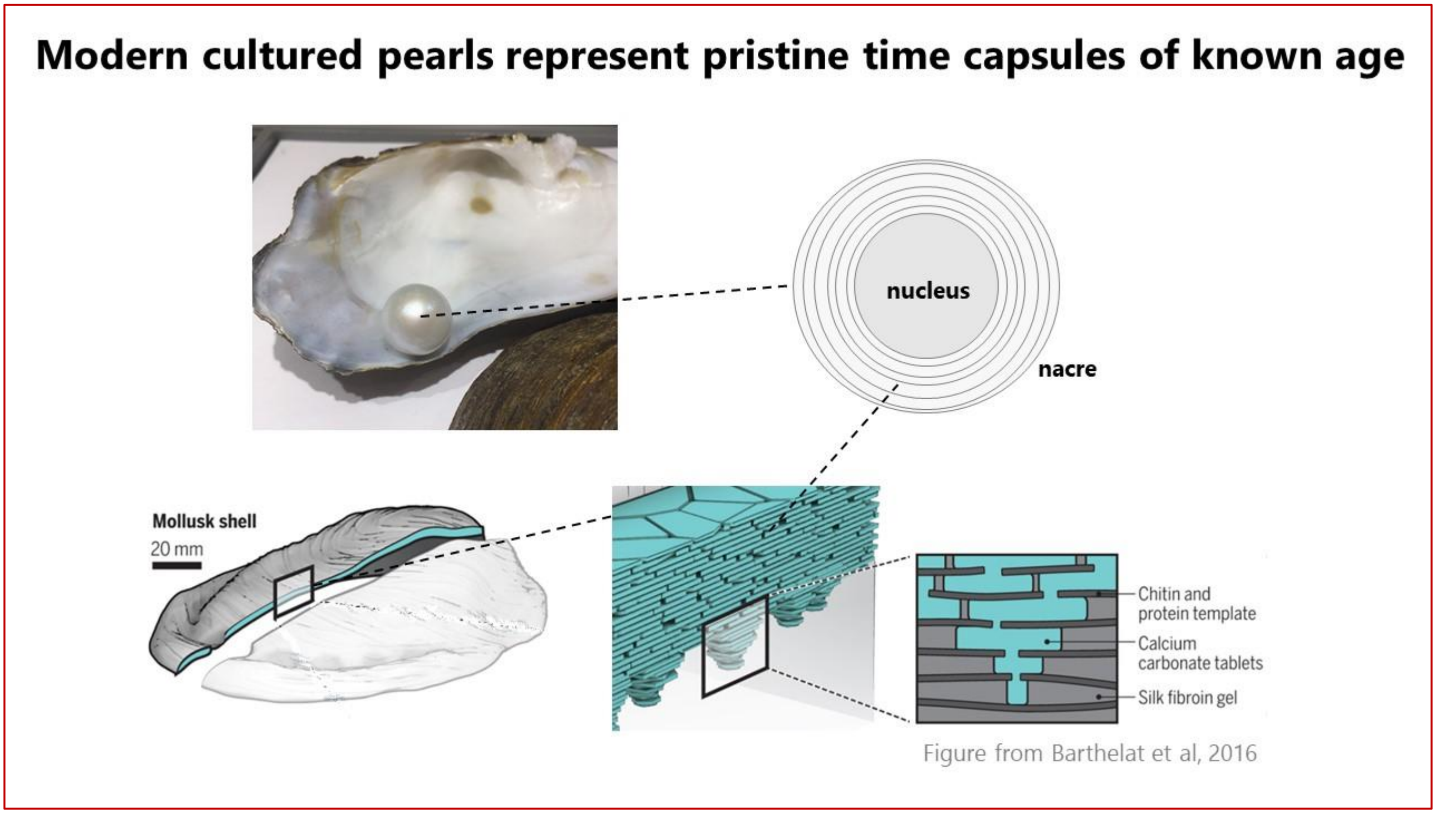
At this point in Gabriela's presentation, it was clear that she and her colleagues in the Smithsonian Department of Mineralogy engage in ground-breaking research that goes beyond their curatorial titles or duties. As scientists, their contributions explore and unpack the secrets of nature and go well beyond collecting and displaying nature's treasures, important as that work is for visitors to the National Museum of Natural History.

Formation of Cultured Pearls

As an example of this research, Gabriela described her ongoing work with some yet-to-be published findings about pearl formation. It gives an example of how the nature of biomineralization is changing in response to environmental changes in the temperature and chemistry of lakes and oceans.

She described how workers grow cultured pearls by stimulating the natural process of pearl production. As illustrated in the slide on the next page, pearls are born within a mollusk shell which has three internal structural layers that stack atop one another like a brick wall:

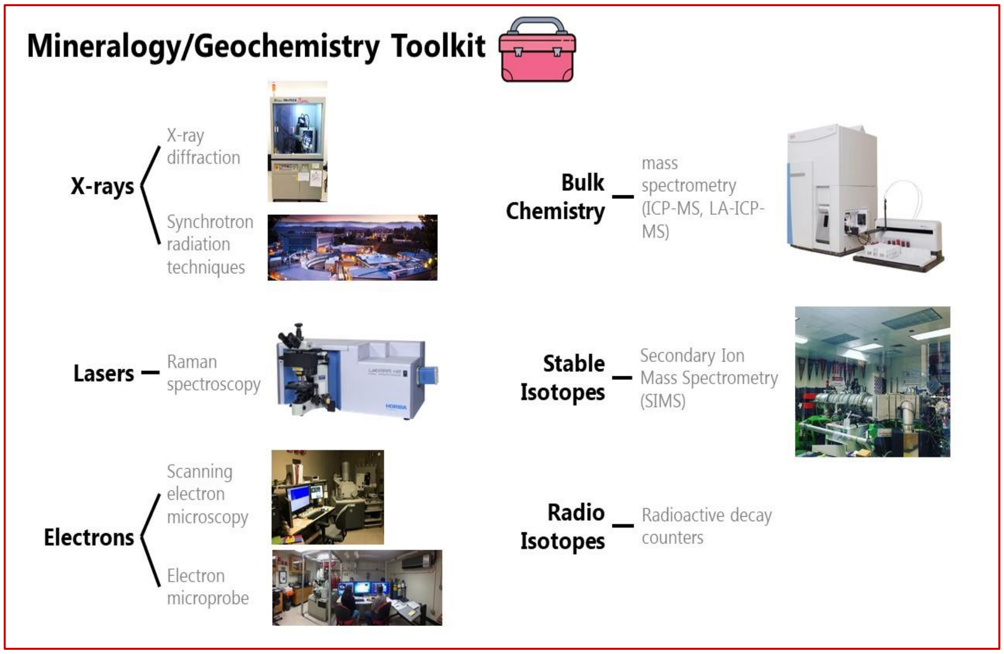
- ► a complex shell structure of chitin protein templates (darker grey),
- ► layers of silk fibroin gel (lighter grey), and
- ► calcium carbonate tablets within the fibroin gel (blue-green).



The cultured pearl production process begins with a seed, which irritates the inside of the shell surface and generates the secretions of nacre (also known as mother-of-pearl, calcium carbonate, and aragonite). These secretions build up in layers on the seed, the nucleus of the cultured pearl. Because the process of growing cultured pearls is carefully controlled by farmers, scientists can monitor the seasonality factors such as weather and temperature changes, and discover how those factors have influenced the history and development of older pearls. Importantly and more broadly, because of their findings, scientists can now predict how, in the coming decades, future changes in the earth's environment are likely to affect the growth and survival not only of pearls but of all the shell-producing marine life.

Research Tools

Gabriela said that one of the joys of working at the Smithsonian is the ready availability of high-tech tools for research, such as some of the techniques noted in the slide below.

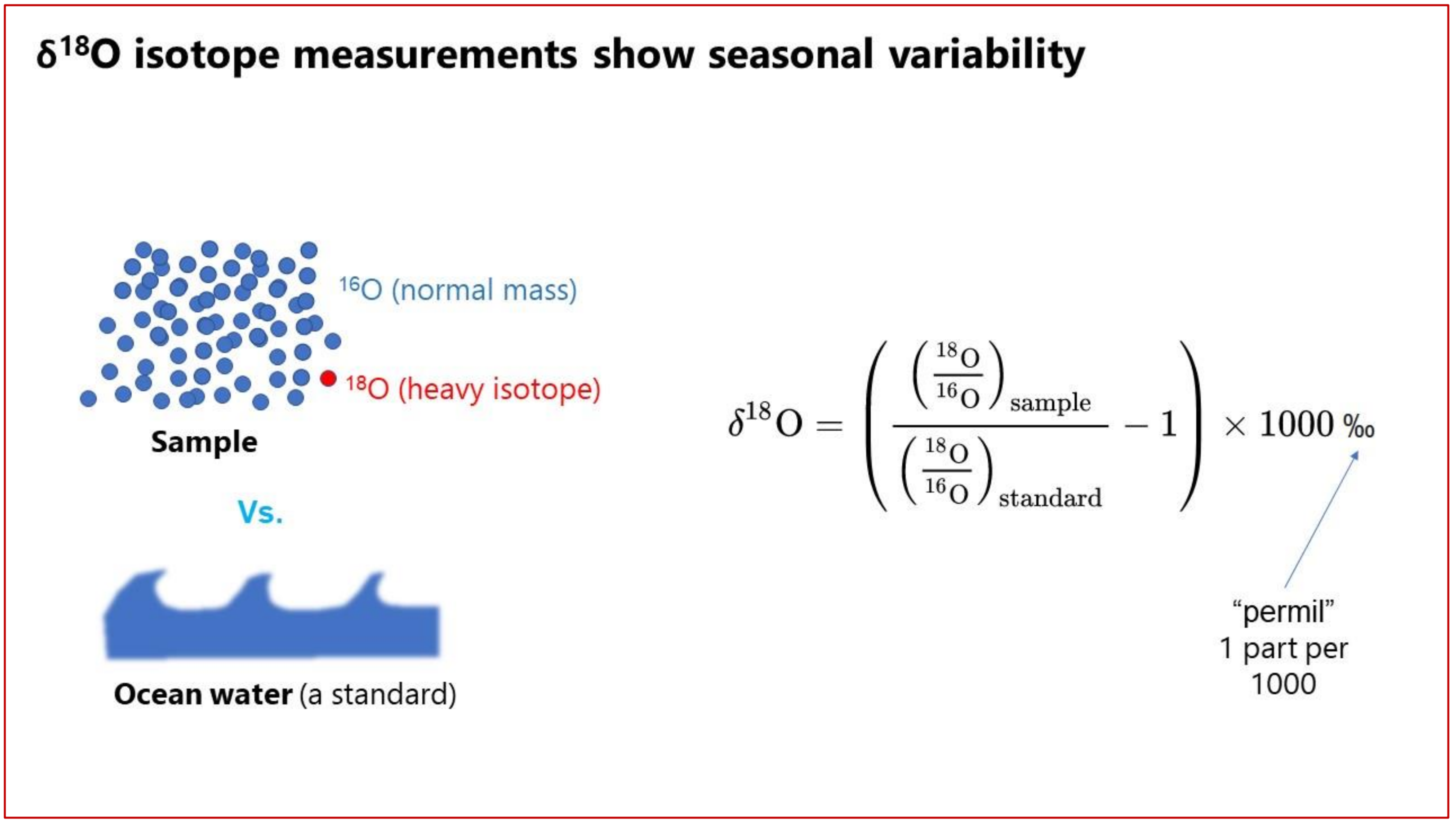


In particular, she described how using these instruments may help to resolve a number of questions concerning the production of biominerals, such as nacre in mollusks, and how this biomineralization depends on environmental variables such as temperature and climate changes.

For example, farmers of cultured pearls always harvest the pearls from mollusks after the summer heat has passed -- usually late September or later when the water is colder. The reason, farmers say, is because that is the best time for obtaining pearls with the highest amount of luster. But why is that the case?

Gabriela and her colleagues examined data from decades of harvested pearl farming information and discovered important variables. **She noted that much like tree rings, which are thicker in summer and thinner in winter, nacre production also slows down in cooler water, producing thinner layers of mother of pearl.**

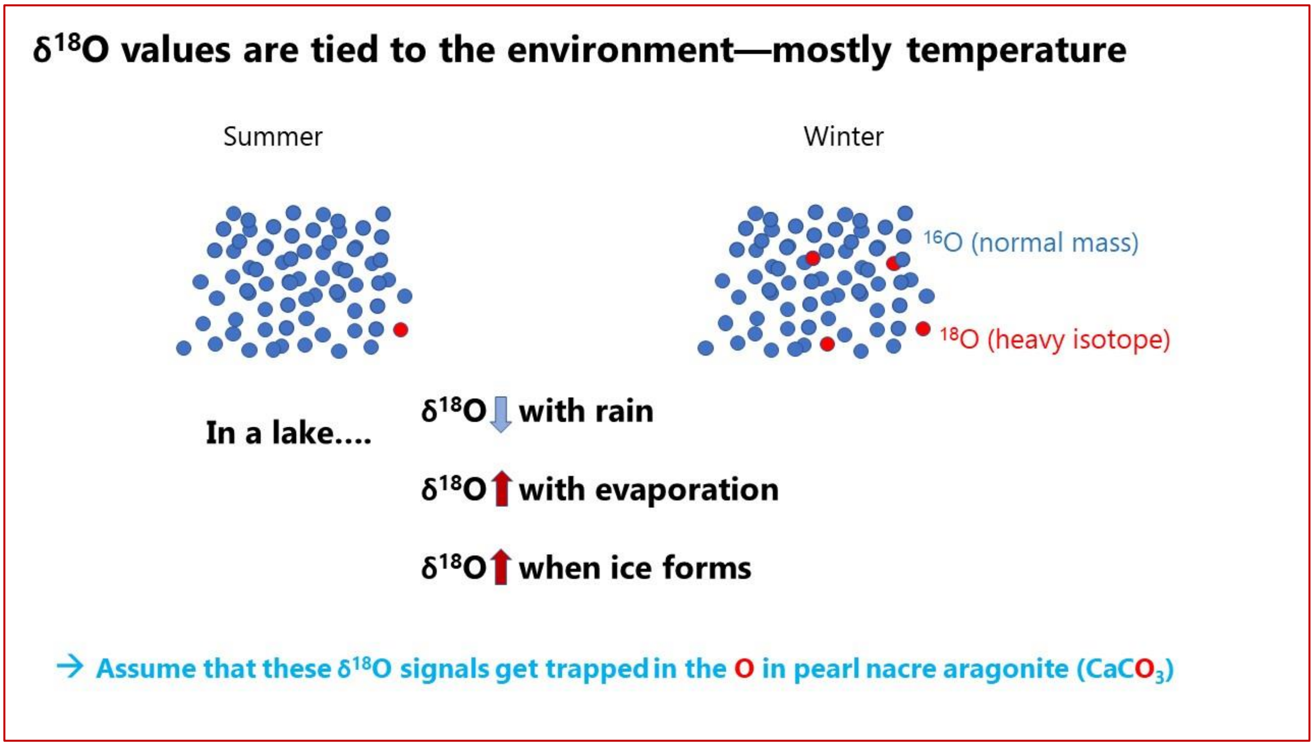
The change in seasons was similarly found to be associated with how much heavy (^{18}O) and light (^{16}O) oxygen was absorbed in the pearls' mineral chemistry. As a result, the seasonal variations helped Gabriela identify the pearls' growth history and also helps scientists predict the future impact of climate changes on aquatic shell species. Of the six instruments noted above, it was the SIMS, or **Secondary Ion Mass Spectrometry** tool, which helped unlock the question concerning the heavy oxygen isotope and opened the door to weightier issues concerning longer term changes in the environment.



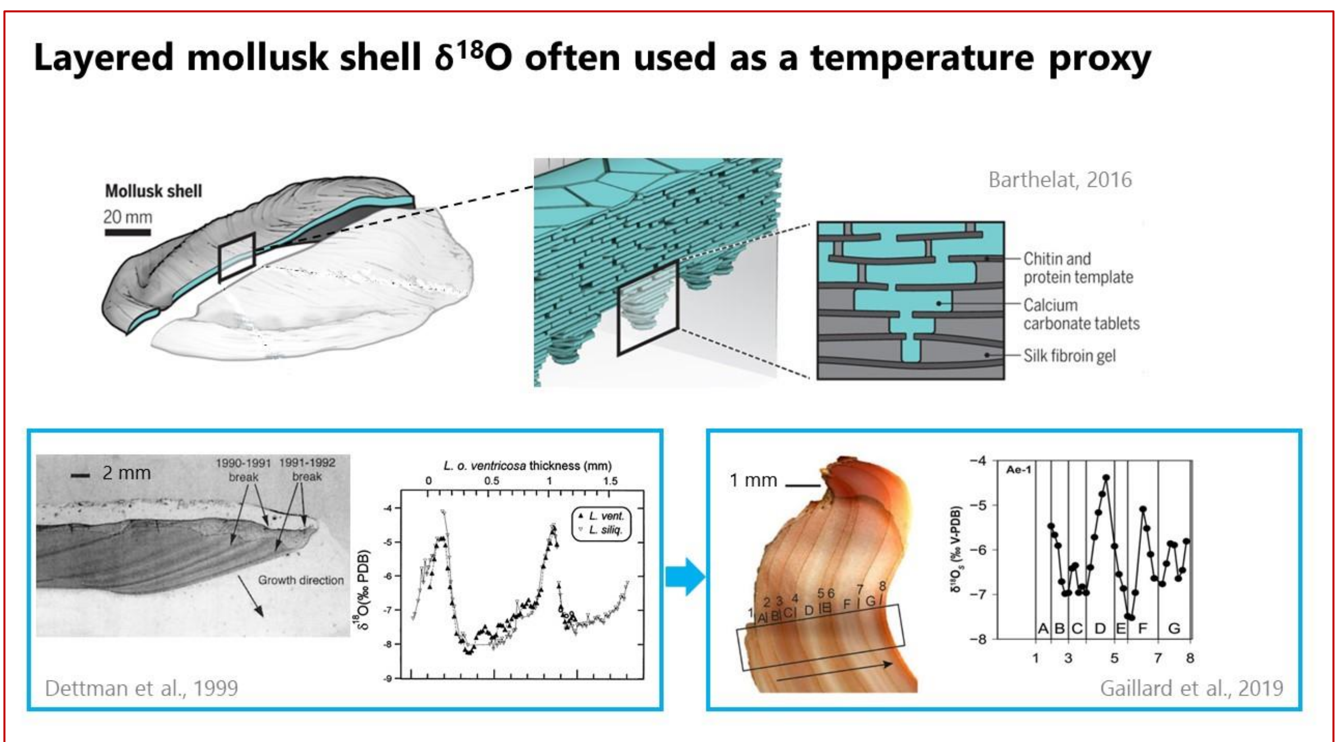
Gabriella explained that the Secondary Ion Mass Spectrometry instrument works by bombarding the surface of the mollusk or pearl with a "primary" stream of **"Ions"** which blow off tiny amounts of the calcium carbonate that become the **"Secondary"** stream. That second stream contained a diversity of oxygen atoms, mostly of the average atomic weight of 16, and a very tiny portion of the heavy isotope oxygen having an atomic weight of 18. That scattered beam of charged oxygen atoms and ions, when passed through a magnet, separated the two based on their different **"Mass,"** the lighter ^{16}O from the heavier ^{18}O.

Gabriela did not say the ^{18}O caused the greater luster of fall- or winter-harvested pearls. Rather, like the thinner trunk rings which trees produce in the winter, pearls harvested in the early fall similarly have produced thinner layers of nacre which allow light to bounce off the thinner layers and produce the greater luster of the mother of pearl.

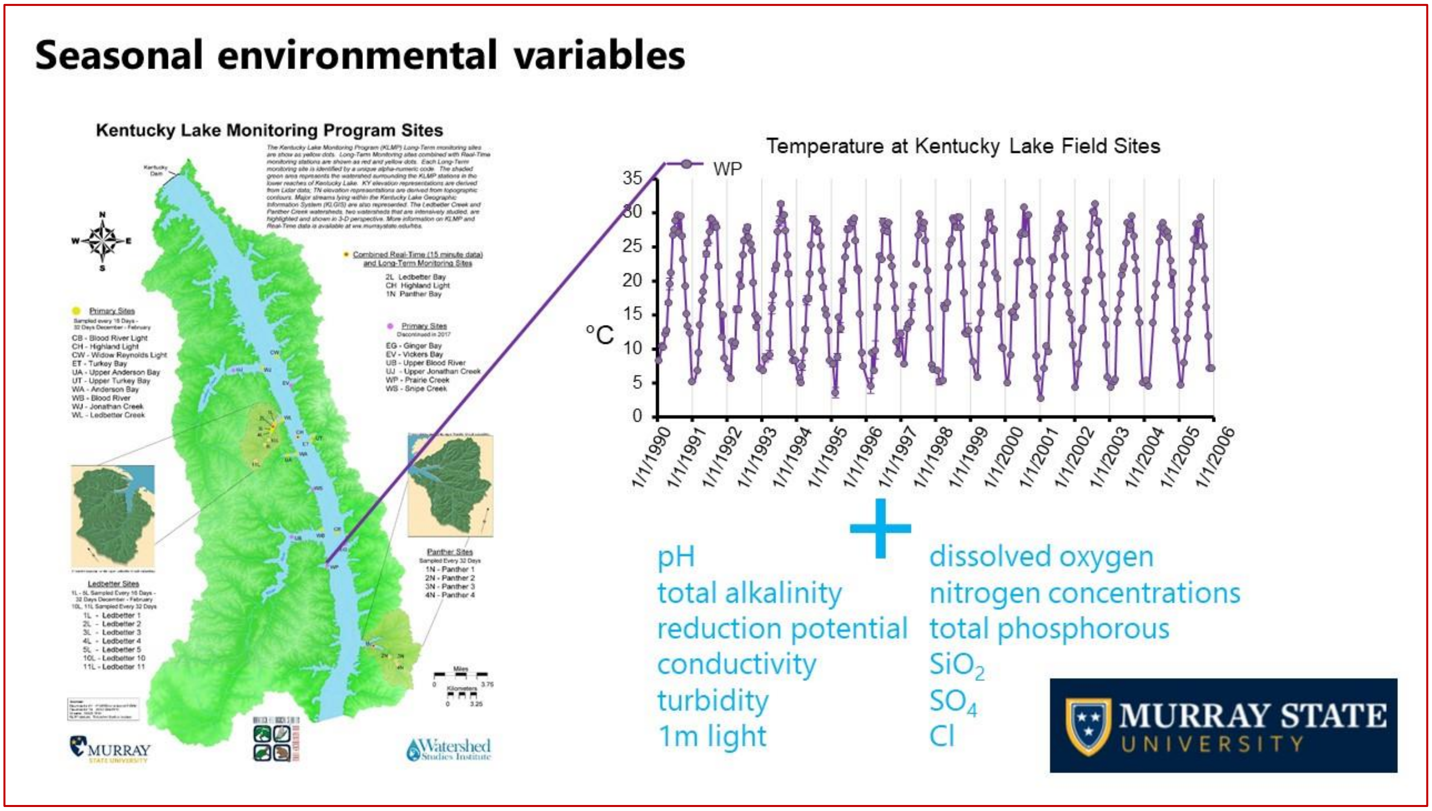
In the hotter summer months, with its greater evaporation and less rainfall, lakes and bays contain fewer of the heavier isotopes of oxygen. But with the transition to cooler fall weather and greater rain, the heavier ^{18}O is more present in the water. By using the Smithsonian's "tool kit" of instruments, as well as instruments elsewhere, Gabriela and her colleagues can capture various types of spectrographs, or pictures, of biomineral production.



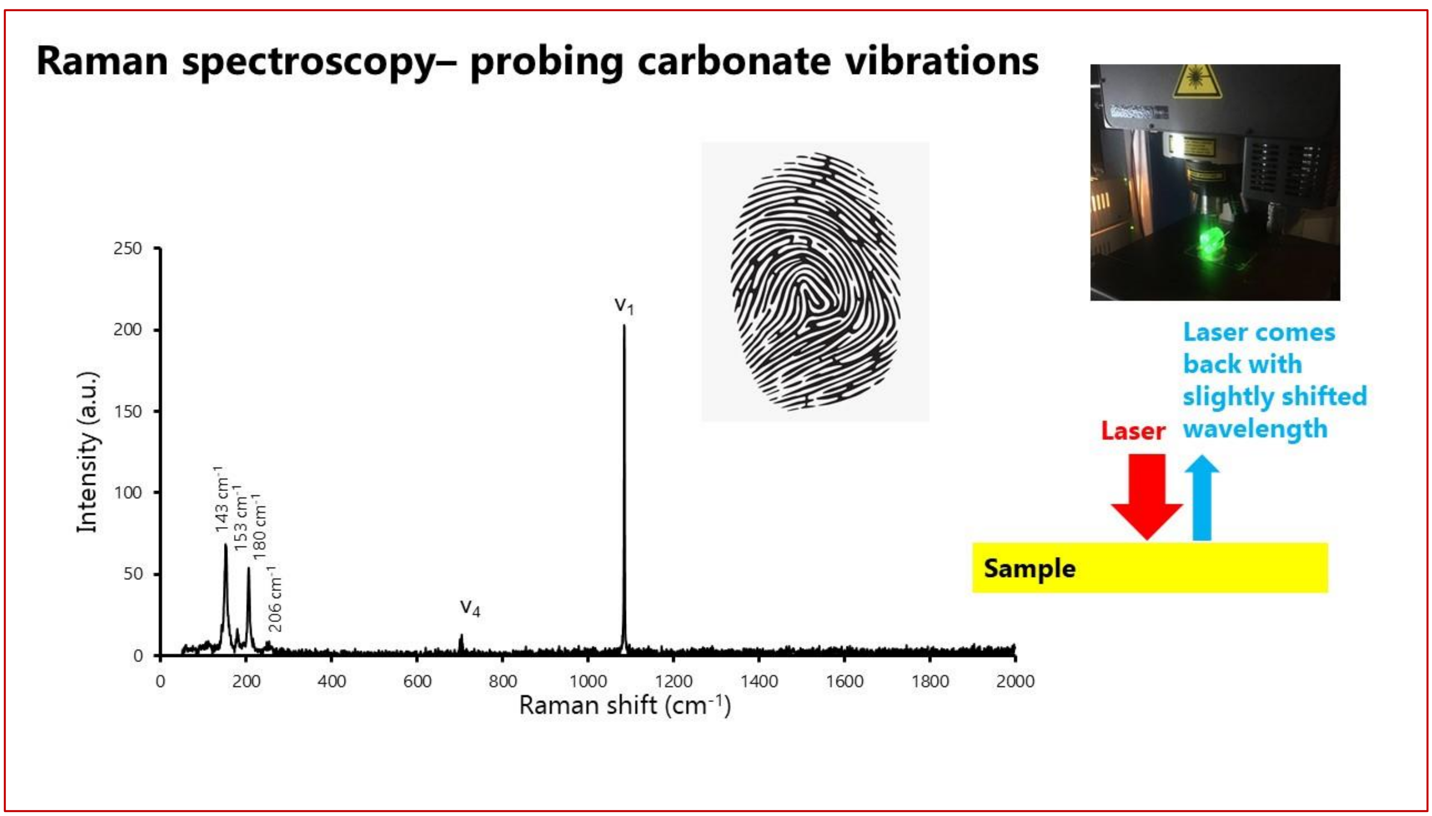
Without going into the technicalities of how the various instruments of the tool kit work, she said they all provide important and different types of information, as do the simple concentric rings of tree trunks. **By identifying the shell structures of the biominerals, scientists can read the shells' formation history of strong and weak years of growth.** That information also allows scientists to make projections about future changes that can be expected in view of the earth's changing environment. Simply put, the relative amount of ^{18}O in a pearl's layers provides a clear indication of the temperature and season during which those layers were formed.



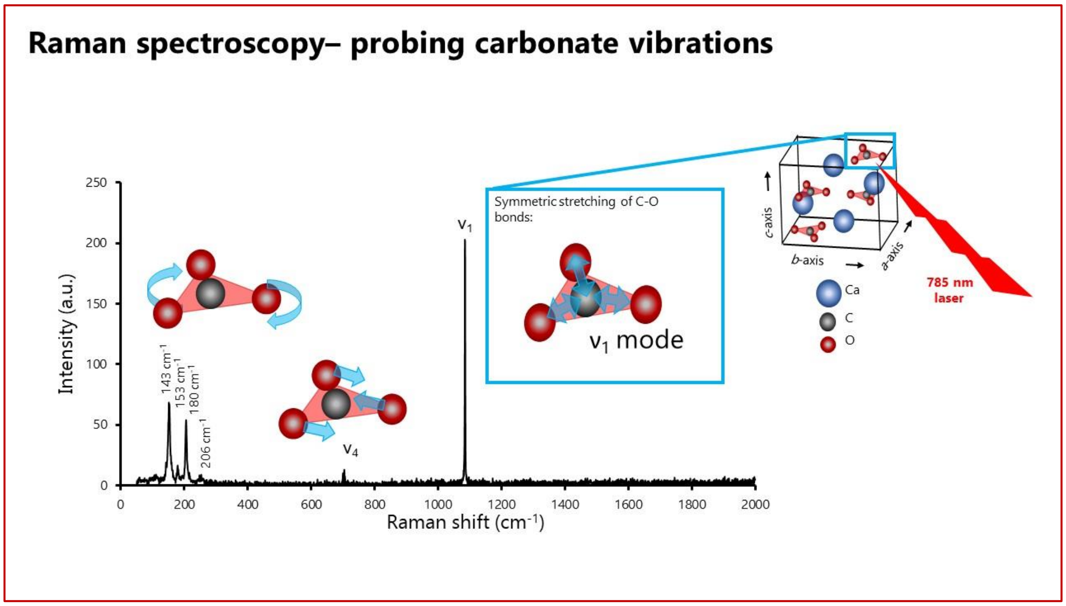
Gabriela's research also drew on data from the pearl industry at Kentucky Lake, Tennessee. She tapped into an extensive multi-decade data bank describing the physical and chemical characteristics of the water of Kentucky Lake. The Murray State University lake monitoring project provided her with data she could compare with her own findings concerning how pearl growth was associated with variables such as temperature and water quality.



Gabriella briefly referenced use of another one of the above six mineralogy/geochemistry tool kits, namely the Raman spectroscopy laser instrument. Like the above-described SIMS tool, the Raman tool bombards the aragonite, but uses various intensities of laser rather than using a stream of ions.



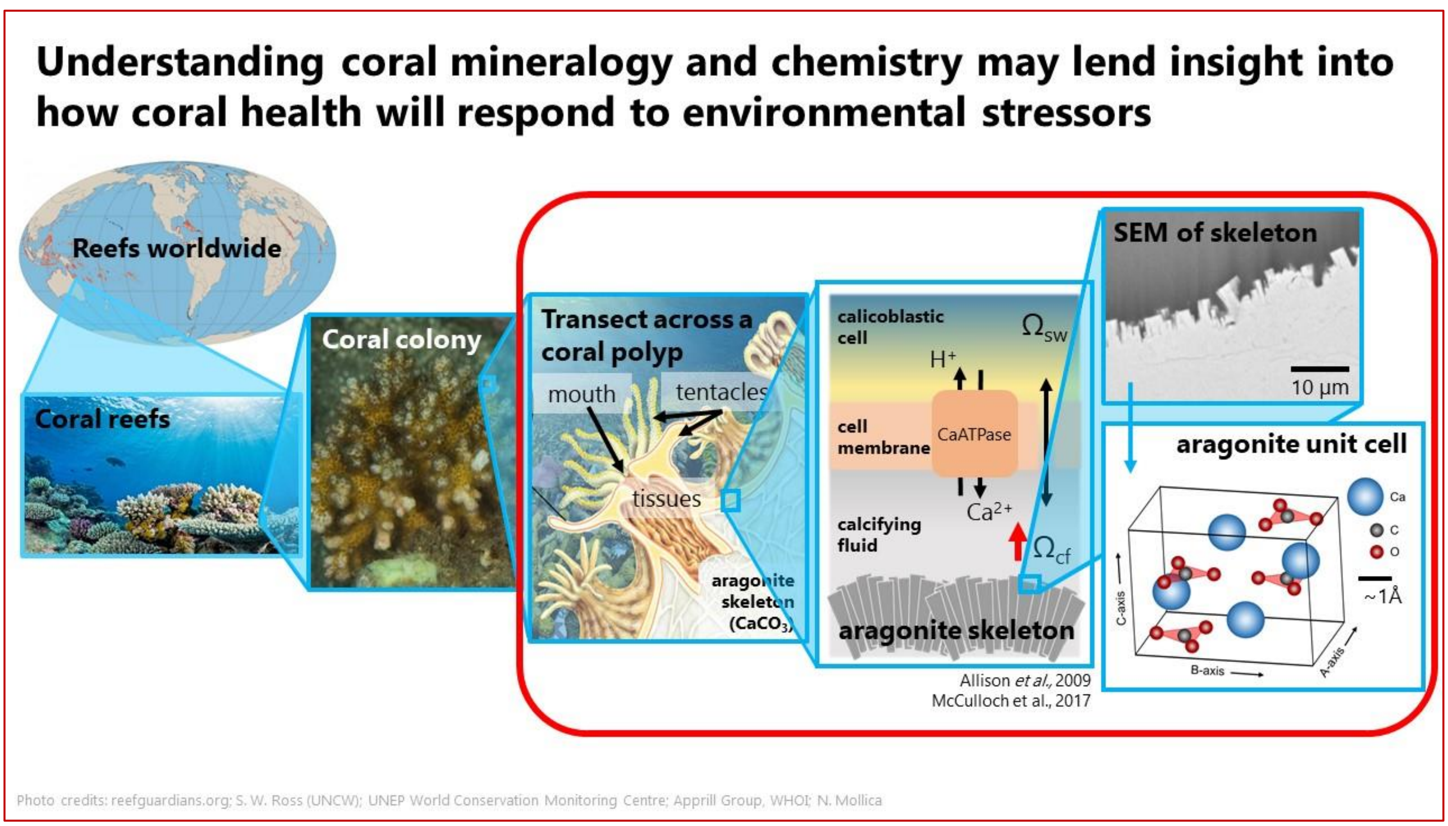
The researchers then capture pictures and create charts, such as the one above and below, showing how the layers of calcium carbonate vibrate and calcium carbonate molecules shift in response to the laser bombardment. The Raman instrument detects tiny shifts in the carbonate vibrations and using that data creates another "fingerprint" which tells scientists more about the structure of the aragonite crystals.



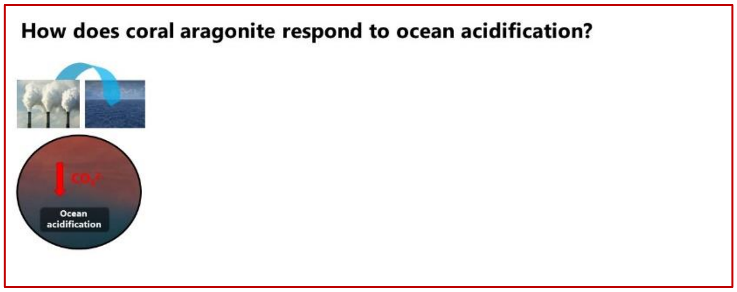
Gabriela worked with the Raman vibration shifts and what they disclose about the structure of the calcium carbonate in mollusks and pearls. She noted that her findings will probably be ready and available for publication in about a year.

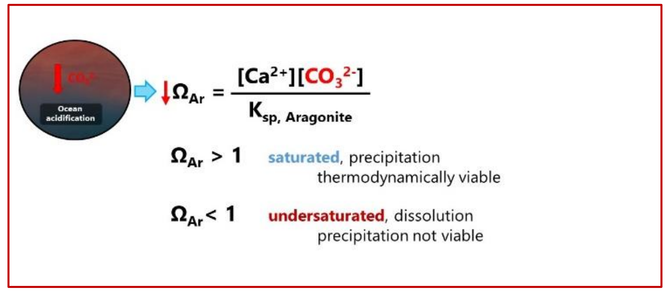
Key Conclusions

One big payoff for the above findings is that they document and provide insight into how changes taking place in the earth's environment adversely affect coral and other aquatic life forms. Their survival depends on our oceans and lakes having low levels of acidity which enable them to produce biominerals which, in turn, allows them to build strong calcium carbonate structures. The collage below encapsulates this big-picture question of how coral will react in the face of increased stress from the environment.



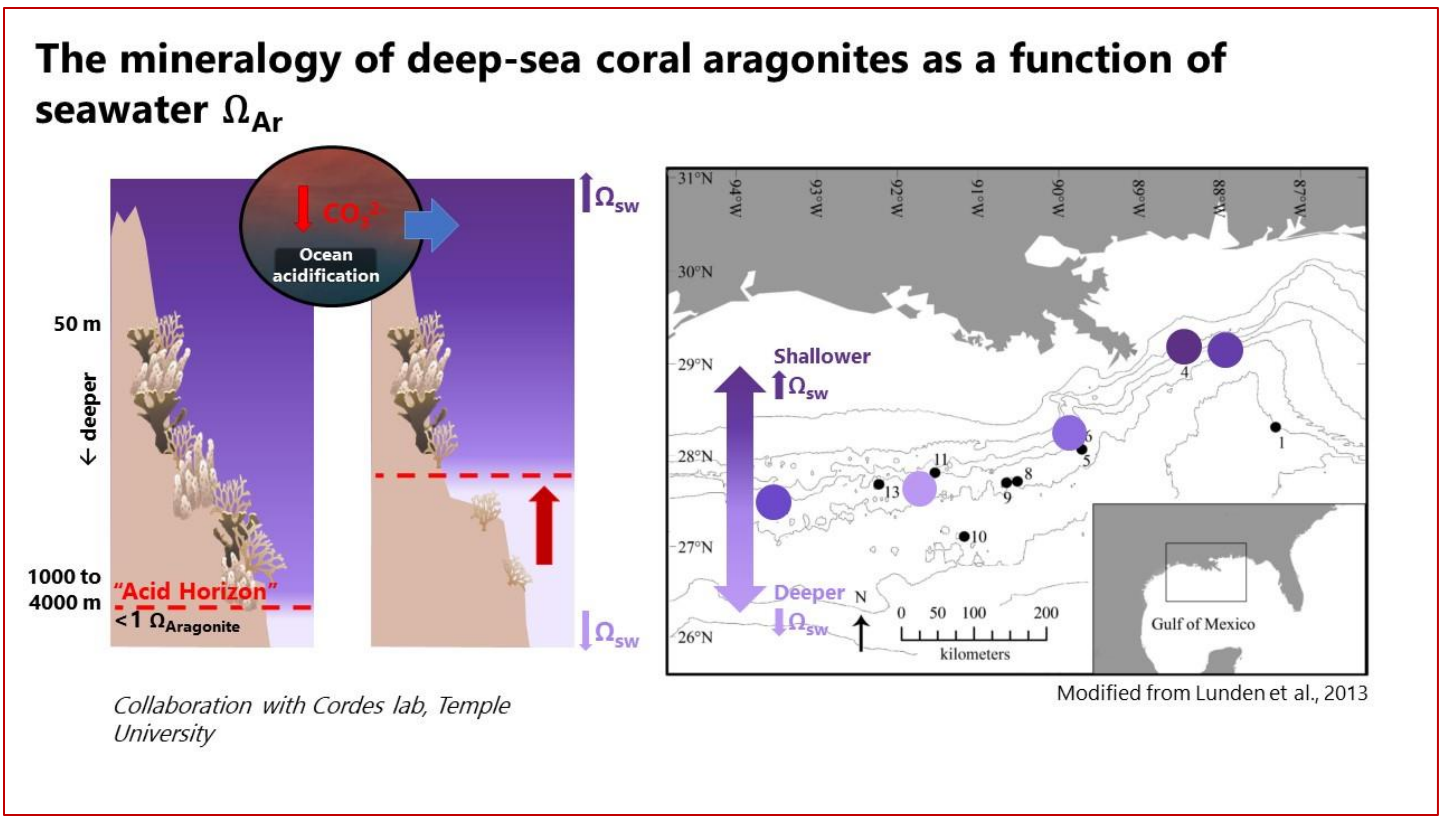
Gabriela said that coral is of major interest in part because it supports 25% of all marine life, including various species of fish. As oceans become more acidic, coral species, with their calcium carbonate structure, will be weakened and need to adapt. **Specifically, the more the ocean absorbs the atmosphere's carbon dioxide, the greater the acidification and the more damage is done to the coral structures.**





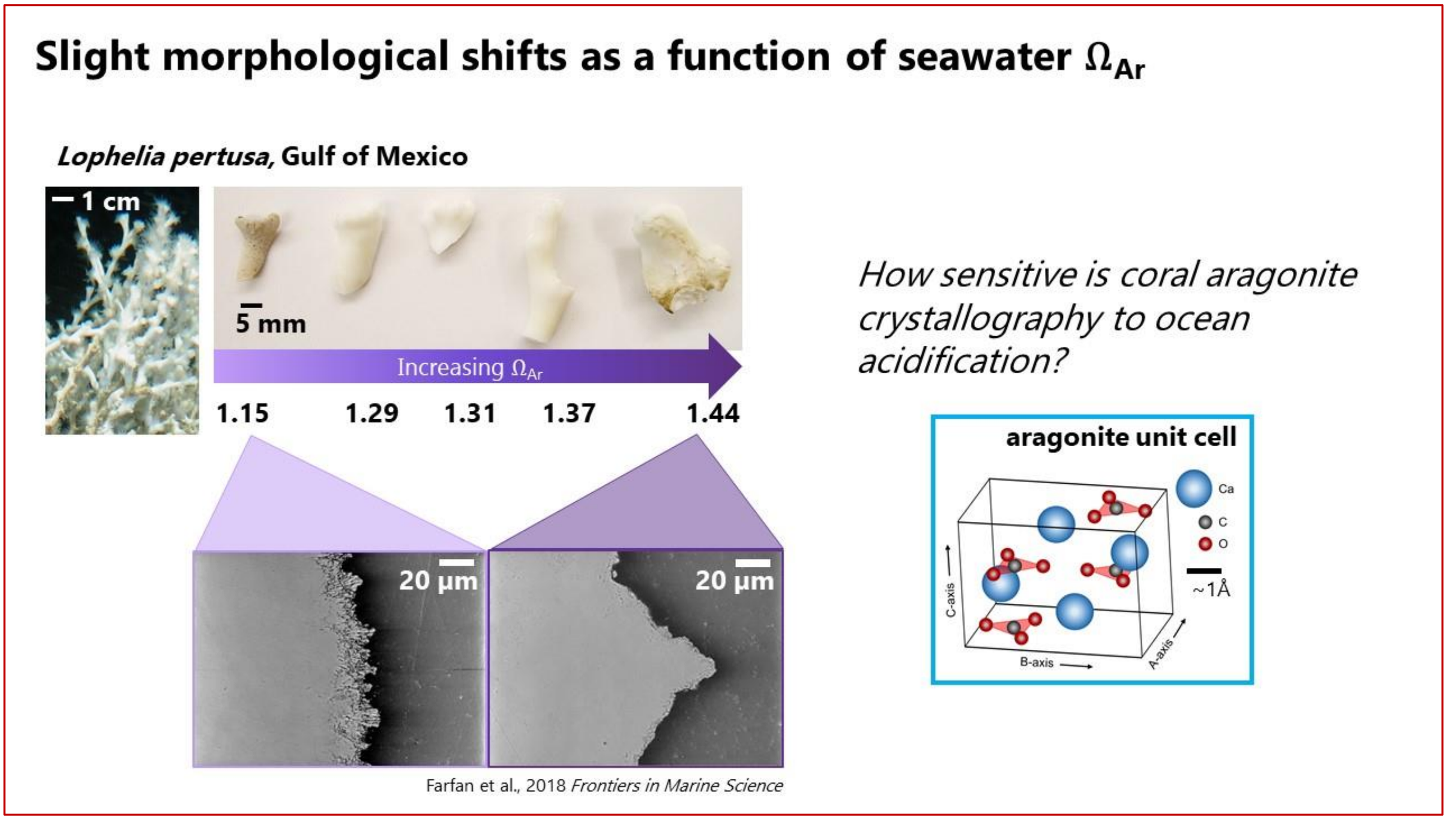
Scientists use the above mathematical equation to describe this problem of increased acidification of ocean and fresh water. They describe the carbon dioxide saturation levels in the water (i.e., the acidification of the water), by the Greek letter Omega. The Ar subscript represents the aragonite crystals in the coral or other forms of aquatic shell life. When the Omega aragonite is undersaturated (i.e., has a value that is less than 1), then that lifeform will have difficulty generating calcium carbonite and the species will have difficulty surviving.

As indicated in the graphic below, there is a certain level within the overly acidic water, the "acid horizon," represented by the dotted red line, below which coral life typically dies.

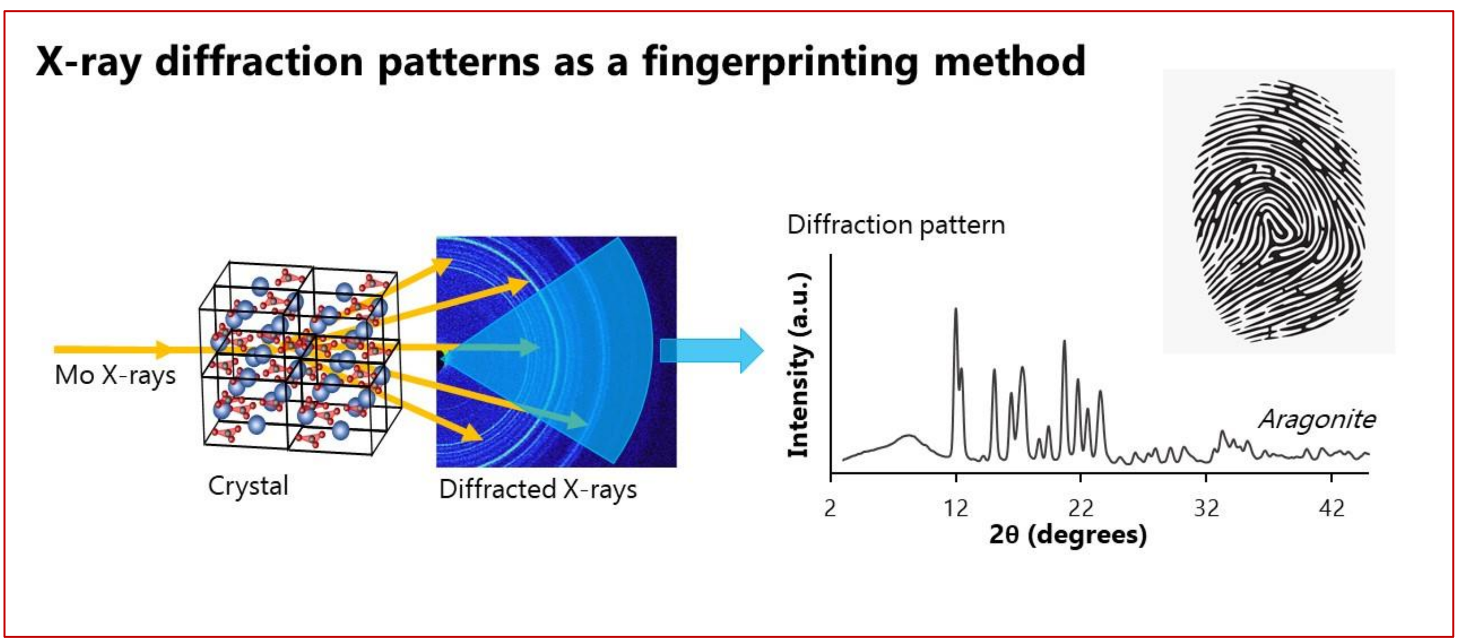


Working with her colleagues at Temple University, Gabriela confirmed that the effect of the acidification of the water depends on at what depth beneath the surface the coral roots. The deeper the coral attempts to grow within the acidic water, the more concentrated is that acid and it becomes more difficult for the coral to survive.

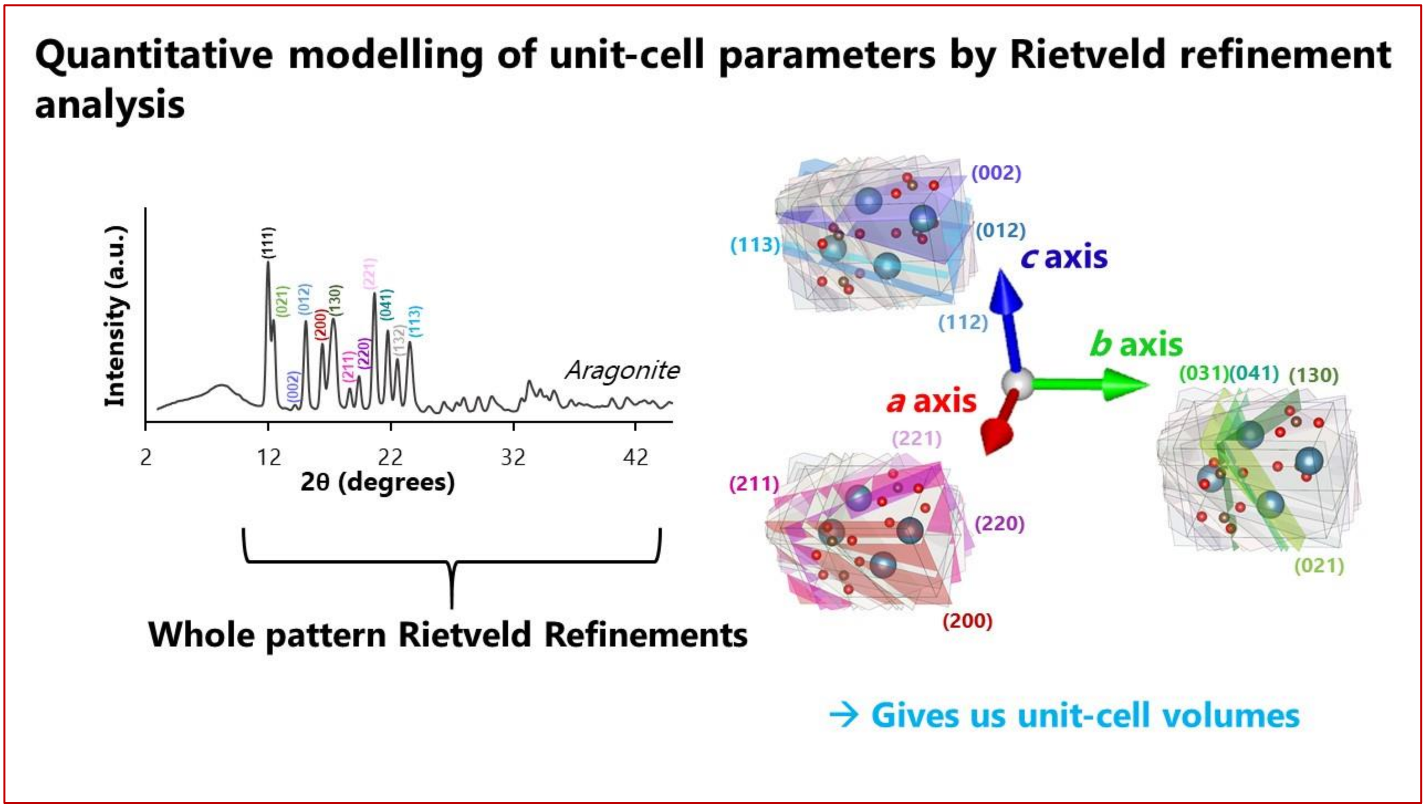
In 2018, Gabriela published a report and provided microscopic evidence, pictured below on the left, that the acidification of the water ate away the edges of the coral. That provided clear evidence that the coral was sensitive to the acidification level of the water.



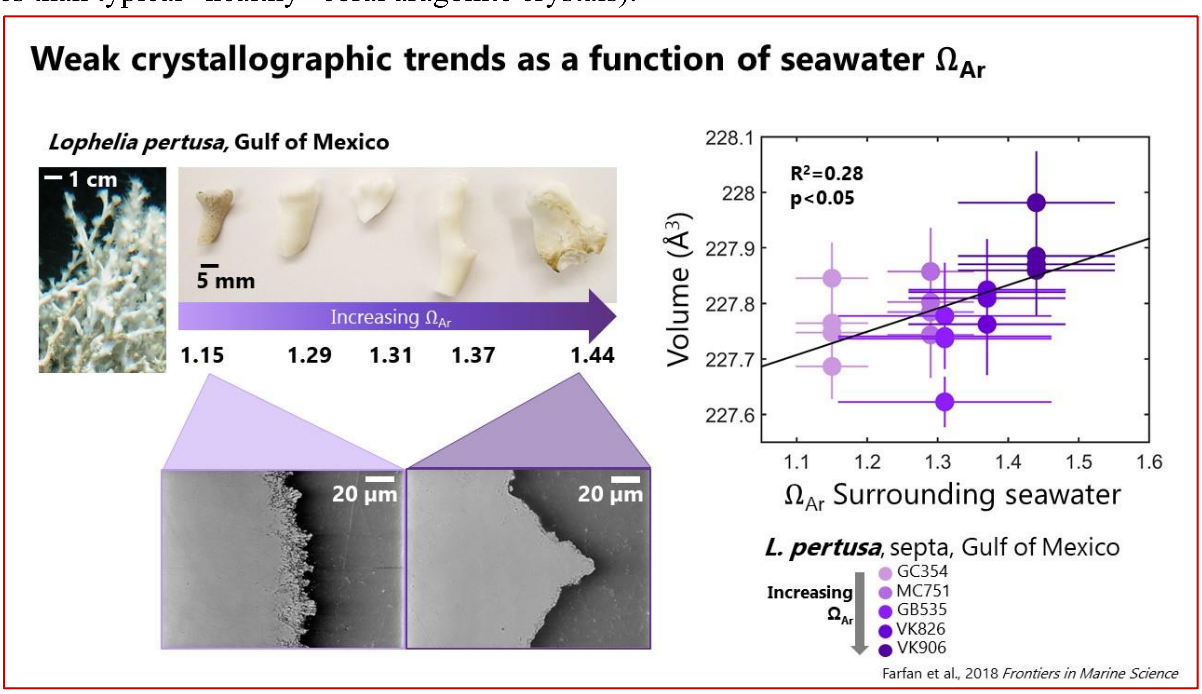
To probe the changes in the crystal structure of the coral aragonite under different ocean acidification conditions, Gabriela used a classical mineralogy technique: X-ray diffraction (XRD). XRD works by shining X-rays through a mineral sample and seeing how the arrangement of the atoms in that mineral diffracts the X-rays along different crystallographic planes. The result is an XRD pattern which, like Raman spectroscopy, can be used as a unique fingerprint to identify a mineral species.



Another more refined use of X-ray spectroscopy, the Rietveld technique, provided yet another interesting insight. By using that instrument with powdered aragonite, researchers can use findings about the geometry of the different crystallographic planes within the mineral structure to calculate and determine the volume of the crystal structures themselves. This is fascinating because under certain conditions in nature, the volumes of the aragonite crystal cells increase and foreign materials become trapped within the cell structure. That discovery, in turn, opens up new avenues of enquiry.



The final slide in Gabriela's presentation (below) shares her finding, published in *Frontiers of Marine Science* (2018), documenting that as the acidification of the sea water increases (lower Omega), the volume of the aragonite cells also decreases. This could be due to the coral having difficulty growing a skeleton and the resulting aragonite crystals forming more slowly and thus creating more perfect crystals (with potentially different properties than typical "healthy" coral aragonite crystals).



Future work will need to be done to see how these changes in the crystal structure of coral aragonite ultimately translate into the health of coral skeletons (e.g., hardness, solubility). In summary, these kinds of studies are just the beginning when it comes to bridging the gap between mineralogy/crystallography and environmental science.

Conclusion

President David Hennessey thanked Gabriela for her wonderful presentation and its clear marshalling of scientific findings. The Zoom audience applauded with clapping hands in the gallery view and a host of follow-up questions for Gabriela. In part, they included inquiries about what Gabriela expects the Mars rover Perseverance will find in terms of carbons and silicas. She noted that opals are composed of up to 20% water. If **opals** are found, they would be a proxy for water**.**

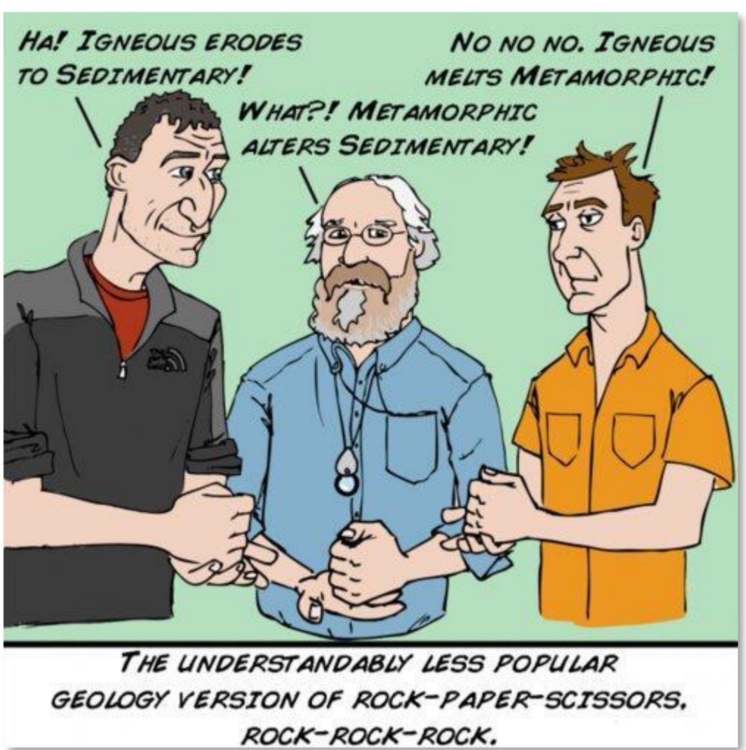
Mineral Show and Tell

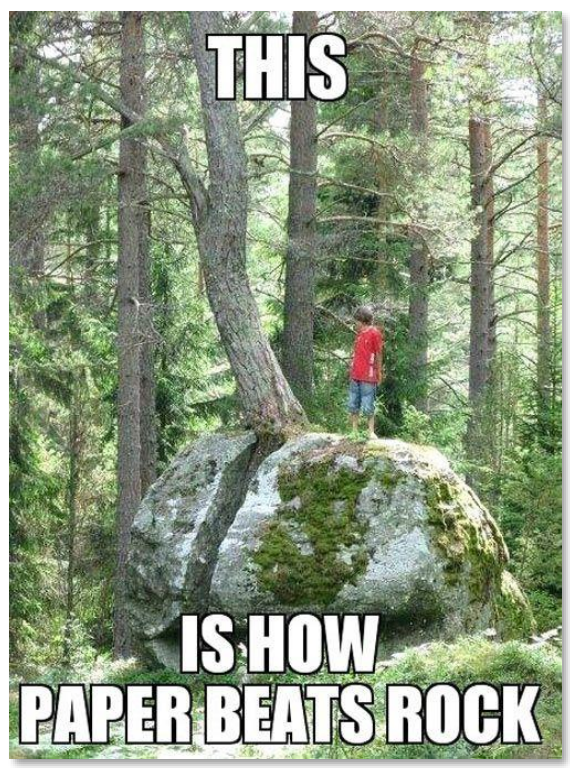
Dave then invited attendees to show photos of, or actual minerals they brought to the meeting and wanted to show their fellow attendees. That led to:

- stories and showing specimens of Lake Michigan limestones
- the famous mineral U.S. postage stamps
- a collected clam shells from Ruck's Pit, Florida (put a U.V. light on it)
- abalone collected from the California surf and gifted to a spouse on a honeymoon
- a question about the source of the iridescence of mother of pearl being similar to that of ammolite, an opal-like gemstone made from the fossilized shells of ammonites and composed of multiple tiny aragonite crystal layers reflecting the light and colors.

With no other mineral specimens to show, Dave thanked those who shared and again thanked Gabriela for her excellent presentation. He thanked everyone for attending and participating in the meeting and wished everyone a "Good Night" and safe travels home.

Humor Section





MSDC Club Information

Due to COVID-19, our meetings will be virtual over Zoom. No in-person meetings are planned until further notice. In non-COVID times, meetings are the First Wednesday of the Month (Jan-Jun and Sep-Dec). We meet in the Constitution Avenue lobby of the Smithsonian National Museum of Natural History at 7:30 pm.

Website: http://mineralogicalsocietyofdc.org/

Facebook: www.facebook.com/Mineralogical-SocietyOfTheDistrictOfColumbia

2021 Officers and Directors

President - Dave Hennessey | davidhennessey@comcast.net

Vice President - Yury Kalish | yury.kalish@gmail.com

Secretary - Andy Thompson | thompson01@starpower.net

Treasurer - John Weidner
Mailing address for dues: 7099 Game Lord Dr, Springfield, VA 22153-1312

Directors
Ken Reynolds | kennyreynolds62@gmail.com
Dan Teich | danteichdvm@yahoo.com
Alex Venzke | alex.venzke27@gmail.com

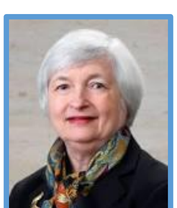
Webmasters
Betty Thompson | bdthompson01@yahoo.com
Casper Voogt | casper.voogt@gmail.com

Newsletter Editor
Ken Rock | kennethnrock@gmail.com

THE MINERAL MINUTES

NEWSLETTER OF THE MINERALOGICAL SOCIETY OF THE DISTRICT OF COLUMBIA

Mineralogical Society of DC
Time Sensitive Dated Material



I've been collecting rocks since I was 8 and have over 200 different specimens.

In my junior year, I studied geology on Saturday mornings at the Museum of Natural History. Mineralogy has always been a major interest.
-- **Janet Yellen, U.S. Secretary of the Treasury**

Useful Mineral Links

	American Federation of Mineralogical Societies (AFMS)	www.amfed.org
	Eastern Federation of Mineralogical and Lapidary Societies (EFMLS)	www.efmls.org
	MINDAT	www.mindat.org
	Micromineralogists of the National Capital Area	www.dcmicrominerals.org
	Mineralogical Society of America (MSA)	www.minoscam.org
	Friends of Mineralogy	www.friendsofmineralogy.org
	WebMineral	www.webmineral.com
	The Geological Society of America (GSA)	www.geosociety.org
	Jeff Scovil Mineral Photography (not advertising - just great photos)	www.scovilphotography.com
	United States Geological Survey (USGS)	www.usgs.gov
	The Geological Society of Washington (GSW)	www.gswweb.org

AFMS Code of Ethics

- I will respect both private and public property and will do no collecting on privately owned land without the owner's permission.
- I will keep informed on all laws, regulations of rules governing collecting on public lands and will observe them.
- I will to the best of my ability, ascertain the boundary lines of property on which I plan to collect.
- I will use no firearms or blasting material in collecting areas.
- I will cause no willful damage to property of any kind – fences, signs, and buildings.
- I will leave all gates as found.
- I will build fires in designated or safe places only and will be certain they are completely extinguished before leaving the area.
- I will discard no burning material – matches, cigarettes, etc.
- I will fill all excavation holes which may be dangerous to livestock. [Editor's Note/ Observation: I would also include wildlife as well as livestock.]
- I will not contaminate wells, creeks, or other water supply.
- I will cause no willful damage to collecting material and will take home only what I can reasonably use.
- I will practice conservation and undertake to utilize fully and well the materials I have collected and will recycle my surplus for the pleasure and benefit of others.
- I will support the rockhound project H.E.L.P. (Help Eliminate Litter Please) and will leave all collecting areas devoid of litter, regardless of how found.
- I will cooperate with field trip leaders and the se in designated authority in all collecting areas.
- I will report to my club or Federation officers, Bureau of Land Management or other authorities, any deposit of petrified wood or other materials on public lands which should be protected for the enjoyment of future generations for public educational and scientific purposes.
- I will appreciate and protect our heritage of natural resources.
- I will observe the "Golden Rule", will use "Good Outdoor Manners" and will at all times conduct myself in a manner which will add to the stature and public "image" of rockhounds everywhere.

Membership Application or Renewal
The Mineralogical Society of the District of Columbia (MSDC)

(____) Family – $25.00 per year. One address.

(____) Individual – $20.00 per year.

(____) New *

(____) Renewal dues are for year__________*

For new members who join in the last months of the year, membership will extend through the following year with no additional dues.

ANNUAL DUES – PLEASE PAY YOUR DUES PROMPTLY

Pay at next in-person meeting or mail to:

Mineralogical Society of DC
c/o John Weidner
7099 Game Lord Drive
Springfield, VA 22153-1312

Name(s) (First and Last) ____

Address____

City______________________________________State_________________Zip:___________________

Phone(s): Home/Work/Mobile____

Email(s):____

OK TO INCLUDE YOU ON CLUB MEMBERSHIP LIST?

(   ) Yes – Include name, address, phone, email.

If you want any information omitted from the membership list, please note:

Omit my: ( ) Email; ( ) Home phone; ( ) Work phone; ( ) Mobile phone; ( ) Address; ( ) Name

SPECIAL CLUB-RELATED INTERESTS? ____

Meeting Dates, Time, and Location: The first Wednesday of each month; no meeting in July or August.

(**Due to COVID-19, our meetings will be virtual over Zoom. No in-person meetings are planned until further notice.** Normally, the MSDC meetings take place at the National Museum of Natural History, Smithsonian Institution, 10th Street and Constitution Ave, Washington DC. We usually gather at the Constitution Avenue entrance at 7:30 pm to meet our guard who escorts us to the Cathy Kerby Room.)