



**Denver Gem & Mineral Guild**  
**Founded March 1964**

1420 S. Reed Street  
 Lakewood, Colorado, 80232

AFMS Silver Medal Club 2016



*President - George Daggett*  
 720-488-5692

*Vice President - Sarah Reece*  
 303-263-9906

*Secretary - Pro-tem*  
 Marj Becker

*Treasurer - Debbie Baldwin*  
 303-377-4211

*Hospitality - OPEN*

*Editor - Beth Simmons*  
 303-986-9693

*Grab Bags - Joe Walkowich,*  
*Joe Payne, Kathy Honda*  
 720-272-8806

*Field Trips - Committee*

*Show Chairman - Beth Simmons*  
 303-902-1708  
*Dealer Chairman*  
 Linda Burns  
 303-263-0391

*Membership - Merlin Schreffler,*  
*Sue Childs*  
 303-791-2102  
 303-988-8958

*Ways & Means - Dave Sanchez*  
*Gideon Breithaupt, Sandra Lucero*  
 303-238-8344; 720-989-7202  
 Dave Sanchez  
 303-423-5206  
 Sandra Lucero  
 303-726-3829

*Historian - Kathy Honda*

*Web Master - Bob Johnson*  
 303-985-8167

*Claims Manager - George Daggett*  
 303-404-9944

## TIPS & CHIPS

[HTTP://WWW.DENVERGEM.ORG](http://www.denvergem.org) OR  
[HTTP://DENVERGEM.ORG](http://denvergem.org)  
 AND NOW FACEBOOK!!!

July 2020

# FIRST TIME IN HISTORY!

## DGMG PICNIC CANCELLED OR POSTPONED TIL SEPTEMBER

Reporting the results of the vote taken regarding the DGMG summer picnic on June 20, 2020

On Tuesday, June 30, 2020, Beth Simmons sent an e-mail to all members who have e-mail addresses requesting that members respond with their wishes regarding the 2020 DGMG summer picnic. And, that the response should be to Beth by the end of this Tuesday, June 30, 2020. By **8:31 pm**, twelve (12) members had responded: nine (9) members voted to postpone the picnic (perhaps, until September); three (3) members voted to hold the picnic as usual. Postponing the picnic seems to be the best consideration for the persons returning the vote. Scheduling the picnic for September 2020 will be revisited in August to evaluate whether or not a picnic can be held safely dependent upon the status of COVID 19, at that time.

Marj Becker

Secretary Pro-Tem



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## 57 years of DGMG Kudos, Celebrations, & Events

### 2020 DGMG Officers & Chairmen

**President::** George Daggett  
**Vice President:** Sarah Reece  
**Secretary:** **OPEN PRO-TEM:** Marj Becker  
**Treasurer:** Deb Baldwin;  
**Treasurer Assists:** Beth Simmons  
**Hospitality:** **OPEN**  
**Ways & Means:**  
 Dave Sanchez, Gideon Breithaupt, Sandra Lucero  
**Membership:** Sue Childs; **Ass't.:** Merlin Schreffler  
**Claims Manager:** George Daggett **Ass't.:** Susanne Peach  
**Editor:** Beth Simmons; **Ass't.:** Marj Becker  
**Historian/Librarian:** Kathy Honda  
**Webmaster:** Bob Johnson  
**Show Chairman:** Beth Simmons  
**Dealer Chairman:** Linda Burns  
**Field Trips:** Committee  
**Grab Bags:** Joe Walkowich, Joe Payne, Kathy Honda  
**Merchandiser:** Sandra Lucero  
**Council Rep:** Kathy Honda; **Alt.:** Linda Burns  
**Denver Show Rep:** Kathy Honda  
**Sunshine:** Sandra Lucero  
**Party planning:** Deb Baldwin, Marj Becker  
**RMFMS Rep:** Kathy Honda  
**Outreach:** Susanne Peach; Bob Johnson  
**Inventory manager:** Linda Burns

An "Assistant" is the officer's backup in case of illness or other reason they can't do their job.  
 Every officer needs an "Assistant"!  
 Join up! Say YES when asked!

### July Birthdays:

Marj Becker  
 Janie Bennett  
 George Franz  
 Stephen Marsh  
 LJ O'Malley  
 Dante Panciocco  
 Donna Rhodes  
 Evelyn Snow  
 Tyler Strand  
 Lauren Tremper  
 Christopher Van Cleave  
 Thomas Walls

Dan White

### July Anniversaries:

Angela Garcia/Calvin Smith  
 The Howie Houks  
 The Zully Loos'



### July Sunshine Spotlight

CONTACT **SANDRA LUCERO** 303-726-3829  
[gardengal001\(@\)yahoo.com](mailto:gardengal001(@)yahoo.com)

TO  
 INFORM HER OF SUNSHINE REQUESTS

**HOPE EVERYONE IS WELL!**



**NOTE: NO EMAILS ON FRONT PAGE**

There is a scammer somewhere who has apparently taken email addresses off newsletters that were posted online. And it happened to us, too! So I'm taking emails out of the newsletter or changing them slightly with (around the @). We will be posting the new member rosters in our secret place on the webpage after the virus scare ends and things settle down.

### Quote of the months:

**DON'T STAY HOME!  
 GO PLAY WITH ROCKS!**

### THE DENVER GEM AND MINERAL GUILD—57 Years old!



*Founded in 1964, the Denver Gem and Mineral Guild pursues exploration, experimentation, and education in the earth sciences; the discovery, development and preservation of minerals and mineral deposits; and the advancement, encouragement and utilization of the principles of art and craftsmanship as applied to gems and minerals.*

*The Guild meets on the second Friday of the month at 7:30 pm at Berthoud Hall on CSM Campus, except for June, July, August, and December. Picnics, field trips, and parties replace regular meetings those months.*

*Deadline for article submission for the Tips & Chips is the 20th of each month. Email photos and articles to editor Beth Simmons at [cloverknoll@comcast.net](mailto:cloverknoll@comcast.net). Exchange with other newsletters is invited, and reprinting of material from this newsletter with proper attribution is encouraged.*

# 2020 DGMG CALENDAR OF EVENTS

**A persistent page—watch monthly for additions! PUT THIS ON YOUR FRIDGE!!!**

## 2020 Calendars STILL FOR SALE!

**Only about 10 copies left!**

**\$10— stunningly beautiful!**

**Proceeds go to DGMG Scholarship Fund  
to CSM Geology Department**

**See article in this issue about the  
Dropbox instructions for submitting  
photos for the 2021 calendar.**

## 2020 DGMG Show Report

by **Beth Simmons**, Show Chairman

**As of July 1, no progress has been made  
on the show for next year. The world has  
enough problems at this time.**

## CONTINUING EXCITEMENT?

**MAYBE WE'LL GO TO SALIDA IN JULY!**

**JULY 10-12 2020**

**FIELD TRIP—SALIDA: JOHN AND DONNA RHOADS  
MORE DETAILS FORTHCOMING**

**WE WILL NOTIFY THE CLUB BY EMAIL IF THE SALIDA TRIP GOES!**

## WE'LL SEE!

**ALL SUMMER GEM AND MINERAL SHOWS ARE  
CANCELLED, INCLUDING THE WORLD-FAMOUS  
BUENA VISTA ROCK SWAP AND THE LAKE GEORGE  
GEM AND MINERAL CLUB SHOW IN AUGUST.**

## 2021 DGMG Calendar

The DGMG Calendar is yet another way that DGMG members can strut their (photographic) stuff! The sponsorships essentially pay the printing bill, so the proceeds from the sales go to the CSM Scholarship Fund.

And it's already that time of year again to submit your pictures for the 2021 DGMG Calendar!

This year, Caleb Smith (who does the amazing job of designing our annual calendar) has asked that we rename each photograph with the following format - "FirstNameLastName.PhotoTitle.filetype" i.e. "Robert.Johnson. AmethystRose.jpg". That will assure that he can properly title and credit your photo in the calendar.

Please upload your pictures to the **2021 Calendar** Folder in DropBox. Invitations to that folder were emailed to all of last year's contributors on 4/25/2020. If you cannot find your invitation, or if you are a new contributor, please contact [MineralGuild@Gmail.com](mailto:MineralGuild@Gmail.com) to request access. If you do not receive a timely response to your request, or you need further assistance, please Call Bob Johnson 720-514-0266. When you open the folder, please create a new folder within it and give it your name, then upload your pictures to that folder.

We look forward to seeing **YOUR** amazing photos in next year's Calendar!

## PRESIDENTIAL MESSAGE

I'm sorry I was on a two-week road trip and missed Linda Burns' field trips to Joe Dorris' topaz mine and his Smoky Hawk claim. Those are two of my favorite places and it pains me to have missed them. Getting out into the wild and learning from our seasoned pros, like Linda, is a basic core value of belonging to the Guild. These sites are huge and there is automatic safety from social distancing since very few rock hounds want another invading their personal space. Please, people, take advantage of our field trips. You'll enjoy the camaraderie, scenery, and the rocks! The next trip would be the weekend of July 11 and 12 to visit Donna and John Rhoads at their home in Salida, but we have not been able to firm it up. We might want to reschedule for later in the year when more is known about the progression of coronavirus in our neighborhood. Stay healthy and happy in the meantime.

With rocks in the head,

George!



## MINERALS IN THE ROUND

by

George Daggett, DGMG President

I've been creating "mineral rounds." I took a bunch to Michigan, Wisconsin, and Iowa and gave them to friends and family. People loved them. They are about the diameter of a quarter and approx. 6 mm thick.

I put circles on slabs, trim around the circles and rough out the circle on a grinding wheel. Then I finish shaping and polishing the edges on the flat lap. Then I mount the round onto a Dremel tool that fits into a flex shaft grinder. I spin the flex shaft grinder and also the flat lap grinder, and by holding the flex shaft at precise angles, I'm able to taper the edges of the round just so. I take the rounds through #180, #360, #600, #1200, and #3000 grits and polish with #14,000 diamond grit.

For the last four months or so, I've been pursuing an objective to reveal "the heart of the stone." My display case at our show in February featured tumbled stones that I'd produced from ruby ranch agate, sow belly agate, striped opal, jasper and apache tears.

Then, I tried making cubes with the help of Linda Burns and Jim Dennis, but that didn't result in the perfection I'd expect. Then I started grinding off the exteriors to expose the interiors from rocks like prairie agate, rosebud, sow belly agate, jasper, and even a chunk of Argentina rhodochrosite I'd purchased at our show. I enjoyed the results but kind of lost momentum.

In the back of my head, I had the idea of making ball markers for golf. The mechanics of mounting a specimen on a flex shaft grinder and spinning it on a flat lap grinder took a clear vision of where I want to go and the experimental solving of many problems along the way. I'm finally at a point where I can create the quality I'm looking for every time. My collection currently includes tree moss agate from India; lapis lazuli from Afghanistan; stone canyon jasper from Oregon; stromatolite from Wyoming; gold tiger eye from Africa; crazy lace agate from Mexico; hickoryite jasper from Mexico; rhodochrosite from Argentina; rhodonite from Colorado; sow belly agate from Colorado; amazonite from Colorado; amazonite from Brazil; ocean jasper from Madagascar; tiger iron from Australia, and willow creek jasper from Idaho. There's plenty more to come!

It's been an absolute blast creating what I call mineral rounds.

They're not just for golf. People who love the art of nature, like jewelry people, enjoy them.

And, yes, they do work as ball markers.  
It's been a great way to endure seemingly endless days of isolating at home.

I am thankful that Wendy allows me to spend the hours I need in the basement. And the hours to play golf and test the product.

I'm having fun!





## Pictures from Field Trip to Smoky Hawk Claim June 13, 2020

by Wendy Carley

Left: Bob P. with his first find, a nice smoky

Right: The DGMG group collecting

Left Middle: Randy with the smoky he found  
Middle: Joe Dorris, claim owner (THANK HIM!)

Right Middle: Smoky Hawk tailings piles

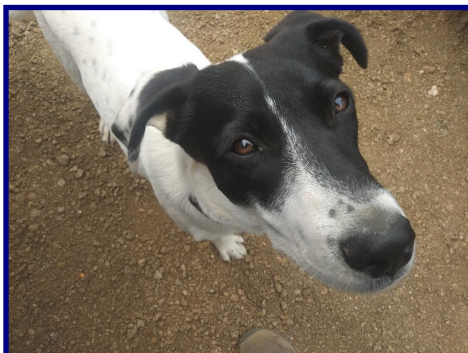
Left below: Old Stone Head from Smoky Hawk

Center below: Joe Dorris Claim Owner & Otis

Right below: An assortment of specimens found

Left corner: Otis, the rockhound

Right corner: the DGMG collectors





## DGMG DUES STILL BEING ACCEPTED

We can well understand if you haven't renewed your dues to the Denver Gem and Mineral Guild yet this year. So, for the first time ever, we are printing a reminder list, in alphabetical order by last name. And accepting dues long after the March 31st deadline.

We need dues from Bourke, Max (Ruth); Brandon, Isabella; Brannan, Katherine; Breithaupt, Gideon and Cindy; Carter, Jacob Brantley and Christi; Christensen, Charley and Jushakne; Curtin, Seija; Dempsey, Michael; Forrest, Betsy; Garcia, Angela Green; Gilbert, Johnny and Moore, Michelle; Gillham, Matt and Dorsey, Caitlin; Gordon, Zane and Maria; Gowins, Ronald and Jennifer; Hardy, Ellen; Heater, Les and Pearl; Hunt, Erin; Kalicki, Shauna; Larsson, Linda; Lemmons, Clint; Loos, Zully and Preston; Luchtenburg, David; Lyons, Jennifer and Patrick; Marcoux, Alex and Preston; Marsh, Stephen; Martin, Michelle; Matsuo, Jeff Kim and Minah; Menchaca, Frank; Panciocco, Sue and John; Parks, Vicki; Patterson, Chuck, PhD; Rinner, Don and Joan; Sherman, Lindsey and Kyle; Simonds, Jim; Snow, Sarah and Fleetwood, Michael; Strand, Tyler and Reece, Sarah; VanCleave, Christopher; Veselinova, Iva; Webber, Kristie and Christopher; Wenrich, Karen, Dr. and Wildrick, Lenny; Whaley, Cass; White, Dan; Wittwer, Deb; Zellner, Dan; and Zeyrek, Tricia.

Please remit \$15 for individual, \$25 for family dues to the DGMG Clubhouse, 1420 S. Reed St., Lakewood, CO 80232 FORMS ARE ATTACHED!

THANKS!! I won't be changing the email list for the Tips & Chips for quite a while because of the Corona! (and I'm not talking beer! I wonder if they will change their name?)

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## DGMG FIELD TRIP to Lost Gem Topaz Mine, June 27 Photos by Linda Burns



**Above: Group spread out over the dump piles, digging away!**

**Left: Wendy's big topaz 115 carats!**

## DENVER GEM AND MINERAL GUILD MEMBERSHIP 2020

☐ Renewal

☐ New Membership

Annual Dues:

- Individual=\$15.00

☐ Family=\$25.00 (Family is one or two adults, living at the address, and your children, under 18)

Primary member \_\_\_\_\_ Birthday \_\_\_\_\_  
Name Month Year

Phone number \_\_\_\_\_ Email address \_\_\_\_\_

Spouse/Partner \_\_\_\_\_ Birthday \_\_\_\_\_  
Name Month Year

Phone number \_\_\_\_\_ Email address \_\_\_\_\_

Anniversary Month \_\_\_\_\_

Junior Member \_\_\_\_\_ Birthday \_\_\_\_\_  
Name Month Year

Junior Member \_\_\_\_\_ Birthday \_\_\_\_\_  
 Name \_\_\_\_\_ Month \_\_\_\_\_ Year \_\_\_\_\_

Junior Member \_\_\_\_\_ Birthday \_\_\_\_\_

Name                      Month          Year  
Name                      Month          Year

Address \_\_\_\_\_

City \_\_\_\_\_ State \_\_\_\_\_ Zip Code \_\_\_\_\_

☐ Check this box if you DO NOT want your name, phone number and email address included in the Members Only section of the DGMG website.

**interests and Skills (check all that apply)**

- Fossils
- Lapidary
- Faceting
- Jewelry
- Have a collection
- Display at shows
- Attend mineral shows
- Willing to volunteer at shows
- Field trips

○ Mineral collector: (list favorites)

○ Willing to share special skills with others:

Signed: \_\_\_\_\_ Date: \_\_\_\_\_

Return membership form, liability form for each person, and payment to Membership Chairman at a monthly meeting or mail to: DGMG

DGMG  
Membership Chairman  
1420 S. Reed Street  
Lakewood, CO 80232

## DENVER GEM AND MINERAL GUILD

### RELEASE OF LIABILITY

By signing below, I acknowledge that all activities sponsored or conducted by the Denver Gem and Mineral Guild (DGMG), a Colorado non-profit organization, may be hazardous and may result in loss, damage, or death.

With full knowledge of these dangers, and in consideration for my acceptance as a member of the DGMG and participant in any and all field trips and activities sponsored by the DGMG, and the services and amenities to be provided by the DGMG in connection therewith, I confirm that I have read the foregoing and voluntarily assume all risks of such damages and hazards occurring in connection with the activity. I hereby agree for myself, all my family, and heirs to RELEASE the DGMG and any of its trip leaders, club officers, club members, hosting property owners and claim owners, instructors, guides, or representatives from liability, claims, demands, or any causes of action.

I UNDERSTAND THAT THIS IS A LEGAL DOCUMENT AND BY SIGNING IT, I AM GIVING UP MY RIGHT TO SUE OR OTHERWISE MAKE ANY CLAIM against DGMG or any of its trip leaders, club officers, club members, hosting land owners and claim owners, instructors, guides, or representatives which may arise during my participation in any and all activities of the DGMG or activities I conduct as an individual on DGMG owned or leased properties.

I intend this RELEASE OF LIABILITY to be effective whether or not any loss, damage, injury, or death RESULTS FROM NEGLIGENCE of the DGMG or any of its trip leaders, club officers, club members, hosting land owners, and claim owners, instructors, guides or representatives. I understand that negligence means failure to do an act which a reasonably careful person would do, or the doing of an act which a reasonably careful person would not do, under the same or similar circumstances to protect himself, herself, or others from injury or death.

I agree to be solely responsible for my own safety and to take every precaution to provide for my own safety and wellbeing while participating in the activities of the DGMG. Also, I understand that on DGMG trips, there may not be rescue or medical facilities or expertise, which may be necessary to deal with potential injuries to which I may be exposed. I understand that these risks exist and notwithstanding them, I wish to participate in DGMG activities.

I HAVE READ THIS RELEASE AGREEMENT AND HAVE FULLY INFORMED MYSELF OF ITS CONTENTS BEFORE I HAVE SIGNED IT. ALSO, I PLEDGE TO UPHOLD THE CODE OF ETHICS ATTACHED TO THIS RELEASE.

Printed Name (Please print legibly): \_\_\_\_\_

Signature: \_\_\_\_\_ Date: \_\_\_\_\_

IF UNDER 18 YEARS OF AGE, PARENT OR GUARDIAN MUST READ AND SIGN BELOW

I am the legal guardian of the above minor and have read the above RELEASE. I hereby consent to the terms of the RELEASE on behalf of the named minor and give my consent to the participation of the above-named minor in all activities of the DGMG on the terms stated.

Signature: \_\_\_\_\_ Date: \_\_\_\_\_



## Not A Poem

By Marj Becker

This month, I want to share things I've learned while in "lock down." So, this is not a poem. Don't look for rhymes or open verse.

There are none. Just sharing.

I've learned that I don't like bread crust.

I've eaten the crusts of bread for a lifetime, but now I cut them off and feed them to the squirrels.

I've learned that while watching TV movies - and I've watched a lot of them lately - there are kernels of truth in the dialogue. I've included some of them below, along with the name of the movie and the network where it was shown. I've also included some non-movie kernels, as well.

Time is a great teacher. Unfortunately, it kills its students.  
Anonymous

From *Love on Safari*, Hallmark Channel:

Judge not your beauty by the number of people who look at you. But by the number of people who smile at you.

In the end, it is up to you to decide  
What makes you happy.

To get lost is to learn the way.

Just because the water is calm, Doesn't mean there are no crocodiles.  
Malaysian Proverb

You should return to old watering holes for more than water. Friends and dreams are there to greet you.  
African Proverb

Sometimes the universe shows us the way, Even when we don't know we are looking.

From *Puppy Love*, Hallmark Channel:

Nobody is perfect. And, that's the reason  
Pencils have erasers.

From *Expecting A Miracle*, Hallmark Channel:

At first, do what is necessary. And, then, do what is possible. Suddenly, you will be doing the impossible.

From this sorrow, Some strength will come.

From *Forever My Heart*, Hallmark Channel:

Sunshine always follows rain. Good things come after bad things.

And . . . I've learned that I've watched a lot of Hallmark movies. I've also learned that I'll be in the body brace for eight weeks, again. The L1 compression fracture is worse, now. I'm guessing that I'll be watching a lot more Hallmark movies. But . . . life goes on . . .



## SPOTLIGHT ON JULY'S SPONSOR: Marj Becker

Our resident poet always steps to the plate when something is needed. She donates July's sponsorship in memory of Larry, her husband, whom we all loved very much.

Not one to be "locked up" and in a brace to boot (or to neck and back), she's coping well by obeying her doctors, and her daughters, Heidi, here in Denver and Jill in Wisconsin. She usually would be driving or taking the train to Green Bay for a summer visit, but alas, that option is not available this July.

In case you didn't know, Marj was raised in Pueblo and other places in that neck of Colorado. She met Larry at Western State in Gunnison where she got her teaching degree. They have lived in some unique places in the state, including the now railroad ghost stop of Sargents west of Monarch Pass where she taught in a two room school, and over on the far west in Uravan where Larry worked in the carnotite processing uranium mill that caused his lymphomic cancer.

She eventually became superintendent of schools at Agate, Colorado, so she's the only DGMG member who has lived in a town named for a rock! Except Howie Houk who is living in Silver City, NM. Does that count?

With Marjie and Joe Payne guiding, the Beckers joined the Guild in 2013 and Marj has been a key component to things going right since. She is the main greeter at the front door for our annual show. After a term of serving as secretary, she has now stepped into the position "pro-tem" while we get through this difficult transition stage to somewhere we're not sure about.



Next time you see Marj, thank her!

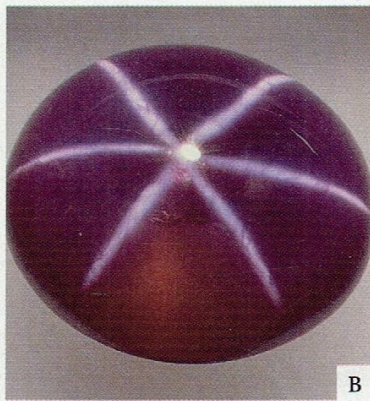
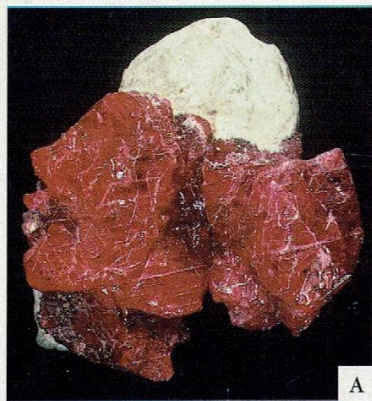


# JULY BIRTHSTONE—RUBIES by Anne Sasso

Article absconded from Discover Magazine, November 2004, p. 31-32

## THE GEOLOGY OF ... RUBIES

by anne sasso



## The Queen of Precious Stones

A ruby's dazzling color masks the mysterious origins of its birth

SOMETIMES GEORGE HARLOW LOOKS MORE like a medieval magician than the curator of gems and minerals at the American Museum of Natural History. Sweeping an ultraviolet light wand over a box of rocks in a darkened room at the museum, he ignites the stones—uncut rubies—in a burst of fiery red light that is otherworldly. “It’s like Day-Glo colors,” he says. “They are brighter than they should be. You look at them and say: ‘Wow! Look at that red! What’s going on?’”

That remarkable radiance—caused by any ultraviolet light, including UV rays from the sun—has given rubies a special place in history. Long before Marco Polo found his way to Asia, Burmese warriors were embedding the stones under their skin to make them invincible in battle. Sanskrit medical texts were prescribing rubies as a cure for flatulence and biliousness. And Hindu lore was preaching that a ruby’s light could not be extinguished nor hidden by clothing. Geologists can explain the glow: Ultraviolet light causes the chromium in rubies to fluoresce. But there is much about rubies that scientists cannot account for. The biggest question, the one that has geologists on both sides of

the Atlantic at odds with each other, is how rubies formed in the first place. Geologists simply do not know. That rubies even exist, says Peter Heaney, geosciences professor at Penn State University, is something of a “minor geological miracle.”

Rubies are a type of corundum, a rare mineral made up of densely packed aluminum and oxygen atoms, which are normally colorless. When other atoms are substituted for a few of the aluminum ones, bright hues emerge. Small amounts of chromium impart the deep red color of ruby, traces of titanium and iron produce the stunning blue of sapphire, and chromium and ferric iron create the delicate orange shades of the extremely rare and costly padparadscha.

None of this can take place, however, if silica or large amounts of iron are present. And therein lies the mystery. Since silica is one of the most abundant elements in Earth’s crust, how is it that rubies managed to avoid it but at the same time connect with the exceedingly rare chromium? And how did rubies avoid iron, another common element? Sapphires and padparadscha need some iron, but rubies, by definition, have very little at all. “The fluorescence [of a ruby] is tied to its composition, to the low iron. That’s hard to do in geology, to get the iron that low,” says Harlow. “Corundum is rare enough as it is. So, adding all these things together, ruby is very rare.”

The majority of the world’s ruby deposits (but not necessarily the best) are in a discontinuous band of marble that stretches 1,800 miles along the southern slope of the Himalayas from Tajikistan

After diamonds, rubies and their corundum cousins, sapphires, are the second hardest mineral known to man. The best rubies usually come from northern Myanmar (Burma) or other parts of Asia. For example, this uncut stone (A), still embedded in white marble, is Burmese. Six-pointed “star rubies” (B), often from Myanmar or Sri Lanka, are generally smoothed into what are called cabochons. The stars are reflections from microscopic rutile crystals that intersect at 60 degree angles. The deep red color is known as pigeon blood. In India, where this uncut stone (C) was found in a bed of marble, rubies are considered the most valuable of all gems.

through Afghanistan, Pakistan, Kashmir, Nepal, and on into China and Vietnam. The model of ruby formation that many geologists, including Harlow, accept involves tectonics: two continents—India and Asia—smashing together to form the Himalayas.

Around 50 million years ago, the Indian subcontinent moved toward Asia, constricting the Tethys Sea, an ancient ocean that lay between. On the floor of the Tethys were deposits of limestone, sedimentary rocks of calcium carbonate (the stuff of Tums). “It turns out that many limestones are dirty,” says Heaney. The Tethyan limestone was composed of every mineral that washed off the rocks of the surrounding land, including all the ingredients necessary for rubies: aluminum, oxygen, and chromium, plus silica.

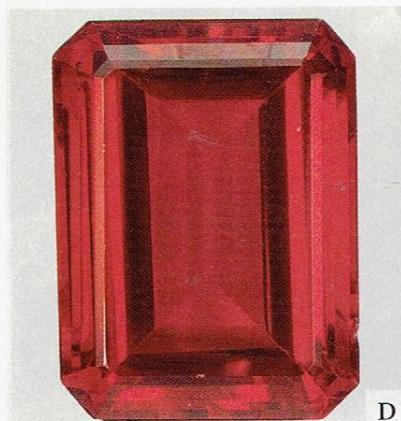
As the Tethys closed up, its limestones were pushed deep into the earth, where they were cooked and squeezed at inferno-like temperatures (1,112 to 1,238 degrees Fahrenheit) and pressures (3 to 6 kilobars). The result? They metamorphosed into sparkly marble—the kind Michelangelo loved to work with. At the same time,

PHOTOGRAPHS: LEFT TO RIGHT, E. R. DEGGINGER/COLOR PIC, INC.; DK IMAGES; TH FOTO/TISCHNIZ-HOFMANN/OKAPIA; DK IMAGES; E. R. DEGGINGER/COLOR PIC, INC.

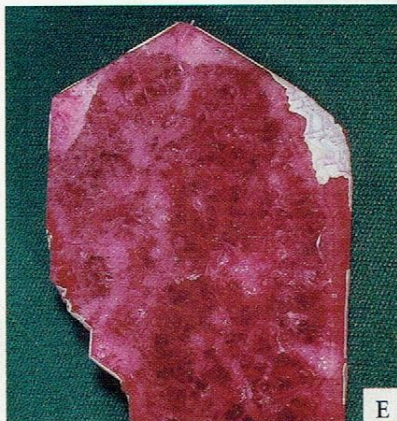
Con’t. next page...



## THE GEOLOGY OF ... RUBIES



D



E

molten granite intruded into the marble, releasing fluids that percolated up through the rock. That process, called metasomatism, removed the silica but left the alumina behind. For the next 40 million to 45 million years, the two continents slowly squeezed together, raising the Himalayas. Erosion eventually exposed a necklace of ruby deposits along the scar where the two plates collided.

Studies done in France by Gaston Giuliani of the Institute of Research and Development, along with Virginie Garnier and Daniel Ohnenstetter of the Petrographical and Geochemical Research Center, back up the traditional view—in part. They link the timing of ruby formation to the rise of the Himalayas. “When we dated the ruby deposits, we noticed that they were directly related to the continental collision and to the Himalayan orogeny [mountain building],” says Giuliani. “So the ruby is in effect an ideal marker of this continental collision.”

But the French team also noticed that while the Himalayas ruby-hosting marbles extend over large areas, the rubies themselves occur only erratically in patches. “The occurrence of ruby is very isolated and localized. We don’t find rubies everywhere that there is marble. So then we had to ask, why do we only find ruby in certain locations? Because if it’s a metamorphic phenomenon, normally it affects the whole ensemble of marble,” says Giuliani. “But that wasn’t the case, so there’s a big secret here.”

The secret, the French believe, is salt. Not only were the limestones dirty, they were salty as well. The Tethys, they say, was so shallow in places that it would

occasionally dry out, leaving behind a thin rind of salt from evaporated seawater. The salt mixed with detritus washing off the land to form the unique limestone that gave birth to rubies. Once heated, the salt acted like a flux, assuring that the aluminum became mobile enough to mix with the chromium.

Further clues to salt’s role lie deep within the microscopic world of the ruby crystal. There Garnier found tiny drops of fluid, immortalized snapshots of the liquids swirling within the marble when the rubies crystallized. Minuscule crystals of sodium chloride and anhydrite (found in sea salt) float within the liquid. But what of ruby’s enemy, silica? Garnier claims that there wasn’t enough present in the original rocks to do much damage. And what of the role of granite? Giuliani says it had no role at all.

Harlow disagrees. “The fundamental issue is, if you metamorphose a marble, the silica content is much greater than that of aluminum, and you’re never going to make corundum—although we all know that there are marble-hosted corundum deposits. So how do you do it?” he asks. “Simple. You need a fluid. You need some transport mechanism to reduce the silica in the rock.” Intrusions, like granites, offer a convenient source of fluids. “It’s a simple mechanism, even though it’s not yet proven for rubies,” he adds.

No model of ruby formation will be

Classical Hindu texts frequently called any red stone—including semiprecious garnets and spinels—a ruby and divided them into four castes. High-quality synthetic rubies, like those seen in (D) and (E), have been on the market since 1959.

considered definitive until geologists can explain the legendary stones of the famed Mogok mine in Myanmar (formerly Burma), source of some of the world’s finest rubies and spinels. While Mogok gems are indeed hosted in marble, they often grow alongside beautiful topaz and moonstone, minerals that are igneous (crystallized from rising magmas) rather than metamorphic in origin. The huge size of these crystals implies a type of magma called pegmatite, a juicy water-rich melt that provides unusual conditions, allowing minerals to grow to enormous sizes. This suggests that different processes than those hypothesized for the creation of other rubies were at work. “The minerals blew my mind,” Harlow says. “I started seeing things that really challenged the concept that rubies are metamorphic.”

Sadly, it may be some time before geologists can sort this out. Politics in Myanmar have long blocked scientists—especially Western scientists—from entering the country to take a look. “The fundamental problem with Myanmar is that you can’t get in there to do anything,” Harlow says. “And the people who have done the geology are Myanmar geologists who, unfortunately, are suffering with being 40 years behind in science.”

If Western scientists were allowed complete access to Mogok, would they find an answer to the question of how rubies formed? Harlow isn’t sure. “Yes, Mogok’s special,” he says. “But is it going to defy the other models or defy other interpretations? I don’t think fundamentally it will. There’s a strong similarity among a lot of the deposits, even though the details tend to be different. I think we’re still a ways away from answering these questions.”



Tom Chatham of Chatham Created Gems in San Francisco knows how rubies form—sort of. He can cook up a batch of synthetic rubies in a year. “There are still a lot of mysteries in our process,” he says. “It’s not cut and dried; we get a lot of worthless stones.” Even so, Chatham’s lab-created stones can fool everyone but gemologists.



## HAPPY BIRTHDAY, MARJ BECKER!

Marj Becker's birthday is this month, and her younger daughter, Jill sent this message as a surprise (to all of us!)  
THANK YOU, JILL!

July 2, 2020

Happy Birthday, Mom!

As you know, during the last several years for your birthday, I've enjoyed donating money to your various endeavors. This year is no different. With the help of Beth and Linda, I am donating \$100 in your name to the Denver Gem and Mineral Guild.

I look forward to travelling another year around the sun with you!

Love, Jill

(Chihuly is one of Mom's favorite artists, and this sculpture in particular has some deep memories.)  
And now Marj will have to share those and tell us about this work of art!

