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Message from the President

The Gem and Mineral Show is coming up soon! We are all getting excited for it – how about you? We are now ready to start signing up volunteers, soliciting Silent Auction donations, and getting folks enrolled in the great variety of classes!

Volunteering for the Gem Show

As a volunteer, you get free entrance to the Gem Show for all three days! You also make great connections with vendors, students or customers depending on the job you do. The sooner you sign up, the more possible options to choose from: gold panning, dealer dinner, class assistant? Fun, fun and more fun!

Sign up HERE.

As the club's biggest fundraiser to keep the shop going and offer an FLC scholarship, we need Club and community members to contribute time for this event. Sign up with a friend to work a shift then enjoy the show together!

Silent Auction Donations

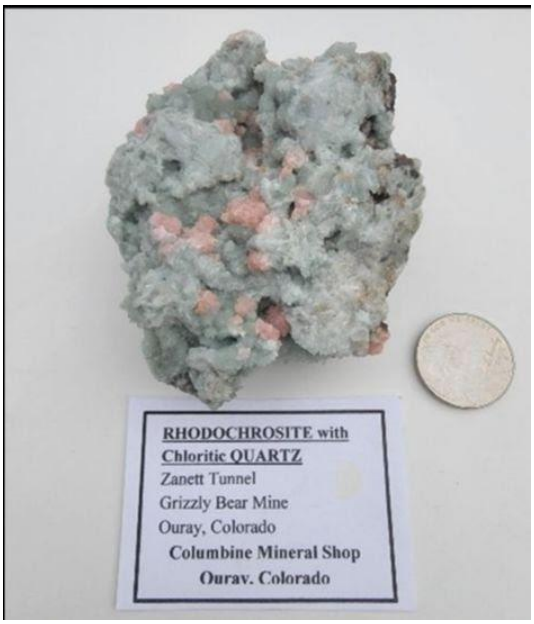
Joleen Porter is organizing the silent auction for the annual Gem and Mineral show

this summer. We **still need donations** for this event. If you have items such as minerals or jewelry you are willing to donate or know of another source, please let Joleen know. We can also accept donations from local business who might offer an item – what connections do you have in town or the area that you could request an auction item from?

If you have an offering, please contact Joleen at joleenporter.mms@gmail.com

Silent Auction Teasers

Ben Kuehling who owns the Columbine Mineral Shop in Ouray donated four specimens for the silent auction for the Gem and Mineral Show. The donated samples are highlighted below to entice you. Top left: rhodochrosite and quartz from the Grizzly Bear mine, Ouray. Top right: amethyst pendant. Bottom left: “Bumble Bee” agate, Utah. Bottom right: polished labradorite.



Upcoming Classes in June and at the Gem Show

We have a new polishing machine – a Genie Grinder from Diamond Pacific! This is for fine polishing and will really make your cabs shine! Randy Ferris will offer a free demo on how to use and care for the Genie on **June 13 at 6pm at the Gem Club**!

Cutting and Polishing Cabochons, **June 26 from 10:00 am to 2:00 pm**
Contact Instructor Joel Arnold for more info or get registered by calling Joel at 970-247-5140 or emailing him at joelrecuerdo55@gmail.com

If you want to know more, visit the Club's calendar at www.durangorocks.org/events.html

Gem Show Classes:

Wire wrapping, Slab painting, Layered Rings and more!

Instructors are donating their time, so the cost of the class is reduced to materials only! There's no better time to try something new! There are 14 classes with a wonderful variety of art and skills to learn and try. Check them out and sign up here.

Upcoming Field Trips

June 11 The Mancos Ammonite Fossils with Ammolite trip, offered by Jama Crawford has three spots left! For more details and to register for the trip use this link: http://www.durangorocks.org/fieldtrips.html

June 18 - If you want to get an introduction to the geology around Durango then join David Gonzales on June 18 from 9:00-10:30 am @ the Fort Lewis College Chapel on the west side of campus. There is a lot of shade at this location, but you might want to bring a lawn chair. This event is free and is intended to give you a general understanding of the geology around the area.

What would you like to see? What can you share with other members? Let us know!

Open Shop Hours

Tuesday 1-4 pm
Tuesday 6:30-9 pm
Wednesday 9am-noon
Wednesday 1-4 pm

Thursday 1-4 pm

Thursday 6:30-9 pm

First & Third Saturdays 10am-2pm

Four Corners Focus

Member Becky Walkden loves agates and shares with us some of her finds and insider info on locations. The June Four Corners Focus will be up on the web site soon. Read the write up here! Thanks, Becky!

A new way to enjoy open shop!!!

Tired of always looking for a crumpled $5 at the bottom of your pocket to pay the Open Shop fee? Now, you don't have to: Punch Cards are here! You can prepay your open shop fees on one convenient card that also gives you one shop visit FREE! The card only costs $45, but you can use it for Open Shop 10 times!

How to get it?

Pay online and bring your receipt to a steward at Open Shop. Or bring a check or cash to an open shop and purchase a pre-paid card from the steward. Easy Peasy!

Rock On: A Play on Colors

"Mere color, unspoiled by meaning, and unallied with definite form, can speak to the soul in a thousand different ways". Oscar Wilde

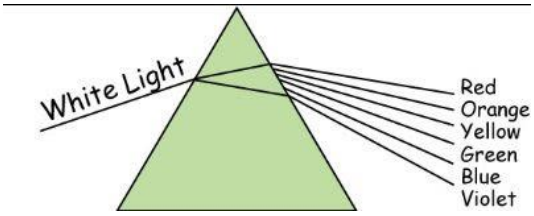
Color is an attractive force that draws humans to desire certain natural materials. Most of the colored objects we experience are created by the absorption of the red, orange, yellow, green, blue, violet energies of visible light. The spectra of light that are not absorbed by an object are

mixed to create the color we observe. Absorption is influenced at the atomic scale. This can include the presence of a certain elements that are an essential part of the mineral composition, a minor chemical impurity, physical defects in the crystal structure, mechanic mixtures of very fine impurities, and presence of finely-spaced structures in the minerals. In this essay I will focus on the different ways that colors can be created by phenomenon aside from absorption.

Before we can discuss different ways that non-absorptive colors are created it is important to establish the concept of light waves. We all know what waves are, and probably the most familiar waves are those produced in water. But light moves in waves also, just on a smaller scale. Just for the sake of thought, imagine we could view waves of light. We would witness a motion similar to waves on water but there will be different colored waves, violet to red. The distance between the crests of violet waves will be less than those for red waves which means that for a given amount of time more violet waves will pass a certain point.

One way that colors can be created in nature is by refraction and dispersion of light. When light travels from air into a substance (e.g., glass, water, mineral) it slows down and the waves of light are bent or refracted. The amount that light is bent depends on the color since violet light is bent more than red. The refraction of light by water drops or ice in clouds creates rainbows, and the spectrum of color presented by prisms are also created by refraction and dispersion. Refraction does not typically create color in minerals but the two images you can witness when you hold a piece of clear calcite over an image is caused by refraction and is called “double refraction”. In this instance light is forced into two atomic paths in which light travels in different velocities expressed by the two different images.

Below you see refraction and dispersion of sunlight by ice crystals in in clouds creating bands of color near Bayfield, Colorado. Photograph by D. Gonzales.



There is another phenomenon that creates colors that most people have observed in soap bubbles, the surface of an oil slick, the wings of black birds, and some specimens of volcanic glass. These colors are not created by absorption but by the process of reflection and interference. Let's focus on the soap bubble for a moment. When light interacts with the outer surface of the bubble some is reflected. Then when the light interacts with the inner surface of the bubble some of the light is again reflected. The light waves reflected from the inner and outer surfaces of the bubble are not travelling together since the outer surface reflected the light before the inner surface. So, when the two light rays interact, a dynamic interplay of interference colors is generated by the simultaneous reflection of light from both the inside and outside surfaces of the bubble. If the inner light waves lag behind the outer waves by exactly a distance of a full wavelength (distance from top one crest to another crest), constructive interference occurs, and those colors are enhanced (brighter). If certain waves of color are out of step by a full wavelength, destructive interference transpires, canceling the reflected light and the color. The colors that are in between these two states create different intensities of a certain color. When all of the available energies mix, it creates a rainbow of colors, interference colors.

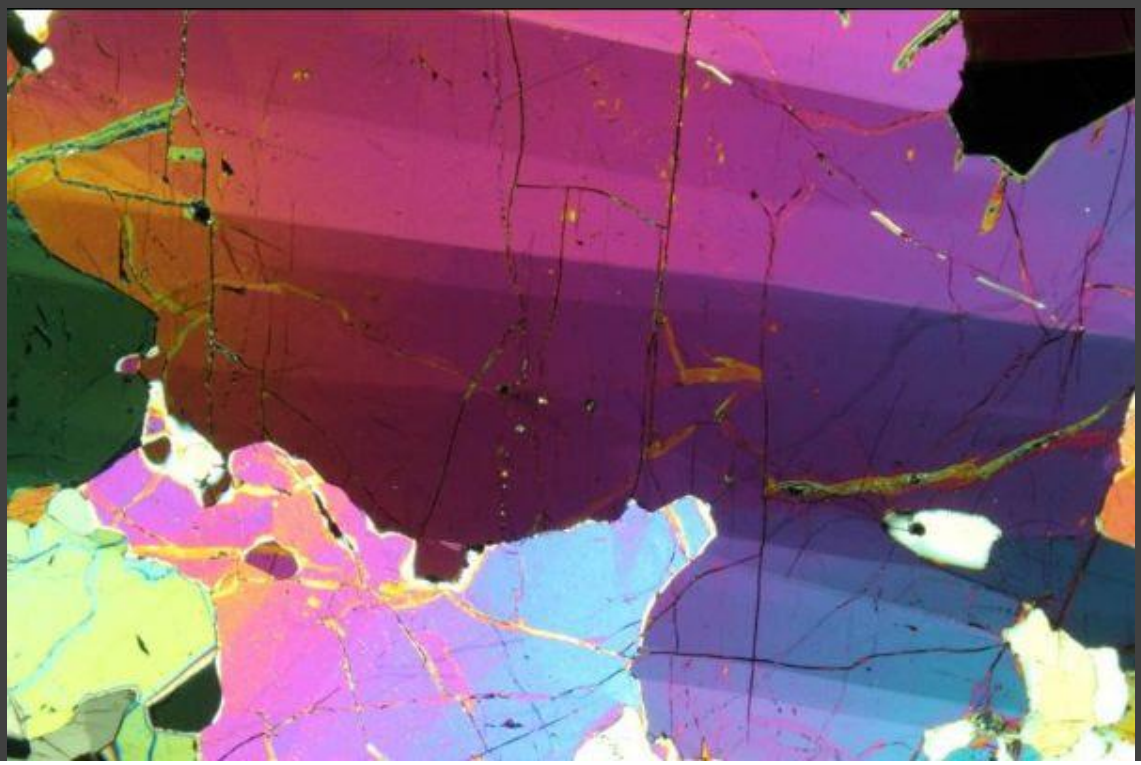
Below you see Interference colors created by reflection and interference of light in a soap bubble. Photograph from https://www.sciencefocus.com/science/why-are-soap-bubbles-rainbow-coloured/

In minerals, this phenomenon is expressed as iridescence on mineral surfaces such as chalcopyrite and bornite. When chalcopyrite is oxidized a thin coating is produced that interacts with light in the same way that a film of oil on water creates a play of colors.

Iridescence or “play of colors” on the oxidized surface of chalcopyrite. Photograph by D. Gonzales.

Interference colors are easily viewed in minerals under a petrographic microscope in which two pieces of Polaroid are aligned at right angles. Minerals that are not isometric or opaque can polarize light into two or three atomic planes where light travels with different velocities and can create interference. You can create this same effect by taking to pieces of Polaroid with the planes of polarization at right angles. Place a thin piece of non-isometric mineral (e.g., quartz) between the sheets and observe the interference colors.

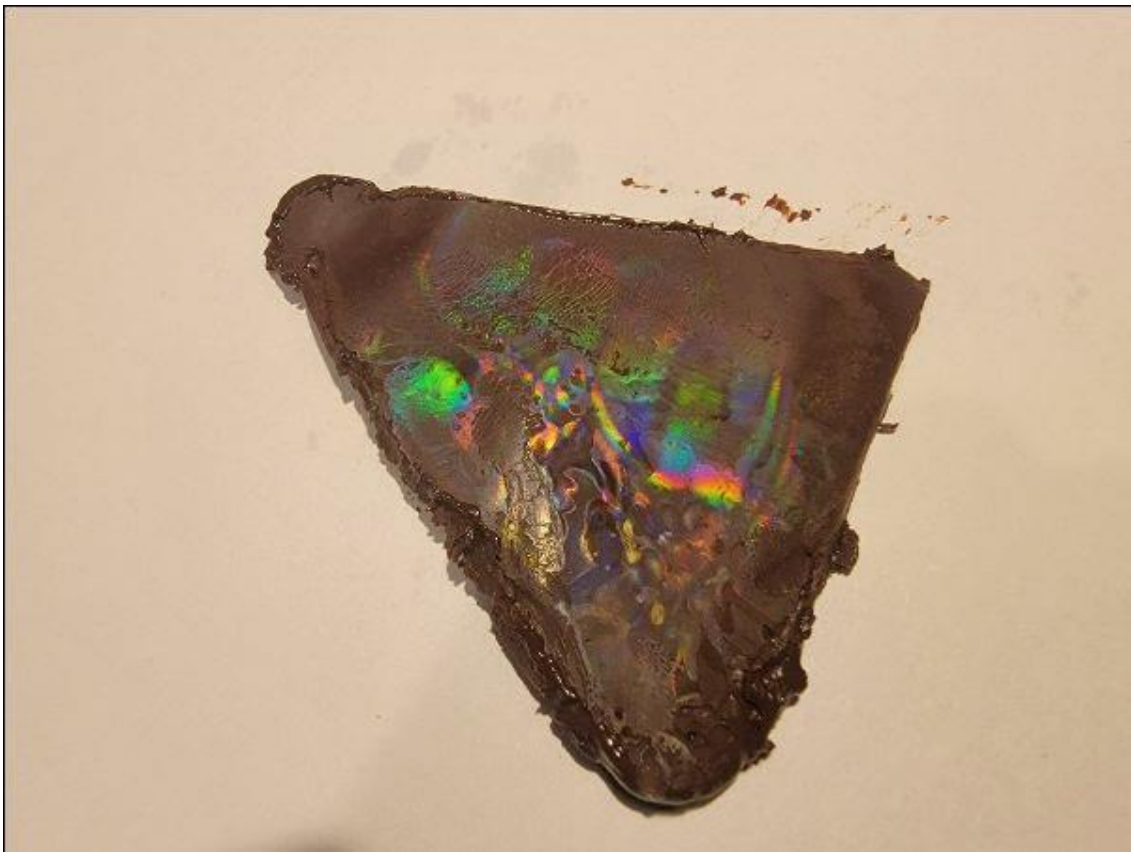
Interference colors in olivine under crossed polarization viewed in a petrographic microscope. From https://www.alexstrekeisen.it/english/pluto/olivine.php



Yet another way that colors can be created is by process called diffraction. Diffraction is a process that happens when light waves interact with an obstacle, an opening or very fine parallel features (e.g., diffraction grating). One way this color phenomenon is presented is on the surface of a CD or DVD. The fine parallel grooves on the surface of these devices interact with the light. Depending on the angle the light strikes the surface a variety of colors

are created. This happens because at different angles the grooves can block out or allow the passage of different energies (wavelengths) of light. If a diffraction grating blocks out the longer wavelengths (red) the violet and blue colors are reflected into our eyes.

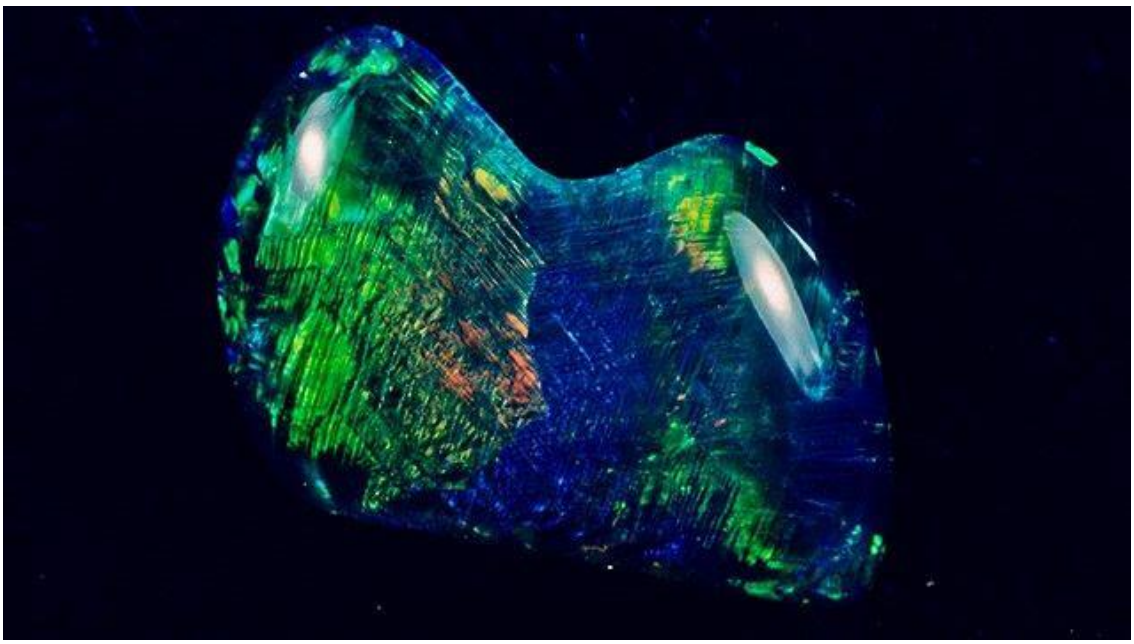
This is a piece of chocolate showing interference colors. My sons, Alex and Jon, created this by placing a piece of diffraction-grating material with 13,500 lines per inch on the chocolate when it was soft. Once the chocolate cooled the diffraction sheet was removed and the fine lines in the surface of the chocolate interacted with light to create a play of colors.



Minerals such as opal and plagioclase feldspar are also diffraction magicians. In these minerals the presence of closely spaced structures interacts with light to produce an iridescence or play of colors. Consider opal which is composed of silicon, oxygen, and water. And, by the way, opal is not a mineral since it does not have an ordered arrangement of silicon and oxygen (crystalline as in quartz) but instead the water causes the silicon and oxygen to form in submicroscopic spheres. If these spheres are random in shape and arrangement then common opal is created (i.e., potch). If the spheres are rather uniform in size and arrangement then light interacts with structure and is forced between the spheres (diffracted) and can then interfere. The colors created depend on the size of the spheres

and thus the space between them (www.webexhibits.org/causesofcolor/15F.html . If the spheres are relatively small (150 nanometers or 6.5 million spheres per millimeter) then violet and blues waves pass through the spaces. Larger spheres (350 nanometers of 3 million spheres per millimeter) produce orange and red play of colors since more of the longer wavelengths are allowed to pass. As the stone is moved in sunlight the angle of the light on the atomic sphere changes and can create a spectrum or flash of color.

Iridescent “black” opal (GIA, https://www.gia.edu/opal-quality-factor).



Some plagioclase feldspar is known for iridescence or play of colors created by closely spaced intergrowths of different composition. A crude analogy of intergrowths or exsolution in mineral is the separation of water in oil. Plagioclase contains both sodium and calcium which can vary in proportions. Under certain conditions the sodium and calcium plagioclase can separate to create microscopic lamellae of one composition in another (e.g., albite in oligoclase = moonstone). The lamellae are very small features, but the repetition of these intergrowths is about the same as the wavelength of visible light, so the lamellae act as a diffraction grating (Nesse, 2017, Introduction to Mineralogy). Of course, iridescence does not occur in all plagioclase and tends to be more common in the calcium-rich varieties. No matter the composition, however, it is the closely spaced intergrowth structures that produce an iridescence of colors with changing angles of incident light (see the display of feldspar minerals below).

Adularescence (play of colors) in moonstone created by diffraction and interference of light

created by intergrown lamellae or layers or albite and orthoclase feldspar. Moonstone Description (gia.edu)

June Birthstone (Gemini, May 21-June 21; Cancer, June 22-July 22)

Pearl, Alexandrite, Moonstone are the three birthstones for June. June is one of three months, along with August and December, with three birthstones.

Pearls are the lone organic birthstone, created inside the tissue of a living saltwater or freshwater oyster or mussel. “Natural pearls form when the mollusk secretes a substance called nacre around an irritant such as a piece of sand or a parasite that has invaded its shell.” The GIA website notes that pearls are associated with purity, humility and innocence and have been considered to give the wearer a “long life and prosperity” and to alleviate number of health issues.

Moonstone, as discussed above, is a type of plagioclase feldspar in which albite and oligoclase form microscope layers (lamellae) that diffract light which interferes to create a play of colors or adularescence. According to GIA, Hindu mythology claims that moonstone is made of solidified moonbeams. “Moonstone is often associated with love, passion and fertility; it is believed to bring great luck.” June Birthstones | Pearl, Alexandrite, Moonstone Birthstones | GIA. Since moonstone is a feldspar, it is associated with felsic igneous rocks such as granite and syenite.

Alexandrite is a variety of the mineral chrysoberyl (Al_2BeO_4) which contains minor amount of Cr3+ that substitutes for the Al3+ in the atomic structure. The chromium ion produces absorption of light energy between the red of ruby and the blue-green of emerald. When viewed in sunlight or in fluorescent light the mineral appears blue and when viewed in incandescent light or the light of a candle it appears deep red (Nesse, 2017, Introduction to Mineralogy). When alexandrite contains certain types of long, thin inclusions are oriented parallel to each other, they can create chatoyancy or the cat’s-eye effect. Chrysoberyl is formed in granitic pegmatite, aluminous mica-rich schist, and dolomite-rich skarn (contact metamorphosed rock). Alexandrite was originally mined in Russia, but most alexandrite today comes from Brazil, Sri Lanka and East Africa. Because it is hard (H =8.5), lacks cleavage, and has a stunning color it makes a dazzling gemstone.

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