

Bulletin of the Mineralogical Society of Southern California

Volume 95 Number 1 – January, 2022

The 997th meeting of the Mineralogical Society of Southern California

With Knowledge Comes Appreciation

A ZOOM Meeting

January 14th, 2022 at 7:30 P.M.

Program : Tucson! Thirty Years of Glitter

Presented by: Denise Nelson

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Remember: If you change your email or street address, you must let the MSSC Editor and Membership Chair know or we cannot guarantee receipt of future Bulletins

About the Program: Tucson! Thirty Years of Glitter Presented by: Denise Nelson

Denise Nelson of Inner Circle will take us a virtual tour of some of **TUCSON! 30 Years Of Glitter**, fun, friends, amazing minerals and gems packed into one hour of pictures, stories and adventures! Sparkling memories and history of a place unlike any other on earth.

Denise is a Graduate Gemologist (GIA), Appraiser, and occasional Gem hunter. She started her own business, Inner Circle, a Fine Jewelry and Appraisal provider, over 23 years ago in Maryland. Her travels to mines and trade-shows have taken her to many different Countries like Brazil, Thailand, Malaysia, Japan, China, Germany, France and Argentina. This combination of gemology and genealogy is a perfect topic for Denise Nelson, who has taught genealogy and spent many years researching and studying the history of gems and jewelry. An appraiser, consultant and owner of INNER CIRCLE Fine Jewelry and Appraisal Services, Nelson has revealed many interesting facts to her clients in her 30 years in the jewelry business. She's traveled to 38 countries to research historical jewelry, visit mining areas, and buy gemstones, pearls, and jewelry for her customers. Nelson also designs jewelry and is a wholesaler to a number of jewelry stores. She is a member of the National Association of Jewelry Appraisers (NAJA).



How to Join our ZOOM Meetings by Rudy Lopez

MSSC members are automatically included in the invite list each month.

Non-Members must request to attend MSSC zoom meeting each month.

Please go to the MSSC website, <http://www.mineralsocal.org> to read our Bulletin for upcoming programs, then send Rudy Lopez an email, no later than the Tuesday before the meeting, to programs@mineralsocal.org and he will make sure you're contacted.

From the Editor: Linda Elsnau

Happy New Year to each and every one of you. For MSSC, this will be a milestone year, MSSC will host our 1,000th meeting in April, 2022! In case you are counting, that's over 83 years of meetings. Since I wasn't around back then, I don't know the date of the first meeting, we can assume it was during the 1930s! That makes MSSC one of the oldest, if not THE oldest mineral club in the country. There is a request for your help with gathering memories of MSSC's past to help plan our upcoming meeting number 1,000. Contact Angie with anything you have that may be helpful. (Article on page 9)

This starts my 10th year as your Bulletin Editor. Never thought I'd last that long! It's time I restate my request for your help with the Bulletin. I need interesting articles to put IN the Bulletin. I know our membership is made up of intelligent and literate people. Can I borrow your head for an article or picture you think would be on interest to our membership? We don't get together face-to-face these days so it harder to get to know each other better. How about a short article about why you are interested in minerals or why you joined MSSC or just who you are and what else you are interested in would be interesting to your fellow members. Other ideas include your favorite mineral and why it is or how about sharing a favorite mineral related memory, a field trip that was special to you or a mineral show or visit to a good mineral display at a museum that you enjoyed.

I you feel you need help writing a piece, let me know – it can be as short as a paragraph or several pages long.

FROM THE PRESIDENT: Interesting Minerals, A to Z. Round 2, installment 22, the letter "V": by George Rossman

Vivianite: $\text{Fe}^{2+}_3(\text{PO}_4)_2 \cdot 8\text{H}_2\text{O}$



Vivianite is an interesting iron phosphate mineral that was first described from a discovery at Wheal Kind, in St Agnes, Cornwall, England, UK. Its name was given by Abraham Gottlob Werner in 1817 in honor of John Henry Vivian (1785-1855) who was an English politician, mine owner, and mineralogist who lived in Truro, Cornwall, England. Why name it after Vivian? It was so named because he was the person who discovered the mineral. Here are the first few sentences of the original article describing vivianite:

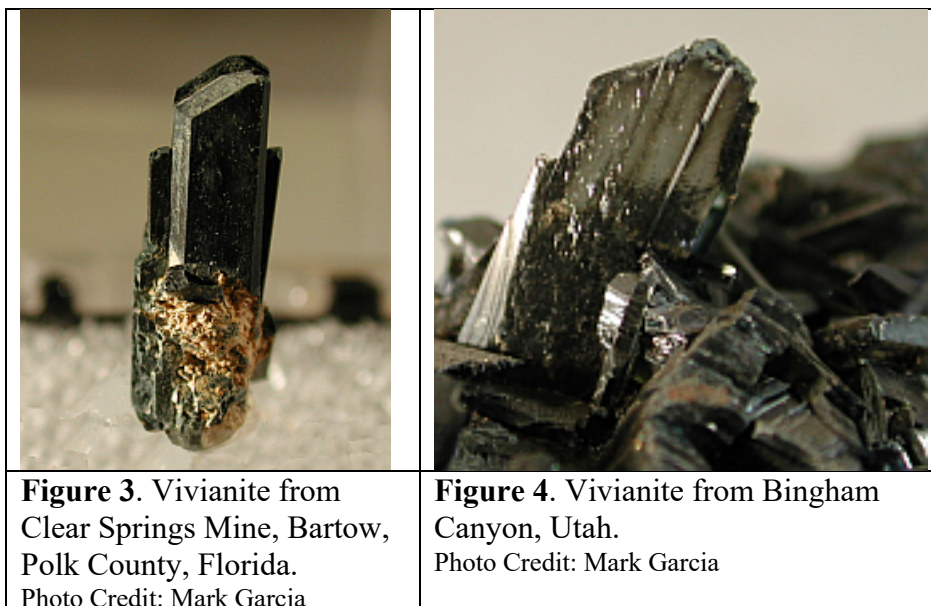
35) Vivianit.
Von dem Vivianit habe ich folgende Charakteristik
entnommen :
Von Farbe lauchgrün, nach den Enden und schärfern
Seitenkanten des Krystals hin fällt er ins himmelblaue.
Die äussere Gestalt ist eine lose schilfartige Säule,
die eingewachsen gewesen zu seyn scheint und
stark in die Länge gestreift ist, so daß sich die Lage
der Seitenflächen nicht näher bestimmen läßt.

Werner A G (1817) Vivianit. Section 35 in: Letztes Mineral-System. Freiberg und Wien, 41-42

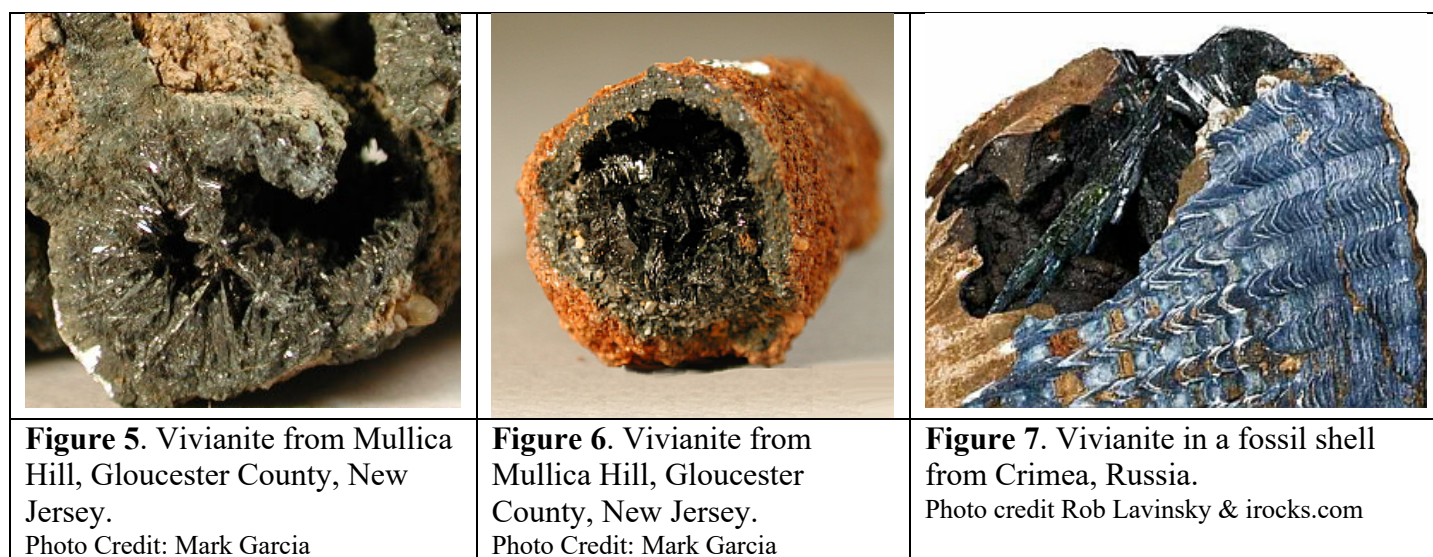
Where does vivianite occur? Vivianite is a secondary mineral that can be found in a number of different geologic environments: It is found in the oxidation zone of metal ore deposits, particularly associated with gossan. It is found in granite pegmatites that containing phosphate minerals. It has been found with clays and glauconite, the greenish clay mineral of the illite group that is usually found in marine sand in sediments. Vivianite also occurs in recent alluvial deposits where it replaces organic material such as peat, lignite, bog iron ores and forest soils.

Vivianite can occur in fine crystals. It is usually a dark blue to black mineral when thick. Nice examples are presented in **Figures 1-4**.

	
<p>Figure 1. Vivianite from Colquechaca, Potosi, Bolivia. Photo Credit: Mark Garcia</p>	<p>Figure 2. Vivianite crystal from Huanuni, Oruro, Bolivia. Photo Credit: Mark Garcia</p>



Examples of vivianite that forms from organic material are found at Mullica Hill, NJ, where it replaces belemnite fossils (**Figures 5-6**). Another famous locality for vivianite is the Kerch Peninsula, Crimea, Ukraine. **Figure 7** shows a small vug filled with vivianite needles in a fossilized mollusk shell. The shell itself is partly replaced with blue vivianite.



Pure vivianite is light green due to the Fe^{2+} but it is prone to oxidize very easily. When that happens, the color changes to the usual deep blue to deep bluish green to nearly black. **Figures 8 and 9** show minimally oxidized vivianite with a greenish color. **Figure 10** shows a thin section (about 0.02 mm thick) of polycrystalline vivianite in linearly polarized light. The dark blue fragment is oriented such that the light is parallel to the crystal's *b*-axis. The colorless fragment is oriented such that light is polarized perpendicular to the *b*-axis.

To understand the blue color and its polarization behavior better we need to both look at the crystal structure of vivianite and the details of the process by which it is oxidized.



Figure 8. Transparent vivianite from Anlova near North Gaoundere, India.
Photo Credit: Mark Garcia



Figure 9. Transparent vivianite from Bolivia.
Photo Credit: Mark Garcia

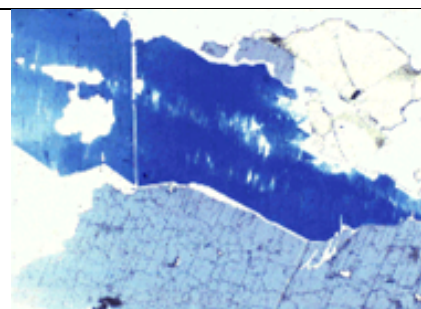


Figure 10. A thin section of polycrystalline vivianite in linearly polarized light.
Photo credit: GRR

Vivianite's crystal structure was determined in 1950 by Mori and Ito. The important part of the structure that allows vivianite to attain the vivid blue color is the pair of adjacent octahedral sites containing iron (**Figure 11**).

Mori H, Ito T (1950) The structure of vivianite and symplecite. *Acta Crystallographica* 3, 1-6

The important thing to note is that the clusters of two Fe^{2+} ions are aligned parallel the crystal's b -axis. Next we need to consider what happens when vivianite is partially oxidized. The oxidation of vivianite is considered to be an internal process. When the oxidation takes place, neither oxygen nor water enters or leaves the mineral from the outside. Instead, visible light is able to dislodge a hydrogen ion out of a water molecule converting it to a hydroxide ion (OH^-). To accommodate the change in the local charge, one of the pairs of divalent iron Fe^{2+} ions loses an electron to become Fe^{3+} . That is to say, an Fe^{2+} is oxidized to Fe^{3+} to balance the local charge.

This oxidation sequence begins when visible light strikes the vivianite. It happens rapidly; often within a few minutes. When this oxidation happens, the color of the mineral changes quite dramatically. This process occurs particularly rapidly when vivianite is ground to a powder.

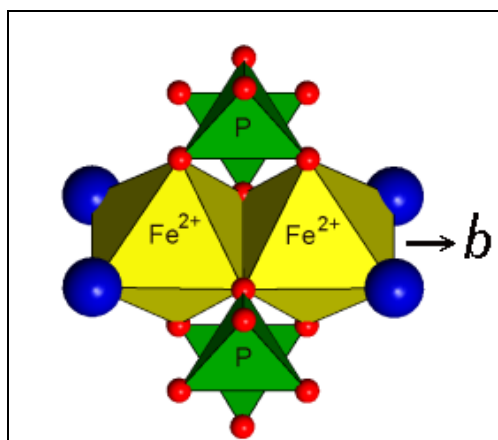


Figure 11. The structure of vivianite around the Fe^{2+} ions. Water molecules are the blue spheres.

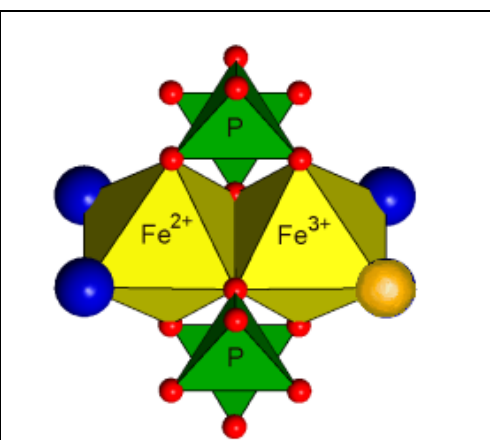


Figure 12. The structure of partially oxidized vivianite around the Fe^{2+} ions. The orange sphere is an OH^- ion.

Now let's go back to the picture of the structure, but now look at partially oxidized vivianite (**Figure 12**). When the partially oxidized vivianite is exposed to white light polarized along the b -axis, the red wavelengths of light will stimulate electrons to jump back and forth between the Fe^{2+} and the Fe^{3+} ions causing strong absorption of the red light, but letting blue light pass through. This is the process of intervalence charge transfer that we have seen in a number of other colored minerals. This process was studied by McCammon & Burns.

McCammon CA, Burns RG (1980) The oxidation mechanism of vivianite as studied by Mössbauer spectroscopy. *American Mineralogist* 65, 361-6.

If the oxidation continues far enough, vivianite will ultimately change to a new dark-blue mineral species, metavivianite, $\text{Fe}^{2+}_2\text{Fe}^{3+}(\text{PO}_4)_2(\text{OH})(\text{H}_2\text{O})_7$, which usually occurs as pseudomorphs after vivianite.

Vivianite is a soft mineral which is easily ground. Its hardness on the Mohs scale is only 1.5 to 2.

There is a group of minerals that share the vivianite structure, and which have a general chemical formula $\text{A}_3(\text{XO}_4)_2 \cdot 8\text{H}_2\text{O}$, where A can be various metal ions and X is phosphorous or arsenic. They include:

Annabergite	$\text{Ni}_3(\text{AsO}_4)_2 \cdot 8\text{H}_2\text{O}$	Hörnesite	$\text{Mg}_3(\text{AsO}_4)_2 \cdot 8\text{H}_2\text{O}$
Arupite	$\text{Ni}_3(\text{PO}_4)_2 \cdot 8\text{H}_2\text{O}$	Köttigite	$\text{Zn}_3(\text{AsO}_4)_2 \cdot 8\text{H}_2\text{O}$
Baricite	$(\text{Mg}^{2+}, \text{Fe}^{2+})_3(\text{PO}_4)_2 \cdot 8\text{H}_2\text{O}$	Manganohörnesite	$(\text{Mn}^{2+}, \text{Mg})_3(\text{AsO}_4)_2 \cdot 8\text{H}_2\text{O}$
Erythrite	$\text{Co}_3(\text{AsO}_4)_2 \cdot 8\text{H}_2\text{O}$	Pakhomovskiyite	$\text{Co}_3(\text{PO}_4)_2 \cdot 8\text{H}_2\text{O}$

A final note on where else to find vivianite: Here are titles of articles that give you a hint:

Wilfert et al. (2016) Vivianite as an important iron phosphate precipitate in sewage treatment plants.

Wilfert et al. (2018) Vivianite as main phosphate mineral in digested sewage sludge and its role for phosphate recovery.

Seitz et al (1973) Iron-phosphate compound identification in sewage sludge residue.

A field trip, anybody?

MINUTES of the December 10, 2021 ZOOM Meeting

Call to Order (Dr. Rossman):

At 7:32 p.m., the 996th Membership Meeting of the Mineralogical Society of Southern California (MSSC) was called to order by President Dr. Rossman, Ph.D. It was MSSC's 19th ZOOM conference meeting.

President's Remarks (Rossman)

Dr. Rossman reports that the International Mineralogical Association (IMA) has approved 5,762 mineral species thus far. One recently published is a nickel sulfide found in an inclusion in a super deep diamond found in a diamond mine in Africa. A violent, rapid eruption brought it to the surface where, under normal circumstances, would have formed under extremely high pressure. The mineral is called *crowningshieldite*, named after G(eorge) Robert Crowningshield, who grew up in Southern California.

Regular Business (Rossman)

MINUTES: Dr. Rossman announced that the November 2021 Membership Meeting Minutes, as published in the December 2021 Bulletin, need to be approved. He called for corrections or additions, seeing none, called for a motion to approve the Minutes. Motion was made by Carolyn Seitz and seconded by Marek Chorazewicz. The vote was taken and the motion was approved unanimously.

Announcements and Reports

1. MSSC's ZOOM License: Over the past 19 months, we have been operating under a ZOOM license for our meetings. Caltech has graciously allowed us to use their license for 17 of those meetings. Now, this is our 2nd ZOOM Membership Meeting under MSSC's license. Tonight, Cheryl Lopez will operate the license;

2. Membership Renewals (Cheryl Lopez): It is time to renew your membership, please send your renewal form, included in the last Bulletin, to Carolyn Seitz, Treasurer. The cut-off date is February 12, 2022 to be included in the MSSC Roster. Carolyn Seitz adds that dues have increased, Individual is \$30 and Family dues are \$40;

3. Program Speakers: In the absence of Program Chair, Rudy Lopez, Cheryl tells us next month's speaker will be Denise Nelson. Topic TBD;

4. Social Gathering: Ahni Dodge announces that she will organize MSSC dinner night out. This activity resumes the pre-COVID casual gathering of MSSC members. All COVID restrictions will be in place, including social distancing and masking. If you would like to join in, kindly contact Ahni;

5. ZOOM Minutes: Angie Guzman thanked the Board for implementing the ZOOM license for MSSC, she said the recording and transcripts are an aid for accurate reporting and they help to cut down the time taken to organize Minutes. She assures everyone that the recording and transcript are strictly for those purposes, not for public use, in any way, and, in fact, are destroyed after the Minutes have been published. Initially, they are only downloaded to one physical computer and no other entity. Cheryl concurs that there is no threat to any personal information, no leak to social media, the “Cloud” or to the Internet;

6. Field Trips: Marek Chorazewicz reports that a field trip is planned for around mid-January 2022 to the southern tip of Ord Mountain in San Bernardino County, to collect molybdenite, malachite, yellow fluorite, some gold, and others. This trip weather dependent so please check the MSSC website or the Bulletin for developing information;

7. Pacific Micromineral Conference: Dr. Bob Housley reports that due to the current COVID pandemic situation, MSSC cannot commit to a PMC conference for 2022 at this time. Tony Kampf submits that one of the societies had their conference via ZOOM.

Program

Dr. Rossman turned the meeting over to Cheryl Lopez, substituting for Rudy Lopez (gone fishin’), who introduced our speaker Dr. Rebecca Greenberger. Cheryl tells us that Dr. Greenberger is the Lab Manager and a Research Scientist at Caltech. She earned her Ph.D. from Brown University and completed a Fellowship at JPL. Her presentation tonight will focus on the Earth’s crust, particularly the ocean crust. She will share some of the latest research and bring us up to date on the ocean’s crust. Welcome, Dr. Greenberger.

Dr. Greenberger begins her presentation, “Mineralogy and Fluid-Rock Reactions in the Ocean Crust”, by stating that a majority of the Earth’s crust is ocean crust. How does ocean crust form, how does it cool, what are some of the interactions involved and how is it changing?

Another important aspect to inquire about is, how do we study ocean crust? There are several kilometers of saltwater to “navigate” before reaching the ocean crust! As for tools, there are submersibles, but they only study the ocean floor. There is also deep ocean crust drilling by ships through the International Ocean Discovery Program, there is seismology (tectonic data) and, on land, by the study of *ophiolites*. Ocean drilling is one of the primary ways to study the ocean but there are some challenges: rock is heterogeneous and difficult to sample, much of what is drilled is not recoverable for igneous rock and there are human biases in sampling for fresher, less altered rocks.

Micro-imaging spectroscopy overcomes those challenges. The Oman Drilling Project (OmanDP), a scientific and research international collaboration, cores recover 100%. Ophiolites are uplifted ocean crust(s) rising above sea level. *[Secy Note: Samali Ophiolite, in Oman, is the largest, best-exposed oceanic lithosphere in the world.]*

What we know: ocean crust forms at mid-ocean ranges; seismology: lower crust is fully crystallized/solidified, <1,000°C within a few km of ridge axis. Models: Conduction and heat transfer without fluid circulation through lower crust is insufficient to cool so quickly. Dr. Greenberger says you need convection cooling/fluid circulation, but how deep?

Greenberger shows 3 models of ocean crust formation and cooling: (1) Gabbro Glacier (large bodies of material move downward and outward, cool slowly via conduction), (2) A hybrid-mixture [of (1) and (3)] and (3) Sheeted sills (crust is all small sills, cools rapidly). Then she explains the importance of mineralogy using the models above and says the sheeted sill model is early pervasive hydrothermal circulation where you expect high temperature secondary minerals throughout ocean crust. The Gabbro Glacier model is where one expects only low temperature secondary minerals in lower crust. Another model: hydrothermal convection model, to ~800m below dike-gabbro transition, conduction below where there are no high temperature secondary minerals deeper in ocean crust. Lastly, fault zones as conduits for fluid circulation and cooling – here expect high temperature secondary minerals in major fault zones.

Rebecca says objectives are: (1) Characterize hydrothermal alteration of ocean crust to understand cooling processes and fluid fluxes between ocean crust and seawater using imaging spectroscopy of OmanDP cores and, (2) Determine modes of cooling of ocean crust, which has implications for crustal formation processes and the inputs to seawater chemistry. Was there early high temperature alterations? What was the role of fault zones? [Secy Note: *subduction and convergent*]. How far from the ridge axis did deep hydrothermal alteration extend? Her photos and graphics were helpful. Rebecca says OmanDP is used to understand the full spectrum of the process that create and modify oceanic crust and shallow mantle, involving mass and energy transfer between mantle, crust, hydrosphere, atmosphere and biosphere! Small wonder OmanDP is a staple for researchers and scientists.

Several subsequent graphs and photos showed foliated and layered gabbros, drill sites of lower crust, middle ocean crust, sheeted dikes (upper gabbros), what cores look like, data and graphs of sheeted dikes, data and graphs of foliated then layered gabbro and picture of visual core description (Japanese drilling vessel *Chikyu*). She showed pictures of minerals in cores: epidote (epidote vein, breccia), chlorite and prehnite, amphibole, clinozoite, quartz, zeolite and anhydrite. The core samples were analyzed by researchers. All of it fascinating!

A new approach is imaging spectroscopy of the drill core. It shows that (a) different material and minerals absorb light differently, (b) instruments measure spatially (resolved reflectance of incident light as a function of wavelength) and (c) sensitivity to hydrated minerals, carbonates, sulfates, iron-bearing minerals and more. She showed photos of samples of visible shortwave infrared imaging. The spectroscopy machine, housed in Ehlmann Laboratory, was custom built by Headwall Photonics for Caltech. This has Visible Near Infrared (VNIR) and Short-Wave Infrared (SWIR) sensors-co-boresighted and optical bench, halogen slit light source that illuminates the core (sample) on JAMSTEC Chikyu multi-sensor core logger track or conveyor belt and the calibration is done by dark current subtraction and correction to Spectralon target. Whew! I'm exhausted.

Dr. Greenberger continues by explaining how more clinopyroxene (augite, diopside) remain deep in the crust, amphibole changes patterns with depth, prehnite and zeolites show lower temperature alterations and lower crustal fault zones are more hydrated, they appear to be conduits for fluid penetration deep in the ocean and they help cool the crust. She shows pictures of fault zones with widespread amphibole.

Points brought up by Dr. Greenberger in conclusion are: (a) Chlorite, amphibole and epidote are the most common minerals they (researchers) mapped in the sheeted dikes and dike-like gabbro transition of the upper ocean crust; (b) Minerals formed at lower temperatures (~100 - ~200°C) are more common deeper; (c) Faults are important conduit for fluid circulation between oceans and deep crust. The fluid circulation helps cool the once-molten crust and changes the minerals in the rocks. There is widespread amphibole in deep fault zones and fluids continue to circulate as rock moves further from the mid-ocean ridge and as the crust cools and, (d) for the future, more research to be done for quantitative estimates of chemical fluxes from crust to ocean.

Thank you, Dr. Rebecca Greenberger, for an interesting presentation, a look into the deep ocean crust, a view of the OmanDP core samples and how they look in the Ehlmann Lab. Dr. Greenberger was kind enough to Q&A after her presentation.

MSSC members and guests, please keep in mind this is an abbreviated report of the night's presentation. Join us next month for Denise Nelson who will present another interesting topic. Our next membership meeting will be *Friday, January 14, 2022* when your newly *elected officers and directors will be sworn in*. Check the Bulletin for details and contact our Program/Education Chair, Rudy Lopez, to be included on the ZOOM invitation list.

As there was no other society business, the meeting was adjourned by Dr. Rossman at 8:30 p.m.

Respectfully submitted, Angie Guzman, MSSC Secretary

List of Upcoming MSSC Events : Mark your Calender!

Event	Date	Comments / Scheduled Program (if known)
Meeting Dates:	ZOOM February 11, 2022	MIKO: A brief Introduction to Indonesian Gemstones
	ZOOM March 11, 2022	Eric Scerri: the Periodic Table: It's Story & it's Significance
	ZOOM April 8, 2022	MSSC Special Presentation
	ZOOM May 13, 2022	Peter Goetz: - Beautiful Opal, Identification, and Internet Opal
Board Meeting	ZOOM January 16, 2022	ZOOM
Field Trip	None at this time	TBA

Note: Dates and programs shown above are subject to change. Check your bulletins to confirm final information each month.

It's Time To Renew your MSSC Membership !

Information to use PayPal is located on the MSSC website or mail a check and completed Membership application to:

MSSC
13781 Alderwood Lane #22J
Seal Beach, CA 90740-3993

If you have any questions, please contact Cheryl Lopez at membership@mineralsocal.org.

As the Membership roster will be sent in Feb/Mar, renewals must be received by February 12, 2022 if you wish to be included in the MSSC Roster.

If you've already sent in your 2022 Membership Renewal....Thank You!

Upcoming Field Trip Information By Marek Chorazewicz

I was originally planning the trip for 1/15 or 1/22, but my schedule dropped more unexpected things in my lap around both weekends, so they are no go at this moment.

With the rain situation it will be hard to get a firm date more than 2 weeks ahead of time as well, so I'll likely move the trip to the second half of February.

The location remains the Red Hill prospect at the southern tip of Ord Mountain, with molybdenite, malachite, hematite, magnetite, stilbite, and yellow SW UV fluorescent powellite.

By the way, Herb and George are planning to go to Quartzite Powwow on the weekend of Jan 22 and will be happy if anybody wants to meet them there.

The Ride Share Listing is being temporarily discontinued until such time as MSSC starts holding in-person meetings again.

MSSC is Reaching a Major Milestone and We Need Your Help

Hello,

As you know, **MSSC will celebrate it's 1,000th Membership Meeting in April 2022.** Our Programs Chair, Rudy Lopez, is putting together an MSSC presentation honoring those who came before us, those that made the society what it is today. I offered to help out. I am BCCing all of you so your response will come directly back to me, keeping the thread manageable. If you want to share your response with any of the others, please do so.

I am willing to weave a portion of the MSSC presentation in a couple of ways: a) using stories, interesting tidbits, quips, etc., from older editions of the Bulletin, b) contacting long-time former members for anything they would like to contribute and c) getting a hold of any older photos from meetings, field trips or other events from years ago.

Currently, the MSSC website only goes back to February 1999 Bulletin publications. Here comes the big ask: **Do you have** any Bulletins (older than February 1999), or **do you know of anyone** who may have some? I am willing to pick-up, copy and return them to their rightful owner(s), if necessary.

MSSC has been around a long time now and many of us may not remember some of the members through the years. For instance, when I became secretary, Bob Griffis was the outgoing officer. I did not know him and I don't have any contact information on him. Do any of you know how I could get in touch with him? Also, there may be other members from the '70's, '80's, '90's who may still be around and could provide some stories. Do you have any of the old Roster lists? If you think of someone and you can provide me their contact information, I'll be happy to give a call and see if they would like to participate by sharing their stories, old photos, field trip experiences, picnic events or any other thing they would like to share.

To Dr. House, Ph.D., at PCC: Please let me know if the school has any historic photos, books, etc., of the Society, archived from the Dana Club would also be nice to include. As you know, MSSC began at PCC in 1931. I will be happy to come and sort through any records PCC has of the Mineralogical Society of Southern California.

Please let me know. Anything will be appreciated and help make our 1,000th Membership meeting more meaningful, a legacy we can leave those who come after us.

Thanks so much. Feel free to share this e-mail request with your MSSC friends not listed herein. Hope to hear from you, at your convenience.

Sincerely, Angie Guzman, MSSC Secretary

Official e-mail secretary@mineralsocal.org

Personal e-mail guzman2929@yahoo.com

Personal cell (323) 828-7086

OTHER FREE THINGS TO DO...by Ann Meister

The **Watson Lecture** is on Wednesday, **January 19**. *Each Watson Lecture will begin at 5:00 p.m. Pacific Time. Each lecture runs approximately 40 minutes, followed by live audience Q&A.* Advance registration is required: [Watson Lecture - Quantum Matter: Why it Matters | CaltechLive!](#). The speaker is Claire E. Bucholz, Assistant Professor of Geology at Caltech. The title of the presentation is, **“When Earth Breathed Deeply.”** Oxygen levels in the atmosphere have increased by many orders of magnitude throughout Earth's history, profoundly affecting biologic and chemical cycles at the surface of the Earth. In this lecture, Bucholz will explore how shifts in atmospheric oxygen concentrations went even deeper, altering Earth's inner workings. *Find more past Watson Lectures on [Caltech's YouTube channel](#).*

The **Von Kármán Lecture** is on Thursday, **January 20** at 7:00 PM. Available live on YouTube at [NASA Jet Propulsion Laboratory - YouTube](#). The speaker is Dr. Cedric David, Supervisor of JPL's Water & Ecosystems Group, NASA/JPL. The title of the presentation is **“SWOT: Looking at the Earth's Water.”** At this year's American Geophysical Union meeting, NASA scientists will provide updates on a range of Earth and space science topics, including an overview of the Surface Water Ocean Topography (SWOT) satellite, an upcoming Earth science mission that will measure the height of Earth's fresh and saltwater. Earth is our home. SWOT will give us a better understanding of the world's oceans and its terrestrial surface waters while showing why these resources are so important.

The **UCLA Meteorite Gallery** has reopened. Check the website for hours. The monthly lecture will be presented on Zoom on Sunday, **January 16** at 2:30 PM. The speaker is Dr. Hilary Downes, University College

London. The title of the presentation is “**Ureilite Meteorites and the History of the Early Solar System.**” Ureilite meteorites, such as those that arrived on Earth via the impact of asteroid 2008 TC₃ in Sudan, are thought to be derived from a small planetary body (“planetesimal”) which formed early in Solar System history. The story of the parent body of ureilites reflects the history of accretion, differentiation and impact disruption that were widespread processes around 4.5 billion years ago. The abundant fresh samples provided by asteroid 2008 TC₃ are collectively known as “Almahata Sitta”. They provide evidence of how the ureilite planetesimal was formed, how it differentiated into a core, mantle, and crust, and how it was disrupted by a major impact while it was still hot, and then re-formed to make a jumble-pile asteroid containing many different rock-types. Reconstructing the history of the parent body of ureilite meteorites is like solving a Sherlock Holmes mystery – it is what is missing that is important! **Zoom Registration:**

https://ucla.zoom.us/joining/register/tJEqduyupj0vGd3S0_52FsbHTbPjYr0sZQUj If you need detailed instructions on [how to join a meeting](#) via Zoom please contact our Curatorial Assistant, Juliet Hook, at jahook@ucla.edu. Note: Registration is only needed once as this is a recurring meeting in Zoom. The speaker and topic will be announced on the website. Visit the website and check on events and videos and other neat things about meteorites, go to <https://meteorites.ucla.edu>

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	1/3 page	\$10.00	
	1/2 page	\$20.00	
	Full Page	\$35.00	
In addition, any advertiser who purchases 12 months of space in advance will receive a discount of 12 months for the price of 10 months. The copy for the ads should be mailed to the editor at bulletin@mineralsocal.org and the payment should be sent to the MSSC Treasurer 1855 Idlewood Road, Glendale, CA 91202			

With Knowledge Comes Appreciation

Calendar of Events:

Only local area shows are listed here. Other CFMS Club shows can be found at: <http://www.cfmsinc.org/>

2022 Shows

January 15-16, 2022 – Exeter, CA

Tule Gem & Mineral Society
Exeter Memorial Building, 324 N. Kaweah Ave.,
Exeter, CA

March 5-6, 2022 – Ventura, CA

Ventura Gem and Mineral Society
Ventura County Fairgrounds, 10 W. Harbor Blvd.,
Ventura
Hours: Saturday 10 AM – 5 PM,
Sunday 10 AM – 4 PM
Website: <http://www.vgms.org>

March 12-13, 2022 – Arcadia, CA

Pasadena Lapidary Society
“Inspiration Unearthed”, 62nd Annual Tournament of

Gems

Arcadia Masonic Center, 50 W. Duarte Rd., Arcadia
Hours: Saturday 10 AM- 6 PM,
Sunday 10 AM – 5 PM

March 19-20, 2022, Lemoore, CA

Lemoore Gem & Mineral Club
Lemoore Trinity Association Hall, 470 Champion St.,
Lemoore, CA 93245
Hours: Saturday, 10 AM – 6 PM; Sunday, 10 AM – 4 PM
Website: <http://lemooregemandmineralclub.org>

April 1-3, 2022, Vista CA

Vista Gem and Mineral Society

Vista Gem and Mineral Show

Antique Gas and Steam Engine Museum, 2040 N.

Santa Fe Ave., Vista, CA 92083

Hours: April 1 & 2, 10 AM – 5 PM, April 3, 10 AM – 4 PM

Website: <https://vistarocks.org>

April 30 – May 1, 2022 – Anaheim, CA

Searchers Gem & Mineral Society

Hours: 10 AM – 5 PM

Website: <https://searchersrocks.org>

CFMS

Gems, Minerals, Fossils & Jewelry Show

MAY 6-7-8, 2022

Friday, Saturday: 9-5

Sunday: 9-4

Gems*Minerals*Fossils*Jewelry*Demonstrations

Exhibits*Dealers*Kid's & Family Activities

State Golden Bear Nugget on Display

Antelope Valley Fairgrounds

2551 W. Avenue H

Lancaster, CA 93536

FREE PARKING & FREE ADMISSION

January Mineral of the Month

Featured Mineral: Ajoite

Formula: $(K,Na)Cu_7AlSi_9O_{24}(OH)_6 \cdot 3H_2O$

Crystal System: Triclinic

Name: Named after the type locality, the New Cornelia mine in Ajo, Arizona, USA



© Irocks

Ajoite

Locality: New Cornelia Mine area (Ajo Mine area), Ajo, Little Ajo Mts, Ajo District, Pima Co., Arizona, USA

2.4 x 2.4 x 2.0 cm



© Irocks

Ajoite in Quartz

Locality: Messina Mine, Messina District, Limpopo Province, South Africa

3.5 x 1.5 x 1.5 cm

2020 MSSC Officers:

OFFICERS		
President	George Rossman	president@mineralsocal.org
Vice President	Ahni Dodge	vicepresident@mineralsocal.org
Secretary	Angie Guzman	secretary@mineralsocal.org
Treasurer	Carolyn Seitz	treasurer@mineralsocal.org
CFMS Director	Angie Guzman	
Past President	Ann Meister	
DIRECTORS		
2020-2021	Pat Caplette	
2020-2021	Cheryl Lopez	
2021--2022	Rudy Lopez	
2021--2022	Pat Stevens	
2021--2022	Leslie Ogg	
COMMITTEE CHAIRS		
Bulletin Editor	Linda Elsnaue	bulletin@mineralsocal.org
Field Trip	Marek Chorazewicz	
Historian	Ann Meister	
Hospitality	Laura Davis	
Membership	Cheryl Lopez	membership@mineralsocal.org
Micro Mount Conf. Chairman	Al Wilkins	
Program and Education	Rudy Lopez	programs@mineralsocal.org
Webmaster	Leslie Ogg	webmaster@mineralsocal.org

About the Mineralogical Society of Southern California

Organized in 1931, the Mineralogical Society of Southern California, Inc. is the oldest mineralogical society in the western United States. The MSSC is a member of the California Federation of Mineralogical Societies, and is dedicated to the dissemination of general knowledge of the mineralogical and related earth sciences through the study of mineral specimens. We are a scientific non-profit organization that actively supports those endeavors through public outreach, field study and related programs. The Bulletin of the Mineralogical Society of Southern California is the official publication of the Mineralogical Society of Southern California, Inc.

The MSSC meetings are usually held the second Friday of each month, January, February and August excepted, at 7:30 p.m. in Building E, Room 220, Pasadena City College, 1570 E Colorado Boulevard, Pasadena, California. However, due to current health considerations, MSSC meetings are held via ZOOM conferencing until further notice. The annual Installation Banquet is held in January, and the annual Picnic and Swap Meeting is held in August. Due to PCC holidays, meetings may vary. Check the Society website for details.

The Society also sponsors the annual Pacific Micro mount Symposium held at the Fallbrook Mineral Museum during the last weekend of January.

Annual Membership dues for the MSSC are \$20.00 for an individual membership, \$30.00 for a family membership. Bulletins are delivered by email, there is an additional annual fee if you prefer paper bulletins mailed to your address. The Society's contact information:

Mineralogical Society of Southern California

13781 Alderwood Lane, #22-J, Seal Beach, CA 90740

E-mail: treasurer@mineralsocal.org

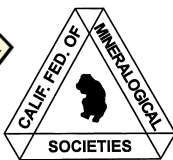
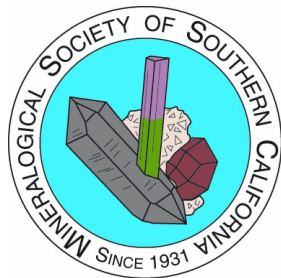
Website: www.mineralsocal.org **The Mineralogical Society of California, Inc.**

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DISCLAIMER: The Mineralogical Society of Southern California, Inc. is not responsible, cannot be held responsible or liable for any person's injuries, damages or loss of property at or traveling to or from any general meeting, board meeting, open house, field trip, annual show or any other MSSC event.

MSSC Bulletin Editor
3630 Encinal Ave.
Glendale, CA 91214-2415

To:



**With Knowledge Comes
Appreciation**

***Your MSSC
Bulletin Is
Here!***