



Lake George Gem & Mineral Club

March 2024

----Content----

- [About Us](#)
- [Club Officers](#)
- [To Join Our Club](#)
- [Look Forward to March Meeting](#)
- [Upcoming Events](#)
- [Upcoming Field Trips](#)
- [Pebble Pups & Earth Science Scholars Report](#)
- [Meet Our Neighbors](#)
- [Mineral of the Month Quiz](#)
- [All You Need to Know About Club Field Trips](#)
- [Interesting Reads](#)
- [Rocks in Balance](#)

About Us

The Lake George Gem and Mineral Club is a group of people interested in rocks and minerals, fossils, geology and history of the Pikes Peak/South Park area, Indian artifacts, and the great outdoors.

The Club's informational programs and field trips provide opportunities to learn about Earth Science, rocks and minerals, fossils, lapidary work, jewelry making, and to share information and experiences with other members. Guests are welcome to attend, to see what we are about!

The Club is geared primarily to amateur collectors and artisans, with programs of interest both to beginners and serious amateurs. The Club normally meets on the second Saturday of each month at the Lake George Charter School gym, located on the south side of US Highway 24 approaching the town of Lake George from Florissant. In the winter, we meet at 10:00AM.

From April through September, we meet at 9:00AM, to allow more time for our field trips.

Contact Us

Postal Address

Lake George Gem & Mineral Club
PO Box 171
Lake George, CO 80827

Website

<https://lggmclub.org/>
www.LGGMclub.org

Meeting Location

Lake George Charter School GYM

[Map to Meeting Location](#)

Club Officers

2024 introduces a lot of new faces to our club management team. Following are the LGGMC Officers for 2024. Please reach out if you need any help.

President	Dave Bruess	david@bruess.me
Vice President	Bart Zobel	bezobel@gmail.com
Secretary	Steve Kahler	pipprophet@gmail.com
Treasurer	Cathy McLaughlin	cathy_mclaughlin@hotmail.com
Newsletter	Betty Bowles	bbowles2@gmail.com
Field Trip Coordinator	Dave Alexander	dave@davealex.com
Show Coordinator	Carol Kinate	kinatec@aol.com
Pebble Pups Coordinator	Betty Merchant	betty.merchant@yahoo.com

Club Officer Biography

Each month we introduce one of our club officer by presenting a bio. This month, we would like to introduce you to our Vice President, Bart Zobel.

Bart Zobel is a Colorado Springs native whose interest in rockhounding dates back to grade school. He was a pebble pup in

the Colorado Springs Mineralogical Society and won first place for his display of self-collected specimens at one of the annual shows in Colorado Springs. Bart returned to Colorado after a career as a Chinese translator in the Navy and his interest in rockhounding has rekindled. He has been an LGGMC member for 2 years.

To Join Our Club

Our organization is incorporated under Colorado law as a nonprofit educational organization, and is a member of the Colorado, Rocky Mountain, and American Federations of Mineralogical Societies. We gather monthly as a club to share information including guest speaker presentations, workshops, and rock specimen show and tell discussions. We coordinate and supervise amazing field trips for club members that cover a broad spectrum of geological, archeological, rock, and mineral interests. We also sponsor the annual Gem and Mineral Show at Lake George, where collectors and others may purchase or sell rocks, minerals, fossils, gems, or jewelry.

Annual Membership

Current year membership application and/or renewal and application occurs only during **January 1-March 31**. Membership is closed for the current year after this time and last years membership list will be purged April 1. Please note that all memberships must be current in order to participate on any field trip or to use any club claim.

How to Apply

One may apply for membership in person at our monthly meetings, or visit our club website at <https://lggmclub.org> to obtain a membership application, or go directly to https://lggmclub.org/LGGMC_Member24v.pdf to download the application in PDF format. The application will need to be filled out and submitted to the club along with the appropriate membership dues. The mailing address to submit the application is provided in the [Contact Us](#) section of this newsletter. Remember to get your application in before April 1, 2024!

Annual Membership Fee

Annual membership dues are collected (Jan. 1 through Mar. 31). They are as follows:

LGGMC Annual Membership Dues 2024		
\$15.00	Individual	Age 18 and over
\$25.00	Family	Parents + kids under age 18

Look Forward to March Meeting

Presentation: "Mineral Eye Candy from the Cripple Creek Mining District"

At the Oct 2023 meeting, a report was given on the geology and history of the Cripple Creek district. This presentation will be a follow on to the Oct presentation. Specifically, this will be a hands on look at a relative few specimens (of the overall 125 or so minerals found in the district) that are of a collector's interest. These include such rarities as large amethyst crystals, canary yellow fluorite, creedite with rhodochrosites, as well as spectacular gold and silver tellurides.

So get up close and personal to some of these at the March 2024 meeting and see what Cripple Creek has to offer to the mineral enthusiast!

Guest Speaker, Bob Carnein, Bio

From 2008 to 2024 Bob Carmein was the Newsletter Editor for the LGGMC. In 1970s through 1980s, Bob taught geology at Waynesburg College in southwestern PA. Included in his duties was the operation of the Waynesburg College Geology Field Station, which was housed every summer in a building behind the Thunderbird Motel in Florissant, CO. From 1989 through 2007, Bob taught a wide range of geology courses at Lock Haven University in central PA. He and his wife, Nell, whom Bob met in Lake George, CO, retired to a home near Divide, CO in 2007. Bob has a BS in geology, an MS in glaciology, and a PhD in geology, all from Ohio State University.



Upcoming Events

[Fort Collins Rockhounds Gem & Mineral Show](#)

(March 22-24, 2024)

Featuring agates and CO minerals.

[Daisy Mountain Rock & Mineral Club's Rock & Gem Show](#)

(March 02-03, 2024)

[The 2024 Southern Colorado Rock & Mineral Show](#)

(May 3-5, 2024)

Demonstrations, vendors, presentations, rock auction, live

music, beer garden, kids activities, supply sales, geology clubs, door prizes, food, gold mining tips, & much more!

[Club Meeting Mineralogy 101](#)

(May 11, 2024)

John's Rakowski's popular 101 presentation at monthly meeting will be followed with the club claims trip on the same day. If this day is crazy popular then we will have an overflow trip, which will be on the following Saturday 5/18.

Upcoming Field Trips

Some of our trips are very popular and sign-up list gets filled quickly. To avoid the rush, members present at our monthly meetings get first dibs at signing up for our field trips.

The field trips that we have available for sign-up at the March meeting are as follows:

4/20/2024	SAT	Baculite Mesa
4/24/2024	WED	Arroya Gulch Garnets
4/27/2024	SAT	Arroya Gulch Garnets
5/11/2024	SAT	(after club meeting) then to Club Claims

Pebble Pups & Earth Science Scholars Report- Betty Merchant

The Pebble Pups and Earth Science Scholars talked about Quartz, the different types, chemical compositions and where they are found. They also discussed what is a fossil and how do they form. In March we will be talking about feldspars and

other minerals found in Colorado. In April we will be discussing various land forms and using clay to build cede land forms. In May we will discuss erosion and streams, rivers and how they form.

Meet Our Neighbors

Here is a list of nearby gem, mineral, fossil, and geology club meetings that you may enjoy. Go to each club's website for more information.

[Cañon City Geology Club](#)

Meets on the 2nd Monday of the month at 6PM in the United Methodist Church, Cañon City.

[Columbine Gem & Mineral Society](#)

Meets on the 2nd Thursday of each month, 6:30PM in the

meeting room, Mt. Shavano Manor, 525 W. 16th (at J St.), Salida

[Colorado Springs Mineralogical Society](#)

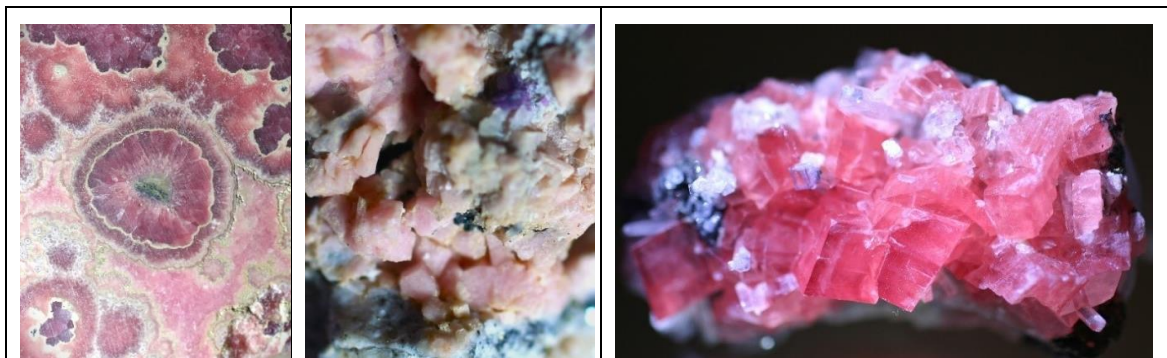
Meets on the 3rd Thursday of each month at 7PM Colorado Springs Christian School, 4855 Mallow Rd, Colorado Springs.

[Pueblo Rockhounds](#)

Meets on the 3rd Thursday of each month at 6:30PM in the Westminster Presbyterian Church, 10 University Circle, Pueblo

Mineral of the Month Quiz - Bob Carnein

The monthly mineral for March is one that Colorado is known for (the specimen to the left is from Argentina; the other two come from nearby). Its attractive color means that many people would like to use it for lapidary work, but the low hardness (around 4) and perfect cleavage mean it



needs protection—for example, it's sometimes made into cabochons. Faceted gems are strictly for display, rather than for wearing. Colorado has yielded what are arguably the best crystals in the world, but the most famous locality is no longer producing. However, with over 100 localities in the state, collectors can still “mine” old collections—some people collect only this mineral. Most mineral collectors from Colorado know this one. What do you think it is?

Last month's mineral: Galena, PbS

Galena is the main ore of lead and is also an important source of silver, which sometimes occurs as tiny inclusion of silver sulfosalts in galena. In some ores, silver may constitute up to 0.5% of the galena - enough to make the galena very valuable, regardless of the lead content. Many newbies have trouble distinguishing galena from sphalerite. The two often occur together, but galena has cubic cleavage and a metallic (silvery) luster. If you look at it with a hand lens, galena and sphalerite are usually easy to tell apart. Crystals are easy to recognize. Galena's are usually simple cubes or octahedrons, or combinations of the two. Watch for galena wherever other sulfides occur. It is usually present, even in small amounts.



All You Need to Know About Club Field Trips - Dave Alexander

FYI, I have been the Field Trip Coordinator for many years and I will be taking a break after this season from this role. Cory Miller has offered to co-coordinate this year with me, I very much appreciate the assistance and opportunity for knowledge sharing.

Volunteer Opportunities

There are many opportunities for volunteers related to field trips that folks should know about. Contact Dave Alexander if you have interest or questions. Several of these roles will assist with managing content on our event website, which I think is a ton of fun and offers creative opportunities without too much technical experience. If you can do word processing and/or email, then editing content on this site should be a no-brainer.

- Field Trip Coordinator - Cory and I are dividing up the work this season. If someone is interested in this position, we'd

love to discuss this and other roles with members; it really helps the club to have a deep bench of understanding around these topics and technologies! I'd be happy to get others involved.

- Individual Trip Coordinator - This role will work with the Coordinator leader(s) and will be in charge of coordinating individual trips. This includes getting permission when necessary and setting up a date for the trip. Finding a leader (could be themselves or someone else) is a big part of this role and the Field Trip Coordinators will help as necessary. This role may or may not add individual trips to the website, depending on their comfort level with the website technology. One important note about this role, the individual trip coordinator does NOT have to go on the trip. There have been people interested in helping with field trips but unable to go on them for a variety of reasons. We've shaped this role such that many folks can participate each season, and they don't have to go on the

trips; which may be great for members that are recovering from an injury and still want to volunteer for trips, for example. The more folks we get trained in this role the more resilient the club is; we have many members helping in this way each season and could use more!

- Individual Trip Leader - We always need leaders; these are folks that will be going on the trips. The "extra" stuff they do includes answering member questions leading up to the trip, reconciling the participant list to who shows up (and providing that info to the Coordinator afterwards), working with the mine operators, caravanning from the meeting point to dig site, etc. Obviously, this role is required to be on the field trip.
- Website Administrator - This person manages the field trip website, answers technical questions Website Administrator - This person ma and works with application developer, if necessary, manages security, helps train others especially around content management, helps with user issues, help developer with validating website upgrades and new features, etc..

How Field Trips Work

Believe it or not, field trip season is rapidly approaching; it's what we've been waiting for! We have a couple of processes we use for managing participants for our events and I wanted to ensure you knew these so you could do your best to get on the trips you desire for this season. I'll include some tips and tricks that we've figured out over the last many years as well.

Overview of field trip event participation

We utilize the Tectonic Treks application for all club membership and event management. This amazing application was written specifically for our club to manage our membership and event management processes. This software makes our volunteers' lives much simpler, which is exactly what computers should do for us! Although we do offer manual club applications for those that want to pay with check, we generally want everyone to utilize this website for all things membership and all things field trips. Thus, you will need to register in our website application as it will be the only way for you to participate in field trips.

You can get to our event website in two ways:

1. Go to <https://LGGMClub.org> and then choose "Field Trip Signup" link
2. Go directly to the field trip event website, <https://FieldTrips.LGGMClub.org>

Okay, lots of information will follow. Let me summarize the most important stuff:

- If you have questions on if a trip is going to be too difficult for you, contact your trip leader in advance
- If it ends up you can't go on a trip, unregister as soon as possible
- If you can't go on a trip but don't know this until the morning of the trip, please give a courtesy text message or phone call to your trip leader
- Utilize the tools and information we provide on every trip to help plan your journey, make sure you add some contingency time for your travels.
- Please be on time!
- If the trip requires something of you please have that completed before the event. For example, on many trips you will have to read a mine's safety briefing and sign a waiver to bring with you. These requirements will be listed in the trip's details, so make sure and carefully read through all the trip details.
- Make sure your vehicle is ready for the trip, especially ensure your spare tire is in good shape and your jack is functional!
- Ensure you are receiving our email notifications, add our email to your "safe sender" list(s)
- Consider volunteering as a trip leader
- Attend monthly meetings for the best chance to attend popular field trips
- For both **new and existing members**, please read the Field Trip Rules and Code of Ethics guides immediately, before you sign-up for your first trip. I can tell by some of your questions when you haven't read these **required** documents! These quick and yearly required reads are located on our websites, specifically in the "Club Events" section.

Field Trip sign-up process and rules

- Our club is very large and events likely will fill up and have waitlists. For all trips that we expect to fill up, we offer an "early" sign-up for these events at our monthly meetings—so coming to the monthly meetings not only is a ton of fun, it's the best way to ensure you get a good place in line for field trips. Our software will tell you what date each trip is available to sign-up via the website—we target the Monday following the monthly meeting, so you can deduce what monthly meeting each trip will be available for early sign-up. As long as the trip is confirmed (you will know it is confirmed if we have a date, meeting location, and field trip leader assigned), you should be able to mark your calendar on when web registration will open up, however we reserve the right to change this date last minute—although that is rare. *PRO-TIP: Come to monthly meetings for best chance to not be waitlisted for trips.*

- There are some field trips that we will not offer an early sign-up for, these are typically out-of-state trips where we historically we do not reach the attendance limit. For these trips, we open them up for website registration as soon as we confirm the trip; we don't delay registration on these as we know members often will need to coordinate with their family/work, get lodging accommodations firmed up, etc. well in advance of the trip. We also do this in case we end up having a lot of extra space; we sometimes invite other clubs to join us on these trips. The website will send an email notification when we open up these trips.
- You will know a trip is confirmed if we have a date, leader and meeting point all documented...all three are required to have a confirmed trip. If the trip is not confirmed, please consider volunteering to lead the trip as that is often what we are waiting for. If you see TBD in the leader or meeting point for a trip, it is NOT confirmed and you will not be able to fully trust the details of the trip yet, especially its tentative event and registration availability dates. Early in the season we are still working on finalizing our trip schedules and getting leaders; so be patient as we work through each trip and finalize them—some could take a while to confirm all the logistics, and some field trips may be cancelled as we determine we can't visit that locality for whatever reason.
- If we don't have a leader for the trip it eventually will be cancelled. We are 100% volunteer organization and thus member involvement is what makes it all happen. Please consider volunteering, we have processes to get you up to speed before you lead by yourself, and generally leading is a lot of fun and not much more work than just being a participant. Let your trip leader know if you are curious about leading and they can show you what it takes, or contact one of the Field Trip Coordinators (Cory & Dave).
- Some trips are limited in the number of participants offered for a variety of reasons. If we get more people to sign-up at a meeting than are allowed on the trip, we will automatically create a lottery-based selection process and randomly (we pull members names out of a hat) create the line. When that trip opens up for web sign-up, all folks requesting to participate will be added to the waitlist. PRO-TIP: It is wise for you to validate your place in line if you signed up at a meeting. We try to have all participants that signed up at a Saturday meeting into the application by that Sunday evening; contact myself or Cory if you have any issues or questions with your sign-up for that trip (sometimes we can't read the illegible details on the sign-up sheet, sometimes we make a mistake when manually entering all these details). When signing up, please print legibly.
- Please read through the trip details and ensure you will be comfortable on the trip. We mark the complexity and

requirements of the trip and sometimes the hike or terrain is not suitable for folks healing from injury or with health problems. If you have questions on the trip please ask. If you have a lowrider vehicle you may want to ensure with the leader that the roads won't be an issue for your vehicle. There are almost always carpooling opportunities with other members which you can arrange prior to the event, or at the meeting point.

- This is the most important rule, it deals with unregistering if you can't go on the trip:
- When you sign-up for a trip, we ask you be mindful that there are likely other excited people in the waitlist behind you in line. They are just as excited (if not more so) to go on the trip as you are! If you do not go on the trip, yet you stay registered, you end up being a "no show". This is a huge bummer for those that were waiting in line behind you because you've left an empty slot that could have been filled.
- As soon as you realize you cannot participate, regardless if you are waitlisted or registered, please Unregister for that trip via the website using that quick button/feature. This will automatically trigger the waitlist process to run and those next in line will likely be registered. *Note that trip leaders and coordinators cannot unregister you, you need to do it yourself.* There may be a reason you can't unregister yourself, if that is the case contact your trip leader via the website or on their phone.
- I'm focusing on this because it has been historically a huge problem. It REALLY sucks when we have a waitlist for a trip and there are no-shows...it sucks for not only the club members in line behind you, but also for the Mine that is expecting a certain number of participants that we've RSVPed. We keep an eye out for repeat no-show offenders and those folks are subject to disciplinary actions.
- When you are waitlisted for an event, as participants unregister and free up available participation slots in line in front of you, you (and your associated family) will be bumped up in line. As soon as there are enough open slots to allow your party to join the trip it will automatically occur. The website will send you a notification email when this happens. We have observed that for many events there is quite a bit of last-minute (week-of) waitlist activity, which is exciting for those waitlisted; there is more turn-over than you'd expect so keep your hopes up! Keep an eye on your email and the website during the week of an event you are waitlisted on! We built the software to proactively send a reminder to *everyone* registered several days prior to the event. We have found this gentle reminder helps people that may have forgotten they registered, or they realize they have a schedule conflict, to unregister and ultimately helps

prevent no-shows. PRO-TIP: If you are waitlisted, keep a close eye on your email and your website "profile" page in the week leading up the event.

- If you want to cross your fingers and hope for a last-minute waitlist change, you may get lucky as we get a lot of waitlist movement on events. It can happen even up to the day before the event. Please be prepared for last-minute notification (via email, check your Junk folder) that you've been added as a participant from the waitlist. Once you decide you don't want to go, even if the day prior, please remove yourself from the waitlist giving those in line behind you their opportunity. The deadline for anyone to unregister is 11pm the night before the event. After that time don't worry about unregistering yourself as its too late for waitlist action, instead give a courtesy phone call or text message to your leader and they will take note that you called instead of just no-show. NOTE that your leader gets an email with only those registered (not on the waitlist) at 11pm the night before the event; *any and all registration changes and waitlist information that occur after this deadline the leader will not be aware of!*
- PRO-TIP: BE ON TIME to the meeting location! Some leaders leave RIGHT on time, others may wait a few minutes to hopefully include those that are not there on time. Assume all leaders leave on time, and thus please be on time! To help you with being on time, we've added the Google Maps widget within each field trip event that details a pin where the meeting place is. Use the "Navigate" feature

to give you directions and estimated travel time, and then add some contingency and plan your departure time accordingly. We created this Maps widget to navigate you directly to the meeting point on the day of (since most folks will have a cell phone, our app will automatically launch Maps with the meeting point directions for you). We made it simple to be on time, the rest is up to you! Quick story, it happens many times every year, folks don't look at the meeting point or map close enough and end up at the wrong meeting place; this is easy to avoid if you use our map feature.

- PRO-TIP. *Ensure you are enabling our email notifications to reach your inbox.* Ensure "noreply@lggmcFieldTrips.com" is a safe sender. This is critically important for you to receive updates from the website. If you use "Apple" based email services (@iCloud.com, @Apple.com, etc) ensure you tag our email into an "important" category. At the beginning of the season, I will see all the bounced/blocked emails and will notify you if you are in that situation, keep an eye out for emails from me (dave@davealex.com). Likely your only notification on waitlist movement or cancellations will come through email so its important you are receiving them.
- PRO-TIP: You can quickly see what trips you are signed up for on the website in your Profile's My Event section.
- PRO-TIP: You can ask questions about a field trip directly to the leader by using that "Ask a Question" feature on every event.

Interesting Reads

In this section, we provide some fun rock, mineral, and geology news and information to enjoy from several of our favorite magazines.

From Rock Seeker

Good morning! When I was a kid, we had one of those big stand-up deep freezers. You know, the ones you store all the extra meat and freezer jam in. One day, for whatever reason, I thought it'd be a good idea to stick my tongue on the ice that was starting to form on the freezer shelf. Needless to say, the story ends with me being in a lot of pain and a brand spanking new wound on the tip of my tongue. In this first article, I'm going to share another story with you about the dangers of putting your tongue on things it doesn't belong...rocks.

IN THE SPOTLIGHT There are many people in the rockhounding and geology community that lick rocks. They do it for a variety of

reasons. And I know this topic can be a bit controversial depending who you talk to. But I just want to share with you a few of the reasons why it might not be a good idea to do it.

The Dangers of Licking Rocks: And a Real Life Cautionary Tale



The Dangers of Licking Rocks: And a Real Life Cautionary Tale

WHAT'S THIS ROCK? Not much is known about it other than it is mostly clear and has blue coloration around the "cracks" and a few slight rainbow refraction areas. Think you know what it is? You can find the answer here.



VIDEO OF THE DAY There are many forms of agate out there, but perhaps none quite as beautiful and mysterious as fire agate. It's a favorite among collectors, myself included...and you'll see in this short video from AZ

Rockhound Expeditions exactly why! This Fire Agate Displays One Intense Fire Storm!



This Fire Agate Displays One Intense Fire Storm!

Rocks in Balance – A Closer Look at the Marvels of Precariously Balanced Rocks - Steven Wade Veatch

Balanced Rock, in Colorado Springs' Garden of the Gods Park, is an example of a type of geologic feature called "precariously balanced rocks," or PBRs. These interesting rocks are common in the American West, where dry climates preserve them. They are also found worldwide in other climates.



Figure 1. Balanced Rock is a famous PBR in the Garden of the Gods Park, Colorado Springs, Colorado. The rock appears to defy gravity by balancing on a small base. This rock is an erosional remnant of the Fountain Formation. Photo date 2021 by S. W. Veatch



Figure 2. An old postcard view of graffiti-covered Balance Rock, Pittsfield, Berkshire County, Massachusetts. A creation of the last glacial era, this 25 x 15 x 10-foot boulder balances on a small rock below it. Postcard circa 1902. From the collection of S. W. Veatch.

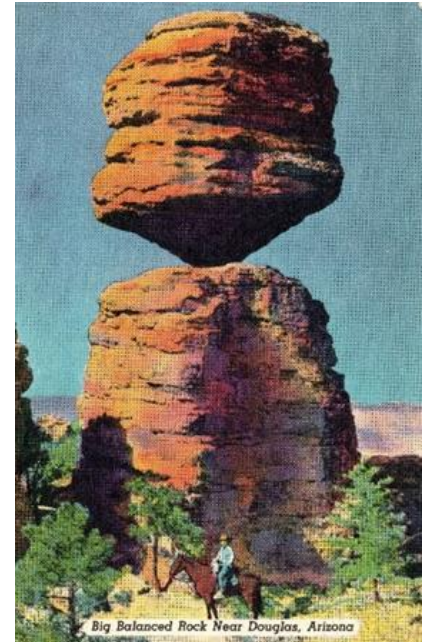


Figure 3. Big Balanced Rock Near Douglas, Arizona. Postcard circa 1948. From the collection of S. W. Veatch

PBRs can vary in size from small boulders to massive stone monoliths weighing thousands of pounds—and many are precariously perched on a pedestal. They look like they could topple over in a strong wind.



Figure 4. Balance Rock, Idaho. Postcard circa 1940s. From the collection of S. W. Veatch.

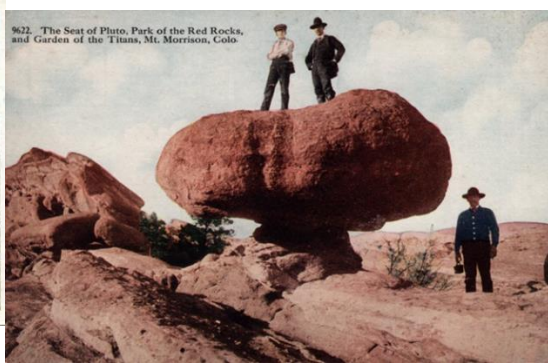


Figure 5. An old postcard view of the mushroom-shaped "Seat of Pluto" rock formation in the Red Rocks Park, Morrison, Colorado. Postcard circa 1912. From the collection of S. W. Veatch.

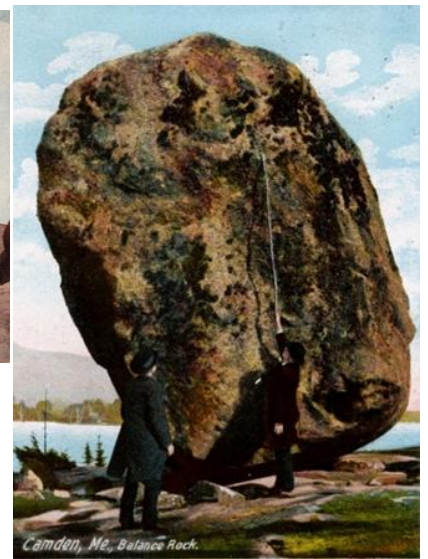


Figure 6. An old postcard view of Balance Rock, Camden, Maine. This glacial erratic is located on Fernald's Neck peninsula near Lake Megunticook. Postcard circa 1910s. From the collection of S. W. Veatch

People have long been fascinated by PBRs. In the past, certain cultures linked these rocks to spiritual or supernatural realms and used them in religious rituals. Balanced rocks also held spiritual significance in Native American culture as markers for guiding mystical journeys. They were also used by early Anglo settlers as they made their way to new homes in the west. In addition to their spiritual significance, PBRs have become popular tourist attractions, and in many cases are surrounded by parks where tourists come to see these incredible geological wonders and marvel at their implausible balancing acts.

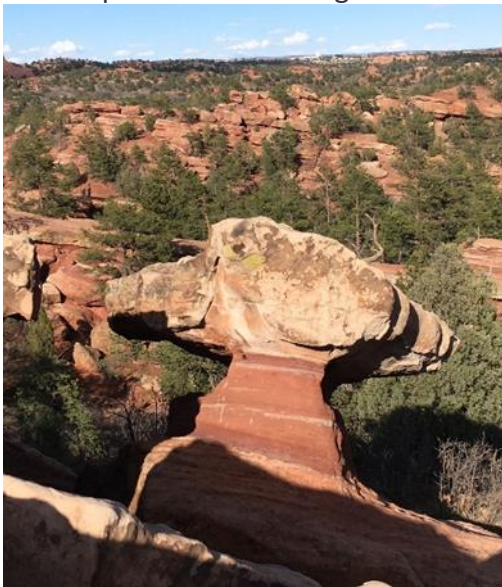


Figure 7. A sandstone PBR at Garden of the Gods, Colorado Springs, Colorado. Photo date 2020 by L. Canini



Figure 8. A sandstone PBR at Red Rocks Open Space, Colorado Springs, Colorado. Photo date 2020 by L. Canini.

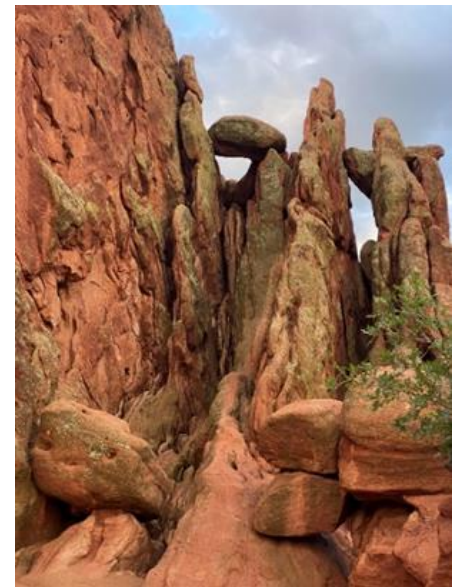


Figure 9. A sandstone PBR at Garden of the Gods, Colorado Springs, Colorado. Photo date 2020 by L. Canini.

PBRs are formed in several ways. Some PBRs result from weathering and erosion. When water percolates through fractures in rock, those fractures can grow and ultimately break the larger rocks into several smaller pieces. Over thousands of years, as erosion lowers the ground level, the rocks are exposed at the surface, and are frequently stacked on top of one another. Weathering and erosion of the exposed rock by wind, rain, and relentless cycles of freezing and thawing removes rock material around the balanced rock, leaving the harder rock behind. Over time, a rock pedestal is formed as the softer material erodes away, leaving only a small base of support protected by the more resistant rock.



Figure 10. A sandstone PBR at Palmer Park, Colorado Springs, Colorado. Photo date 2020 by L. Canini.

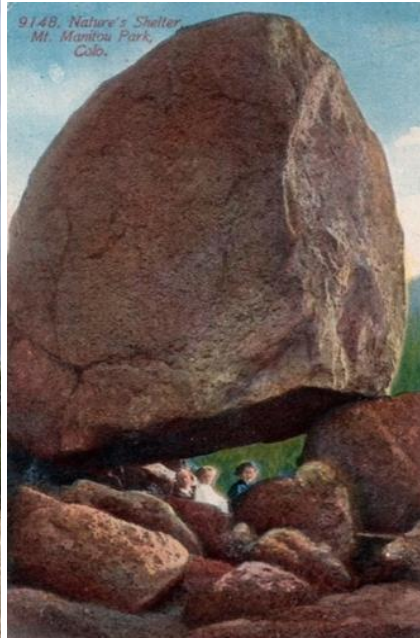


Figure 11. A PBR in Mount Manitou Park, Colorado. A large boulder of Pikes Peak Granite has moved downhill and rests on a smaller boulder. Postcard circa 1912 from the collection of S. W. Veatch.

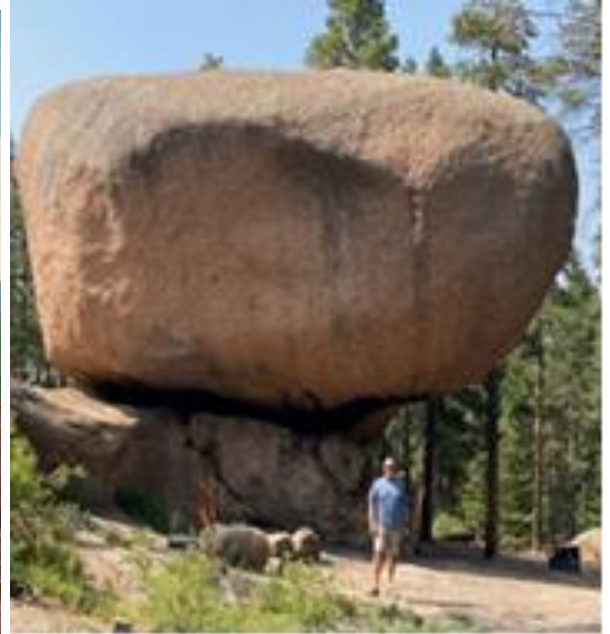


Figure 12. A granite PBR. Devils Head area, part of the Rampart Range of the Rocky Mountains of Colorado. Photo date 2020 by L. Canini.

A glacier can create a PBR when it snatches up a boulder and carries it away in the moving ice. When the glacier melts, it drops the entrained boulder onto its new location (see fig. 2, 6, and 15). Glacial meltwater then removes the softer till and outwash, leaving larger rocks (erratics) perched on smaller rocks. Gravity is another way of creating a PBR when it pulls a larger rock down a slope that comes to rest precariously on another rock or rocks (figure 11).

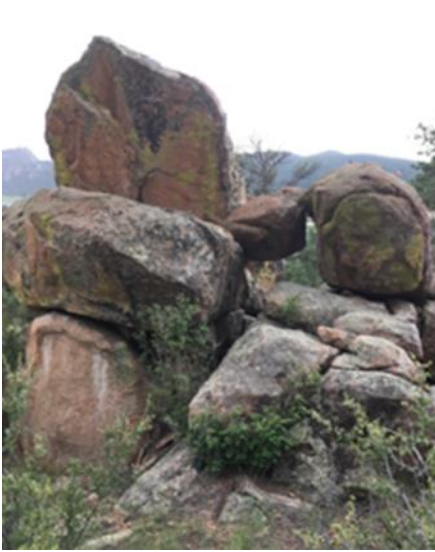


Figure 13. A PBR perched on granite at the Lake George Community Park, Lake George, Colorado. Photo date 2020 by L. Canini.



Figure 14. This PBR is made of an egg-shaped piece of Pikes Peak Granite and is located on Ute Lakes Fishing Club property, about 6 miles north of Divide, Colorado. The 1.08-billion-year-old Pikes Peak Granite often forms rounded and even dome-shaped structures as it erodes. This is due to three main factors: ice, water, and the release of pressure from the overburden. Photo date 2020 by S. W. Veatch



Figure 15. A balanced rock on Azure Mountain in the Adirondacks. This glacial erratic was set in this precarious position by a continental ice sheet about 19,000 to 14,000 years ago as the ice gradually melted. Photo USGS, Public Domain

PBRs are not only fascinating sights, but by remaining balanced, reveal a lack of regional seismic activity from the past (Rood, et al., 2020). These balanced rocks also indicate the maximum intensity of past earthquakes (Brune, 1996; Imbler, 2020). By collecting data on PBRs, seismologists examine uniquely valuable data on the rates of rare, large-magnitude earthquakes.

Over time, erosion, weight changes, or earthquakes will cause PBRs to topple. Tragically, acts of vandalism can destroy PBRs, as seen in 2012 when a scout leader and a friend pushed over a small PBR in Goblin Valley State Park in Utah (Botelho and Watkins, 2014).

PBRs show the power of nature and add to the incredible beauty that is found in the natural world. These rocks are a reminder that the forces of nature can transform even the most stable objects. Whether seen as cultural artifacts, geological curiosities, or sources of seismic information, precariously balanced rocks never fail to fascinate and inspire awe.



Figure 16. A PBR stands as a lonely sentinel in Arches National Park, Utah. Photo date 2013 by S. W. Veatch.

Acknowledgments

The author greatly appreciates the help of Laura Canini of the Colorado Springs Mineralogical Society, who provided interesting discussions and photos of Colorado PBRs.

References and Further Reading

Botelho, G. and Watkins, T., 2014, Ex-Boy Scout leaders involved in pushing over ancient Utah boulder charged. Retrieved from CNN <https://www.cnn.com/2014/01/31/us/utah-boulder-boy-scouts/index.html> on January 29, 2023.

Brune, J. N. 1996, Precariously balanced rocks and ground-motion maps for Southern California. *Bulletin of the Seismological Society of America*, 86 (1A): 43–54.

Imbler, S, 2020, Why Scientists Fall for Precariously Balanced Rocks, Atlas Obscura, January 9, 2020, Retrieved from <https://www.atlasobscura.com/articles/precariously-balanced-rocks?fbclid=IwAR2DS3LCMGd0xYlw9OXG3lgCDelTgWNgpTA2Er7tnNzEompibGCbnXNIHN0> on October 1, 2022.

Rood, A.H., Rood, D.H., Stirling, M.W., Madugo, C.M., Abrahamson, N.A., Wilcken, K.M., Gonzalez, T., Kottke, A., Whittaker, A.C., Page, W.D. and Stafford, P.J., 2020, Earthquake Hazard Uncertainties Improved Using Precariously Balanced Rocks. *American Geophysical Union Advances*, 1: e2020AV000182. Retrieved from: <https://doi.org/10.1029/2020AV000182> on 10/01/2022