Bulletin of the Mineralogical Society of Southern California

Volume 94 Number 1 - January, 2021

The 985th meeting of the Mineralogical Society of Southern California

With Knowledge Comes Appreciation

A ZOOM Meeting

January 8th, 2021 at 7:30 P.M.

Program :

In this Issue:

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: Precious Heirlooms Presented by Denise Nelson, GIA GG

After spending 30 years as an Importer, Wholesaler, Consultant, Designer and Appraiser Denise Nelson will share some of her adventures and personal experiences. She is a Graduate Gemologist (GIA) and member of the National Association of Jewelry Appraisers. Her travels have taken her to 42 countries, to trade shows on five continents, to remote mining areas, and to countless museums. Many of the people she met, from Rock-hounds to world-renowned Experts, became her friends and provide a colorful backdrop to her experiences as an Appraiser in the Washington DC metropolitan area. She realized early on that it is an often misunderstood profession and she will shed some light on actual approved practices and the do's and don'ts of ethical appraisal work. The tales, that handling thousands of Minerals, Gems and Jewels have inspired, are often surprisingly funny, occasionally sad, and always fascinating and enlightening!

How to Participate in MSSC ZOOM meetings:

Program Chair, Rudy Lopez, will send an all call email each month to our members about the meeting.

nonmembers:

If you want to participate in our ZOOM meetings, please check out the information in the MSSC website/Bulletin www.mineralsocal.org , send an email to programs@mineralsocal.org and Rudy will make sure you are contacted.

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From the Editor:

Happy New Year everyone! We made it, 2020 is over! It has been an "interesting" year to say the least! With a vaccine looming on the near horizon 2021 should be better for everyone.

First of all, I want to thank our past MSSC Treasurer, Jim Kusley for his many years as our Treasurer. I know he did a lot of work to clean up our books and handeled several complicated issues for MSSC with much success. Thanks for all your hard work Jim.

This is the beginning of my 9th year as your Bulletin Editor. When I first started this job, I never thought I would last this long! I guess I'll keep doing it as long as it is still mostly fun to do! Linda Elsnau

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FROM THE PRESIDENT: Interesting Minerals, A to Z. Round 2, installment 10, the letter "J": by George Rossman

Jarosite, $KFe_3(SO_4)(OH)_6$

Jarosite was named in 1852 by Johann Friedrich August Breithaupt for the type locality, Jaroso Ravine, Sierra Almagrera, Cuevas del Almanzora (Cuevas de Vera), Almería, Andalusia, Spain.

Breithaupt JFA (1852) Jarosit, jarosites kalicus. Berg- und Hüttenmännische Zeitung 11, 68.

It usually forms from the oxidation of iron sulfides such as pyrite. It typically occurs as an orangish-yellowish mass of numerous fine crystals **(Figures 1,2).**

It can also be found a micro-crystals where it commonly occurs in mining districts **(Figures 3,4)** ,

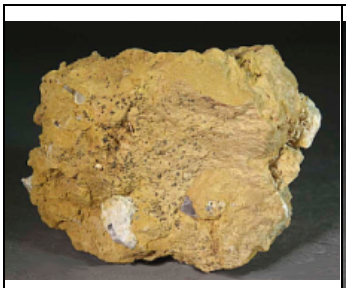

Figure 1. Jarosite from the Barium Queen Mine, San Bernardino Co. Photo Credit: Mark Garcia

Figure 2. Jarosite from near St. George, Utah. Photo Credit: Mark Garcia

Figure 3. Jarosite from the Gilbert Mining District, Nevada. Photo Credit: Mark Garcia

Fibure 4. Jarosite from Sulphur, Pershing County, Nevada. Photo Credit: Mark Garcia

For a photograph of a truly spectacular crystal of jarosite from Andalusia, Spain, see Christian Rewitzer's photo on Mindat.org: https://www.mindat.org/photo-623306.html

Jarosite is a member of a family of related minerals that have different cations substituting for the potassium. Sodium in the mineral natrojarosite is other most common species encountered in the jarosite family.

Natrojarosite	$NaFe_3(SO_4)_2(OH)_6$
Plumbojarosite	$Pb_{0.5}Fe^{3+}_3(SO_4)_2(OH)_6$
Argentojarosite	$AgFe^{3+}_3(SO_4)_2(OH)_6$
Ammoniojarosite	$(NH_4)Fe^{3+}_3(SO_4)_2(OH)_6$
Hydronium jarosite	$(H_3O)Fe^{3+}_3(SO_4)_2(OH)_6$

All of these typically are found as masses of fine crystals that range orange to brown in color (Figures 5,6,7). They are also commonly found in mining districts where the other ions such as lead and silver are available to substitute for the potassium.

Figure 5. Natrojarosite from Goodsprings, Clark County, NV Photo Credit: Mark Garcia

Figure 6. Plumbojarosite from the Yellow Pine Mine, Goodsprings, NV Photo Credit: Mark Garcia

Figure 7. Argentojarosite from Tintic Standard Dividend, Utah. Photo Credit: Mark Garcia

If we consider the greater group of related minerals that have a chemical formula of the general type: $AB_3(TO_4)_2(OH)_6$, we find that there are 44 different species that belong to this group. Some are sulphates (SO_4), some are phosphates (PO_4), some are arsenates (AsO_4), and many are mixtures of these different TO_4 groups. They comprise the alunite and plumbogumite groups of minerals.

Jarosite is the iron analogue of the mineral alunite, with which it is often associated. Alunite, $KAl_3(SO_4)_2(OH)_6$, in particular, is worth a brief mention because it is often found associated with jarosite or natrojarosite [$NaFe_3(SO_4)_2(OH)_6$]. Like jarosite, it often occurs as masses of fine crystals (Figure 8), but occasionally can be found as crystals (Figure 9). Alunite was recognized hundreds of years ago. It typically forms, like jarosite, from the action of solutions containing sulfuric acid from the weathering of sulfides. It can be mined for producing alum, and as an ore of aluminum. Interestingly, there is a ghost town in south-central Utah named

alunite. The city was built around an alunite mine which was originally mined for its potassium content, a valuable component of fertilizer, and later was processed for its aluminum content.

Figure 8. Massive alunite from near Wickenburg, AZ.
Photo Credit: Mark Garcia

Figure 9. Alunite crystals from Marysvale, Piute Co, Utah.
Photo Credit: Mark Garcia

Let's go back to jarosite and its original discovery. How well could they analyze a new mineral 170 years ago? Here is the original chemical analysis compared to a modern analysis of 'ideal' jarosite. Well, they came fairly close. Close enough to determine that it was a new mineral and close enough to define the ideal composition.

Eisenoxyd	52,5	Fe_2O_3	47.8
Thonerde	1,7	Al_2O_3	0.0 (would replace some of the iron)
Kali mit sehr wenig Natron	6,7	K_2O	9.4 (potassium with very little sodium)
Schwefelsäure	28,8	SO_3	32.0
Wasser	9,2	Water	10.8
	98,9.		100.0

The iron ions in jarosite are structurally arranged in rings of three octahedra that share common oxygens arranged in the plane perpendicular to the c-axis **(Figure 10).** This arrangement causes jarosite to be strongly dichroic (light is absorbed with different intensities depending if it is polarized parallel or perpendicular to the crystal's c-axis). It also gives rise to some interesting magnetic effects that cause the paramagnetism (weak attraction to a magnet) to greatly decrease at low temperatures.

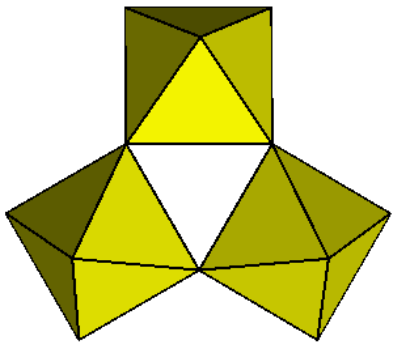

Figure 10. Structural arrangement of the FeO_6 octahedra in jarosite

There is more interesting information about jarosite. Mori et al. (1992) reported that jarosite (and gypsum) occur in corroded concrete sewer pipes. The extent and rate of the corrosion depended on both the pH of the fluids in the pipe and the activity of the bacterium *Thiobacillus thiooxidans*. Apparently, the deposition of these two phases is stimulated by bacterial activity as the concrete corrodes.

Mori T, Nonaka T, Tazaki K, Koga M, Hikosaka Y (1992) Interactions of nutrients, moisture and pH on microbial corrosion of concrete sewer pipes. Water Research 26, 29-37.

One of the minerals found on Mars with the CheMin X-ray diffractometer onboard the Curiosity rover in Gale crater is jarosite (Morrison et al, 2018). There, like on earth, it forms during the weathering and alteration of the planet's surface. It is also found as one of the weathering products of meteorites, probably formed from the weathering of troilite (the iron sulphide, FeS).

Morrison SM and 19 other authors (2018) Crystal chemistry of martian minerals from Bradbury Landing through Naukluft Plateau, Gale crater, Mars. American Mineralogist 103, 857-871.

Ammoniojarosite is relatively uncommon because solutions concentrated in the ammonium ion are not often encountered. In these solutions, the ammonium would come from the decomposition of organic materials or from the associated biological activity. It is most commonly found in lignitic shales where is it associated with other ammonium-containing minerals. Ammoniojarosite is produced industrially as a by-product of the zinc extraction industry where jarosites are used to precipitate out iron from the acid-leach solutions before the zinc is recovered.

Figure 11. Hydronium jarosite from Cyprus, Greece.

Photo Credit: the RRUFF.info project

Hydronium jarosite **(Figure 11)** is of interest. It is one of the few minerals that contain the hydronium ion, H_3O^+, which is essentially a water molecule with an attached acid proton. It forms in acidic solutions which are deficient in the alkali ions. Many of the other jarosite group minerals can have a modest amount of hydronium in solid-solution with the other cations.

There used to be a large ledge of mixed jarosite-alunite near Sulphur Hole, near Calico in the Calico Hills. Nice massive specimens of jarosite could be collected there. Unfortunately, it appears that the gun clubs bulldozed the ledge away to make a flat ground for their target practice. Very little jarosite is left to collect there. But lots of shattered bottles litter the nearby ground. And that's the way it is.

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MINUTES of the December 11, 2021 MSSC Meeting

At 7:33 p.m., the **984th Membership Meeting** of the Mineralogical Society of Southern California (MSSC) was called to order by President Dr. Rossman, Ph.D. It is MSSC's 7th ZOOM due to the ongoing Coronavirus (COVID-19) pandemic. We thank Caltech for their generous allowance in sharing their licensing with us.

Message from the Chair (Dr. Rossman):

Dr. Rossman welcomed one and all to the meeting. He reports that the International Mineralogical Association's (IMA) approved minerals are now at 5,637 species. This is up 20 minerals from last month. Tony and others keep it up! In a few months, Tony will tell us how minerals are approved at one of our meetings. Tony Kampf is from the LA County Natural History Museum.

Regular Business (Dr. Rossman)

Minutes: Dr. Rossman called for a motion to approve the last meeting's minutes. A motion to approve the November 2020 minutes as published in the December 2020 *Bulletin* was made by T. Kampf and seconded by M. Chorazewicz, and others simultaneously**.** Seeing and hearing no corrections or additions, Dr. Rossman declared the minutes approved.

Installation of Elected Officers and Directors: (J. Ritchey)

Dr. Rossman called upon JoAnna Ritchey to administer Installation of Officers (2021) and Directors (2021-2022). JoAnna announced the officers and said the specific duties for all the officers are in the By-Laws and most have been in office previously, so they have a good working knowledge of how things work and what is entailed. Then she installed all asking they repeat the solemn promise to abide by all rules and laws.

Officers		**Director (2021-2022)**	
President	Dr. George Rossman	Director #1	Leslie Ogg
Vice President	Ahni Dodge	Director #2	Patrick Stevens
Treasurer	Carolyn Seitz		
Secretary	Angela Guzman		
CFMS Director	Angela Guzman		

Congratulations to all! Thank you, JoAnna, for the installation.

Field Trip Report (M Chorazewicz):

Marek reports there is nothing immediate. However, there are a lot of new photos from the Red Cloud trip. Check the website for information and the photos.

Other announcements:

A. Program Chair, R. Lopez announced (a) that the January 8, 2021 meeting, our 985th, will be via ZOOM. We will not have a banquet, due to restrictions of the current official guidelines for COVID-19 pandemic. The January speaker will be Denise Nelson, a gemologist (GIA), appraiser and occasional gem hunter; (b) Rudy announced the new vibrantly colored MSSC patch. There is a limited number (48) at a cost of $12 plus $3 shipping. Proceeds of $10 will go to the club and the remainder will go to cover production costs. Check the website to place an order, and (c) On January 16th, there will be a rock giveaway at Rudy's house. The giveaway will be from 9am-Noon. There are some metal crates, otherwise, bring your own boxes to cart them home. Any rocks not picked up will be donated.

B. CFMS Director Guzman reports that she attended the ZOOM Board meeting at which new officers were elected and new Directors were introduced. She informed us that the Change of Officer form will be submitted to CFMS in January and, CFMS' Lodi meeting will be in June 2021.

Thanks to JoAnna and congratulations to all MSSC officers and directors – let's make 2021 really special! Reminders: Next membership meeting will be January 8th (Friday) and the next Board meeting will be January 17th (Sunday).

C. Membership Chair Cheryl Lopez reminds 2021 membership dues are due. Please send in by mid-February to be listed on the Roster.

D. Rudy Lopez advises there are 2 brand new members and they're from Texas! Welcome!

Program: Rudy Lopez introduced speaker, Dr. George R. Rossman, Ph.D. Dr. Rossman is Professor of Mineralogy in the Division of Geological and Planetary Sciences, California Institute of Technology, Pasadena, California. He earned his B.S. degree in Chemistry and Mathematics from Wisconsin State University, Eau Claire, and his Ph.D. from Caltech in Chemistry. His principal research interests deal with the use of spectroscopic probes to study minerals. His work addresses problems relating to the origin of color phenomena in minerals; phase identification; and the special role of metal ions in minerals. He has received many awards including the Richard P. Feynman Prize for Excellence in Teaching at the Caltech in 2004, and the Friedrich-Becke Medal of the Austrian Mineralogical Society in 2005. He was

also honored by having a mineral of the tourmaline family named after him, rossmanite. He has more than 370 publications in the mineralogical and chemical sciences.

We are proud to have newly re-elected "Dr. George" as MSSC's President. Tonight he presents, *"Natural Radiation – A Tale of Two Minerals."*

Dr. Rossman begins by stating tonight's topic and content is something he has been interested in over his career. That is, the color of the minerals we've collected and admired in the field and in museums. Tonight, "*Natural Radiation – A Tale of Two Minerals"*, looks at tourmalines and amazonite feldspars. Feldspars are the most common group of minerals in the crust of planet Earth. Feldspar, a group name, shares three most common chemical compositions: potassium feldspar ($KAlSi_3O_8$), sodium feldspar ($NaAlSi_3O_8$) and calcium feldspar ($CaAl_2Si_2O_8$). They're interesting because the origin of their color is rift in chemical and geological background.

Expect that feldspar would be colorless, in fact they are. Looking at the less common feldspars, they are also colorless such as barium feldspar. But potassium feldspars appear to be red like ones from the upper Midwest of the US or from Ontario, Canada. However, itrongay from Madagascar is mostly clear. Plagioclase, sodium feldspars, are also mostly clear. To get answers, chemical analysis are performed to see what is different, for instance, yellow color is common in feldspar and comes from iron (Fe^{3+}) which replaces the aluminum. Keep in mind this process is over tens of millions of years. Still, it gives us sanidine, labradorite and bytonite. Speaking of labradorite, it also displays iridescence – an optical phenomena, nothing to do with the chemistry, per se.

What about orthoclase? There are hematite particles in orthoclase showing as red. Oregon sunstone is also deep red feldspar. Dr. George displays photos of plagioclase (labradorite) from the Ponderosa Mine up there. The deep red is from the little, tiny particles of copper (Cu^0) found in the minerals.

Amazonite, a potassium feldspar, appears blue in samples from Lake George,

Colorado and Western Keivy Massif, Kola Peninsula, Russia. In samples from Luc Yen, Vietnam and Broken Hill, New South Wales, Australia the potassium feldspar is green. Many amazonites are gem quality.

Rossman explains there are 3 types of amazonite color. How does amazonite get its blue color? His absorbance/wavelength graph compares the Colorado, Australia and San Bernardino County specimens, he shows the aluminum silicon order and disorder of sanidine, orthoclase and microcline. Green feldspars have **dis**ordered Al-Si arrangement. Blue feldspars are ordered Al-Si arrangements. The order vs the disorder is attributed to charges within the mineral. But why are they colored? What happens?

Chemical analysis shows there is lead (Pb) present in all blue and green amazonite! It is thought the lead is in the potassium site: lead (Pb^{2+}) would substitute for potassium (K^+). But some lead-containing feldspars are not colored! Dr. George shows an example from Pike's Peak, Colorado. A blue feldspar with one side not colored! All amazonite contain water in their structures. So, the normal k-feldspar is K^+, $K^+ \rightarrow$ to the amazonite substitute of Pb^{2+}, H_2O. How does it make the blue color? Heat? Yes, 1 min at 800°C the color goes away. How

do you get the color back? By radiation (gamma rays). Just so happens, irradiation comes from the potassium (K) itself! Potassium is a component of feldspar. In fact, 0.01% of the isotope potassium-40 has a half-life of 1.2 billion years, it's natural. The radiation interacts with the water molecules to form free radicals. The OH radicals react with the lead to oxidize it from (lead) Pb^{2+} to (lead) Pb^{3+}, cause of the blue color in amazonite feldspar; lead, water and radiation (over hundreds of millions of years) all involved in the color of feldspars.

Now, let us take a look at tourmaline; Dr. George's favorite mineral, the one whose color he was intrigued by in those early days back in Wisconsin. There are 37 species of the tourmaline group, including common (dravite, elbaite, fluor-liddicoatite, schorl, etc.) to uncommon (dutrowite, tsilaisite, etc.). For purposes in the presentation, we will focus on elbaite. The chemical formula is $Na(Li_{1.5},Al_{1.5})Al_6Si_6O_{18}(BO_3)_3(OH)_3OH$ plus some Fe, Mn, Ti and F. The origins of color in tourmaline are iron (Fe), Manganese (Mn) and Titanium (Ti).

The Himalaya Mine is one of the largest producers of gem and specimen grade tourmaline in North America in the 20th-century. It's located in Mesa Grande, San Diego County. Rossman tells us the mine has pink micas, quartz, pegmatite, large and small gem pockets and tourmaline exposed right on the surface. Note: some of the tourmaline has been damaged due to tectonic activity. Where does the **red** color come from in tourmalines?

The mine's owner at the time, Bill Larson, allowed Dr. George and his students to do some testing in one of the gem pockets a while back. The testing included samples that were irradiated (gamma rays), heated and natural state. The chemical analysis revealed that pink elbaite had, by weight, low iron (0.01%), low titanium (0.01%) and modest manganese (0.08%). Heated for ½ hour, the color goes away. So that means the crystal could not have been pink when it was originally formed, it is a radiation colored crystal. Testing shows the gamma rays, feeble radiation, but if over time, say 2 million years, the color came right back. More radiation (gamma rays), in the lab, gives darker color. By the way, gamma rays (100,000 times more energy than the energy the electron has bound to the atom) move about 10cm through solid rock before it loses ½ of its energy. So back at hand, why and how the darker color? Look at the chemistry. Iron and titanium are eliminated (remember we are looking at the red in tourmaline), but the manganese: Mn^{2+} (clear, under natural irradiation) → Mn^{3+} (color, with laboratory irradiation) → more Mn^{3+} (darker color). WOW! This is an oxidation event for Mn^{3+}, 100 times more powerful than Mn^{2+}. The oxidation brings out the pink color, radiation makes the color darker.

Dr. George showed pictures of tourmalines from Afghanistan, pale from the mine but deep color after irradiation. Other countries irradiate tourmalines, too. Naturally, irradiated minerals are elbaite, amethyst (fades), ametrine, blue topaz (more stable than the brown), brown topaz (fades), Kunzite green (fades to pink), aquamarine beryl (fades to golden beryl), halite (blue color result of irradiation), to name a few. On the other hand, commercial laboratories are irradiating gems: blue topaz, green kunzite (still fades in a matter of weeks), red tourmaline, synthetic amethyst (will fade over time) and even diamonds. Check this, George shows The National Enquirer article showing gamma rays are used to irradiate gems, *"New Lab Process Turns Cheap Gemstones into Valuable Jewels"*. George was interviewed and quoted for the article. He says they were responsible and checked his contribution.

That was fabulous! Thank you Dr. George, we're honored to have you provide presentations to MSSC. Q & A followed with many questions, including irradiation in nuclear reactor (mostly topaz), alpha and beta particles (green diamonds coming out of the ground), and others. Hopefully, you did not miss this wonderful and informative talk.

Marek announced, in honor of Dr. George Rossman, one of the newly IMA approved minerals: aluminoxyrossmanite. Congratulations, Dr. Rossman. We're proud, too!

Dr. Rossman thanked everyone and Caltech for allowing MSSC to use their ZOOM license. See you next month, January 8th on ZOOM! Happy Holidays!!!

The meeting adjourned at 8:41 p.m.

Respectfully submitted, Angie Guzman, MSSC Secretary

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List of Upcoming MSSC Events : Mark your Calender!

Event	Date	Comments / Scheduled Program (if known)
Meeting Dates:	**ZOOM** February 12, 2021	Tony Kampf: The Journey from an Unknown to a New Mineral.
	ZOOM March 12, 2021	John Rakovan: New insights into the structure and formation of wire silver and gold.
	ZOOM April 9, 2021	Krista Sawchuk: Discovering the Deep Earth
	ZOOM May 14, 2021	Howard Heitner: The Tilly Foster Mine, A Classic Mineral Locality
Board Meeting	January 17, 2021	Via ZOOM
Field Trip	TBA	TBA

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

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Reminder: **Your Membership Dues need to be paid before February 20, 2021 to maintain your MSSC Membership, to have your information listed in the Roster and to continue receiving your MSSC Bulletin.**

Dues are Due February 20, 2021

Don't delay or forget…do it now!

Your 2021 Membership form was included as page 13 of your November, 2020 Bulletin.

Detach/Print your form, fill it out and mail it with your check today!

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Ride Share Listing

Can You Provide A Ride?
Would You Like Company On The Drive To Meetings?

We have heard from several of our members that they would like to ride-share with someone to the meetings. We will list the names, general location and either a phone number or an email address of anyone who would

like to connect for a ride-share. If you would like to catch a ride or would like company for the trip, let me know at msscbulletin@earthlink.net and I'll put the information in this section of the bulletin. After that, any final arrangements made are up to you. Also, If you make a connection that works for you, let me know so that I can remove your information from the bulletin. The Editor

Looking for	Who	Where	Contact at
A ride	Richard Stamberg	North Orange County, near Cal State Fullerton	*Meetings cancelled*

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OTHER (FREE) THINGS TO DO... by Ann Meister

The Watson Lectures are back via Zoom! The lecture is on Wednesday, **January 13**, at 5 PM Zoom online with a live audience Q&A at the end. At 8 PM the recorded lecture (without Q&A) will be posted on Caltech's YouTube channel https://www.youtube.com/user/caltech. You must register in advance for Zoom at Webinar Registration - Zoom. The speaker is Yisong Yue, Professor of Computing and Mathematical Sciences at Caltech. The title of the presentation is, **"Artificial Intelligence: How it Works and What it Means for the Future"** Over the past decade, artificial intelligence and the massive amounts of data powering such systems have dramatically changed our world. And as both the technology and the way in which scientists and engineers handle it becomes more refined, the impact of AI in society will become more profound.
In this lecture, Yue will explore the key principles powering the current revolution in AI, consider how cutting-edge AI techniques are transforming the way research is done across science and engineering at Caltech, and what it means for the future of material design, robotics, and big data seismology, among other areas of investigation. Yue will show how, where human intuition breaks down, AI can guide scientists in finding data-driven solutions to complex problems.. For online stuff at Caltech go to http://events.caltech.edu/

The **Von Kármán Lecture** on Thursday, **January 14** at 7:00 PM. The event is live on Ustream. http://www.ustream.tv/nasajpl2 Check online for changes and other viewing options at von Kármán Lecture Series (nasa.gov) The speakers are Manan Arya, Technologist and Lizbeth B. De La Torre, Creative Technologist, both from NASA/JPL. The title of the presentation is **"Spacecraft Origami."** For years, engineers have had to deal with "the tyranny of the faring": anything you want to send into space has to fit into a rocket bearing. A field of advanced design has been looking for new ways to advance our engineering, using the centuries old artform to dream bigger.

The **UCLA Meteorite Gallery** is temporarily closed until further notice, however the monthly lecture will be presented on Zoom on Sunday, **January 17** at 2:30 PM. **Zoom Registration:**
https://ucla.zoom.us/meeting/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 is Dr. Sara Russell, Natural History Museum, London. The title of the presentation is **"Clocks in Rocks - How to date a solar system."** Our solar system was born over four and a half billion years ago, from a cloud of dust and gas called the protoplanetary disk. Examples of the first solids to be formed - calcium-aluminum-rich inclusions (CAIs) and chondrules -have survived in some meteorite samples to learn about these ancient times. In particular, we can determine how old these components are using lead isotopes, which places constraints on the formation time of our Sun and planets. Finer details can be provided by the isotope 26Al, which is a natural clock because it is radioactive and its abundance declines by half every 3/4 of a million years. By looking at how much of this isotope was present in each object when it formed, we can therefore tell how old it is. However, this chronometer depends on knowing how much 26Al originally existed in the disk and how it was distributed. If we can work these details out, then we can use these data to determine the length of time it took to make CAIs and chondrules, and from this we can work out how long the dusty disk took to start to form planets. Visit the website and check on events and videos and other neat things about meteorites, go to **https://meteorites.ucla.edu**

THE TUCSON EXPERIENCE IS NOT LOST THIS YEAR:
THE SHOWS MUST GO ON [LINE] ™

The Virtual Tucson Experience is coming, January-February 2021. It's a new virtual platform: TheRock.Show. A new virtual gem show experience, TheRock.Show encompasses all aspects of the gem, mineral, and fossil community to create a nicely organized, easily searchable marketplace that you can explore from the comfort and safety of your own home. Hop from tent to tent as you chat with vendors, peruse inventory, and watch live sales. With the Masterpiece.Show, Fossil.Show, Gem.Show, Meteorite.Show and more, this online event will encompass all aspects of the natural sciences! Gem and Mineral Clubs, publications, and other organizations will also have booths, and may even have activities or lectures. Pre-registration is open for vendors and customers; just click the link TheRock.show. Registration is quick and easy, allowing you to log in using your Facebook or Google accounts.

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Mineral of the Month: Featured Mineral Kovdorskite

Formula $Mg_2(PO_4)(OH)\cdot 3H_2O$

Crystal System: Monoclinic

Name Named for the type locality**:** **Kovdor** Zheleznyi Mine (Iron Mine), Kovdor Massif, Murmansk Oblast, Russia

© Irocks

Kovdorskite $Mg_2(PO_4)(OH)\cdot 3H_2O$
Locality: Kovdor Zheleznyi Mine, Kovdor Massif, Murmansk Oblast, Russia
3.5 cm x 3.3 cm x 2.7 cm

© Irocks

Kovdorskite $Mg_2(PO_4)(OH)\cdot 3H_2O$
Locality: Kovdor Zheleznyi Mine, Kovdor Massif, Murmansk Oblast, Russia
3.5 cm x 2.7 cm x 2.7 cm

© Irocks

Kovdorskite
$Mg_2(PO_4)(OH)\cdot 3H_2O$
Kovdor Zheleznyi Mine, Kovdor Massif, Murmansk Oblast, Russia
1.4 cm x 1.4 cm x 0.6 cm

© *Irocks*

Kovdorskite $Mg_2(PO_4)(OH)\cdot 3H_2O$
Locality: Kovdor Zheleznyi Mine, Kovdor Massif, Murmansk Oblast, Russia
1.7 cm x 1 cm x 0.8 cm

© *Irocks*

Kovdorskite $Mg_2(PO_4)(OH)\cdot 3H_2O$
Locality: Kovdor Zheleznyi Mine, Kovdor Massif, Murmansk Oblast, Russia
3.9 cm x 5.2 cm x 3.2 cm

© *Irocks*

Kovdorskite $Mg_2(PO_4)(OH)\cdot 3H_2O$
Locality Kovdor Zheleznyi Mine, Kovdor Massif, Murmansk Oblast, Russia
5 cm x 3.8 cm x 3.3 cm

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Calendar of Events:

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

Due to COVID-19 many clubs have cancelled or changed their show dates. CFMS updates this list if clubs notify them. If you have any questions, please reach out to the contact listed to make sure the show is still taking place

March 13-14, 2021, Arcadia CA
Pasadena Lapidary Society **CANCELLED!**

June 12-13, 2021, Escondido CA
Palomar Gem and Mineral Club
340 N. Escondido Blvd., Escondido CA 92025
Saturday – 10 AM – 5 PM, Sunday 10 AM-4PM
30-35 dealers.
Website: pgmcshow@palomargem.org

MSSC Advertisement Policy:
Mineral-related ads are allowable in the MSSC bulletin. Below is the price per month

Business Card	$5.00
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 !

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 Elsnau	bulletin@mineralsocal.org
Hospitality	Laura Davis	
Membership	Cheryl Lopez	membership@mineralsocal.org
Micro Mount Conf. Chairman	Al Wilkins	
Program and Education	Rudy Lopez	programs@mineralsocal.org
Publicity	Linda Elsnau	bulletin@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. The MSSC is a scientific non-profit organization that actively supports the geology department at Pasadena City College, Pasadena, California. Support is also given to the Los Angeles and San Bernardino County Museums of Natural History. 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. 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 San Bernardino County Natural History 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 $20.00 fee if you prefer paper bulletins mailed to your address. The Society's contact information:

Mineralogical Society of Southern California
1855 Idlewood Rd.,
Glendale, CA 91202-1053
E-mail: *treasurer@mineralsocal.org*

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

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

To:

With Knowledge Comes Appreciation

Your MSSC Bulletin Is Here!

Happy New Year !