

PLANETARY GEOLOGY DIVISION NEWSLETTER

The Planetary Geology Division of the Geological Society of America

Volume 40, Number 1

February 2022

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Message from the Chair:

Hello and welcome to 2022! I am excited to be serving as Chair of the Planetary Geology Division (PGD) this year and look forward to working with the Geological Society of America (GSA) and our broader planetary community. I would first like to welcome Jen Piatek as our incoming Secretary/Treasurer and Jupiter Cheng as

our junior Student Advisory Member – we look forward to working with you both! Please also join me in thanking Debra Hurwitz Needham for serving as our chair this past year and Laura Chavez Moreno who is our outgoing Student Advisory Member – both showed tremendous dedication and service to PGD.

The annual GSA meeting in Portland, OR this past October was a success. This year's meeting was hybrid with 13 PGD-affiliated sessions, which meant there was at least one PGD-affiliated session occurring at any one time during the meeting. This was incredible to witness; there were some small glitches along the way (both technical and travel-related), but I was proud of how folks came together and picked each other up whenever something occurred. Thank you so much to everyone who participated in this meeting whether in person or virtual. A special thank you as well to all our session chairs and Joint Program Technical Committee representatives for working on putting the meeting together as this meeting could not have happened without you; organizing a session is never easy, but to do it with a meeting format that at times seemed to be uncertain was huge. I would like to ride this high and encourage folks to look toward our next annual meeting in Denver where we hope to return to hosting our division's annual banquet (fingers crossed on that). Our booth will for sure be at the next meeting, though it may be a challenge to beat this year's turnout – booth sales this year rivaled that of "typical" GSA meetings despite a reduced in person attendance number (thank you to Laura Chavez Moreno for running this and thank you to all of our booth volunteers!). Please definitely do consider attending the meeting in Denver in October.

No GSA meeting is complete without honoring our award winners and honorees and I want to take a minute to note them here. Dr. Janice Bishop (SETI Institute) was honored as our 2021 G.K. Gilbert Award Winner, our division's highest honor and there were two lively and entertaining sessions dedicated to her and her work. Christian Koeberl (University of Vienna) and Jeff Plescia (APL) were both awarded the Ronald Greeley Award for Distinguished Service; these two individuals have for years chaired an impact cratering session at GSA, which has made the annual meeting an important place to report work on impact crater studies. Debra Buczkowski (APL) and Lindsay McHenry (UW Milwaukee) were elected as GSA-affiliated fellows this year as well. Congratulations to all of these individuals.

As we move into 2022, we do have updates regarding two of our division's awards. The first is related to the Dwornik Award where eligibility has been expanded to include all students at any degree level in a field related to planetary geosciences, regardless of location of residency or educational institution. LPSC 2022 will represent a trial run for the expanded eligibility and more details will be distributed afterwards on how this will be run in future years. We are excited for this change and want to thank David Williams, Debra Hurwitz Needham, and the Dwornik family for working to make this happen; we also sincerely thank the Dwornik family for their continued support of this award. The second change is a re-naming of the "Eugene M. Shoemaker Impact Cratering Award" to the "Eugene M. and Carolyn S. Shoemaker Impact Cratering Award". We would like to thank David Kring for his efforts in working with the GSA Foundation to make this name change. I would also like to direct you to David's

touching tribute to Carolyn at the end of this newsletter.

Our division remains solid both financially and in membership (we have >780 active members!). In fact, at the annual GSA officer's meeting last spring, PGD was highlighted as an example of a strong division within GSA and we were asked to describe how we have achieved and maintained this success. That was a proud moment for sure and our success is due to the vision and sturdy leadership of our past officers and also because of the dedication of our membership. Your commitment to renewing your membership, proposing sessions/short courses, and attending conferences is what keeps our division a positive example. Your membership, past donations, and participation with the division booth also allows us to continue funding students to attend meetings, which helps to bring in the next generation of our community and that in and of itself leads to a continually strong division. Please keep it up! And please do renew your membership if you have not done so already!

It goes without saying that these past couple of years have been difficult. This pandemic and everything it has brought has impacted every aspect of our lives. I am tired and I am sure all of you are as well. Isolation is one fallout from this that has been so difficult to take and can be so damaging. Carolyn Shoemaker's comment on the importance of human relationships in David Kring's tribute is spot-on when it comes to isolation – "Without the human relationships we cherish, knowledge would count for naught; both are to be nourished." Inspired by this statement, I would like to leave off here with a challenge – there is no question we as a community are passionate about what we do professionally, but I would like to challenge

us to think about how we can take that passion to our broader communities as outreach. There are so many folks out there who are also passionate about outer space and other worlds and would love to know more about what our community does, especially with so many active missions and missions on the horizon. At a time of so much isolation and less ability to build human relationships, taking our passion and knowledge to others could be a means to building more and stronger relationships. Please think how you might be able to do this. I would love to see PGD delve more into community outreach would welcome suggestions and actions from our community to make this so.

Here is to a productive and healthy 2022!

Take care,

Nick Lang
PGD Chair

Upcoming 2022 Annual Meeting



Mark your calendars for the upcoming 2022 "GSA Connects" Annual Meeting in Denver, Colorado, from October 9-12. Bookmark the meeting website (<https://community.geosociety.org/gsa2022/home>) and check back for further details.

Call for Technical Session proposals: Help ensure that your area of research and expertise is represented in next year's technical program. Any individual or geosciences organization is welcome to

submit proposals for both Topical Sessions and Pardee Keynote Symposia. Topical Sessions are a combination of invited and volunteered papers, while Pardee Symposia are high-profile sessions on significant scientific developments with only invited speakers. Unique formats are allowed, but must be outlined in the proposal along with the technical support needs. Sessions that promote discussion are encouraged. **Due February 1, 2022.**

<https://gsa.confex.com/gsa/2022AM/cfs.cgi>

Call for Short Course proposals: Have something that your peers need to know? Lead a Short Course at the GSA 2022 Annual Meeting. Courses can develop professional, teaching, and research skills at all levels. **Proposals due February 1, 2022.**
<https://gsa.confex.com/gsa/2022AM/shortcourse/cfs.cgi>

Notes from the 2021 GSA Annual Meeting in Portland, Oregon

The 2021 GSA Connects annual meeting was held in Portland, Oregon and virtually from October 22-25. Despite the ongoing pandemic, the meeting continues to be a major annual event for the PGD community.

Among the meeting highlights was the annual Gilbert Award session honoring this year's recipient of the division's highest award - celebration of Dr. Janice Bishop.



Dr. Carle Pieters (right) presents the 2021 G.K. Gilbert Award plaque to Dr. Bishop.

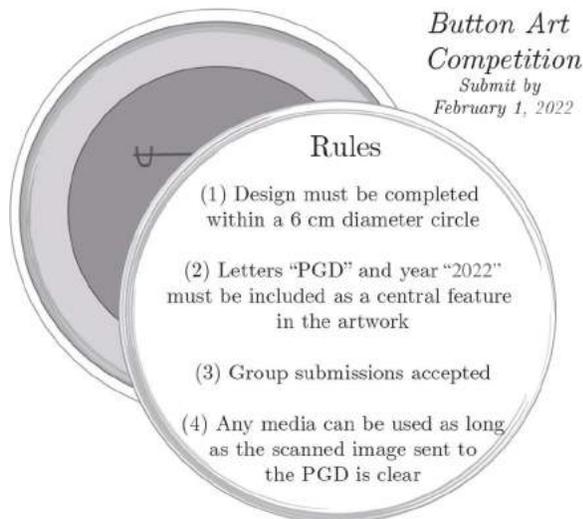
Our division also continued the tradition of hosting a booth in the Exhibition Hall where we sold planetary-related gear and held daily meteorite raffles. Staffed by PGD officers and volunteers (mostly students!) throughout the conference poster sessions, the booth constitutes our chief fundraising effort for the year and is the primary means by which our division pays for student travel awards to the annual GSA meeting. Providing exemplary students the means to present their best work at a national conference is a powerful career development tool, and we look forward to continuing to support their endeavors. **Please share with us any feedback you might have about the booth!**



Always busy at the PGD booth...

Announcement: Button Art Competition

Your design could be featured at LPSC!



We are looking for a new design for Planetary Geology Division buttons. All submissions must be sent to jupiterchc@uga.edu by **5pm February 11, 2022 (the original deadline has been extended)**. Rules: (1) Design must be completed within a 6 cm diameter circle. (2) Letters “PGD” and year “2022” must be included as a central feature in the artwork. (3) Group submissions are acceptable. (4) Any media/software can be used as long as the scanned image sent to the PGD is clear. Additional details: Submission must include brief biographical information about the artist, a brief (500 character limit) description of the artwork, a PDF of the artwork and a JPEG (min 600 dpi) of the artwork. All PGD members may vote from the semi-finalists’ buttons (as determined by PGD officers) soon after submissions close. The winner will be announced late February/early March, 2022.

2021 Award Recipients

2021 Dwornik Awards

The judging panel at the 52nd LPSC had its hands full with another crop of outstanding entries for the 2021 Dwornik Prize, as well as the virtual format of the meeting. We received 53 entries for the oral presentations (49 grads, 4 undergrads) and 53 entries for poster presentations (30 grads, 23 undergrads). The PGD officers would like to thank all members who assisted in judging for the 2021 Dwornik awards. It would simply not be possible to judge the student awards without the help of our volunteers. Please consider judging at a future LPSC!

The 2021 Dwornik winners are:

Best Graduate Oral Presentation: **Samual Cartwright**, University of Nevada, Reno, “Identification of Spectral End Members in the Martian South Polar Residual Cap”

Honorable Mention, Graduate Oral: **Brynna Downey**, University of California, Santa Cruz, “Early Dynamical Evolution of the Moon with a Subsurface Magma Ocean.”

Best Graduate Poster: **Chase Chivers**, Georgia Institute of Technology, “Thermal and Chemical Evolution of Small, Shallow Water Bodies on Europa.”

Honorable Mention, Graduate Poster: **Rebecca Hahn**, North Carolina State University, “A New Study of Shield Fields and Their Spatial Relationships on Venus.”

Best Undergraduate Oral: **Lisette Melendez**, University of South Florida, “Quantifying the Environmental Response

to Deglaciation in Martian Craters During the Late Amazonian.”

Honorable Mention, Undergraduate Oral: **Claire Blaske**, Arizona State University, “Energetic Requirements for Dynamos in the Metallic Cores of Super-Earth and Super-Venus Exoplanets.”

Best Undergraduate Poster: **Ari Essunfeld**, Yale University, “Attribute Recognition for Grouping Elevated-Manganese ChemCam Targets by Visual Characteristics.”

Honorable Mention, Undergraduate Poster: **Kierra Wilk**, Rensselaer Polytechnic Institute, “Characterizing Unusual Deposits at Ius Chasma, Mars.”

Background: The Dwornik Award was established in 1991 with a generous endowment by Dr. Stephen E. Dwornik, who wished to encourage students to become involved with NASA and planetary science. The awards are open to all students at any degree level in a field related to planetary geosciences, regardless of location of residency or educational institution, who are first author on an abstract submitted to LPSC. The award consists of a plaque and a \$500 check (graduate) / \$250 check (undergraduate), and is given for those student presentations (poster and oral) at the annual *Lunar and Planetary Science Conference* (LPSC) hosted by the Lunar and Planetary Institute and NASA Johnson Space Center in Houston, Texas that are judged to be of the highest caliber. The deadline for applications is **Wednesday, January 12, 2022**, which is the day after LPSC abstracts are due. Application forms and more general information about the award can be found at <https://community.geosociety.org/pgd/awards/dwornik>.

2021 Shoemaker Award

The 2021 Shoemaker Award was presented to **Michaela Dobson**, *University of Auckland (New Zealand)*. The proposed project will examine a potential impact ejecta horizon in a 3.5 Ga sequence of sedimentary rocks. If an impact origin is confirmed, it will be the oldest known ejecta layer on Earth.

The Eugene M. Shoemaker Impact Cratering Award is for undergraduate or graduate students, of any nationality, working in any country, in the disciplines of geology, geophysics, geochemistry, astronomy, or biology. The award, which will include \$3000, is to be applied for the study of impact craters, either on Earth or on the other solid bodies in the solar system. Areas of study may include but shall not necessarily be limited to impact cratering processes; the bodies (asteroidal or cometary) that make the impacts; or the geological, chemical, or biological results of impact cratering.

2021 Pellas-Ryder Award

The Pellas-Ryder award is given to the Planetary Science Best Student Paper published during the preceding year. The award is jointly given by the Meteoritical Society and the Planetary Geology Division of the Geological Society of America and consists of a check for \$500 from the Meteoritical Society and a plaque awarded by the PGD.

The 2021 Pellas-Ryder award was presented to **Jan L. Hellmann**, *Institut für Planetologie, University of Münster, Germany*, for “Origin of volatile element

depletion among carbonaceous chondrites”, published in *Earth and Planetary Science Letters*, v. 549, 116508.

2021 GSA PGD Student Travel Grant

The Planetary Geology Division (PGD) of the Geological Society of America uses funds raised at the GSA PGD booth to offer a travel grant of \$500 to help defray costs for PGD student members who are traveling to the GSA Annual Meeting to present first-authored papers.

2021 GSA PGD Student Travel Grants were awarded to Jupiter Cheng, University of Georgia (\$500 service award), Sarah Lamm, University of Kansas (\$500 travel award), Allison Bohanon, Mississippi State University (\$250 travel grant), and Rutu Parekh, DLR Planetary Research (\$250 travel grant).

Interested and eligible students can find additional information about applying for PGD Student Travel Grants for the 2022 GSA Connects meeting here: <https://community.geosociety.org/pgd/awards/travel-grants>

2021 Ronald Greeley Award for Distinguished Service

Christian Koeberl, *University of Vienna*, and **Jeff Plescia**, *Johns Hopkins University*, were awarded the 2021 Ronald Greeley Award for Distinguished Service. These two planetary geologists have, for at least the last 15 years, led the organization of terrestrial impact crater and other cratering sessions for the GSA PGD at our annual meetings. They have helped make the GSA Annual Meeting

an important place to report work on impact crater studies.

This award may be given to those members of the PGD, and those outside of the Division and GSA, who have rendered exceptional service to the PGD for a multi-year period.

PGD-Affiliated GSA Fellows

We are pleased to announce that the following PGD members were selected as GSA Fellows in 2021

Debra Buczkowski (*JHU Applied Physics Laboratory*) was nominated by Dr. Robert Anderson, who writes that “Dr. Debra L. Buczkowski for Fellow of the Geological Society of America [...] has demonstrated an excellent track record in planetary geology. She meets all the criteria for nomination, by her strong publication and winning proposal record, and her continuous service.”

Lindsay J. McHenry (*University of Wisconsin-Milwaukee*), whose nomination notes as a tephrostratigrapher, geoarchaeologist, volcanologist, and planetary geologist who fingerprints saline-alkaline fluid-altered volcanic materials to aid in understanding the evolution of the Martian surface.

Congratulations to the newly selected PGD-affiliated GSA fellows!

Call for Applications & Nominations

Student Advisory Member: The Planetary Geology Division (PGD) of the Geological Society of America is soliciting nominations for the position of Junior Student Advisor. This position is open to all interested graduate and undergraduate students and

offers an opportunity to actively engage with the PGD officers and the planetary community. Responsibilities include participating in regularly scheduled PGD telecons, updating the Student Opportunities page on the PGD website (<https://community.geosociety.org/pgd/about-us/student-advisory-members>), helping with the PGD booth during the annual meeting, and serving as the PGD representative to the GSA Student Advisory Council. This is a two-year position (second year as Senior Student Advisor) and includes a partial travel award to attend the annual GSA meeting. Interested students should send a current CV (include college major and advisor) and a short justification (~300-500 words) on why they are interested in serving as Student Advisor.

Please send completed applications in a single pdf file to PGD 1st Vice-Chair Marisa Palucis (marisa.c.palucis@dartmouth.edu) by **June 1, 2022**.

Dwornik Award: These awards are open to all students at any degree level in a field related to planetary geosciences, regardless of location of residency or educational institution. The application form to apply for a Dwornik Award is due **January 12, 2022** (one day after the LPSC abstract deadline). More information can be found here: <https://community.geosociety.org/pgd/awards/dwornik>. Questions regarding the Dwornik awards should be directed to 2nd Vice-Chair Sam Birch (sb2222@cornell.edu).

Due to the addition of the undergraduate awards, the Dwornik fund is no longer self-sustaining. We hope the fund will continue to grow and encourage all members to donate, which you can do online via <https://gsa-foundation.org/donate/>: be sure to select the “Stephen E. Dwornik Planetary

Geoscience Student Award” as the fund for your donation so it is applied correctly.

In addition, anyone interested in serving as a judge for the Dwornik competition at this year’s LPSC please note that there is now a place on your LPSC abstract submission form where you can indicate your willingness. Thanks in advance!

Pellas-Ryder Award: This award, offered jointly with the Meteoritical Society, is an opportunity for student first authors publishing their work in English to receive recognition for outstanding scientific achievement. The deadline for nominations is **January 31** (annually). For more details and information on nominating papers: <https://community.geosociety.org/pgd/awards/pellas-ryder>.

Ronald Greeley Award for Distinguished Service: All members are encouraged to submit nominations for the Ronald Greeley Award for Distinguished Service. This award was established in 2011 as the PGD Distinguished Service Award, and in 2012 the PGD membership voted to change the name to commemorate Ronald Greeley and his contributions to the Planetary Geology Division. This award may be given to those members of the PGD, or those outside of the Division and GSA, who have rendered exceptional service to the PGD over a multi-year period. The award is not open to currently serving Division officers, but may be awarded to past officers who have provided exceptional service to the PGD after their term on the Management Board has ended. *Nominations for the award, which should include a description of the service the nominee has given to the PGD community, may be made by any PGD member to the PGD 1st Vice-Chair (Marisa Palucis; marisa.c.palucis@dartmouth.edu) by **June 30**, (annually). Approval of the*

award will be by majority vote of the Management Board. The award consists of a certificate signed by the Chair, and will be presented at the Division's Business Meeting/Awards Reception at the Annual Meeting.

Eugene M. and Carolyn S. Shoemaker

Impact Cratering Award: Dr. Carolyn Shoemaker established the Eugene M. Shoemaker Memorial Fund for Crater Studies in memory of her husband in 1998. She established this endowment so that students will have an opportunity to pursue studies of impact craters, which were the focus of her husband's graduate studies and a large part of his professional career. Her name was added to the award in 2022 to reflect her contributions. Friends, scientific colleagues, and companies have contributed to the fund (and continue to do so) to ensure its success.

The Shoemaker Impact Cratering Award is for undergraduate or graduate students, of any nationality, working in any country, in the disciplines of geology, geophysics, geochemistry, astronomy, or biology. The award, which will include \$3000, is to be applied for the study of impact craters, either on Earth or on the other solid bodies in the solar system. Areas of study may include but shall not necessarily be limited to impact cratering processes; the bodies (asteroidal or cometary) that make the impacts; or the geological, chemical, or biological results of impact cratering. *Applications are due early September 2022, and must include a CV, research proposal, timeline and budget, and two letters of recommendation.* For more details and to access the online application forms, go to:

http://www.lpi.usra.edu/science/kring/Award/S Shoemaker_Award/.

Questions regarding this award should be directed to Dr. David Kring, (kring@lpi.usra.edu). The Planetary Geology Division officers strongly encourage all of our Division members to actively recruit promising students to apply for this prestigious award.

Student Travel Grants: As in recent years, the PGD is offering two travel grants to help defray costs for PGD student members who are traveling to the GSA Annual Meeting to present first-authored papers. Applicants for student travel awards must:

1. Be first author and presenter of a paper that has been submitted to (and accepted for presentation at) the GSA Annual Meeting.
2. Be a Student Member of both GSA and the Planetary Geology Division.
3. Be registered for the meeting before applying for a travel grant.
4. Submit a completed Travel Grant Application, current CV, and a short justification (~300-500 words) for why travel funding is needed.

Checks will be presented at the meeting, following the student's talk or poster. See <https://community.geosociety.org/pgd/awards/travel-grants> for more details. Information about applications and the deadline will be updated closer to the date of the annual meeting. Applications should be submitted to the First Vice Chair (*Marisa Palucis; marisa.c.palucis@dartmouth.edu*)

Upcoming Meetings & Workshops

March 7-11: 53rd Lunar and Planetary Science Conference (#LPSC2022): The Woodlands, TX and virtual.

April 25-29: Advancing IDEA in Planetary Science, virtual.

May 17-20: 7th International Planetary Dunes Workshop, Alamosa, CA.

May 23-27: EGU General Assembly 2022, Vienna, Austria, and virtual.

For a more complete list of upcoming meetings, please see the Planetary Sciences Community Meetings calendar at <https://www.hou.usra.edu/meetings/calendar>

Membership and Finance

The number of Planetary Geology division affiliates has remained somewhat constant over the past several years, demonstrating our community's continued contribution to wide-ranging geologic advances across the solar system. Please remember to renew your membership at GSA annual renewal time and encourage your students and colleagues to join. Division dues are \$10 for Professional members. Students, recent graduates, or K-12 teachers receive one division membership free and can join a second at reduced cost. Please help us sustain a strong division by renewing, asking others to join, and volunteering. Thanks for your support!

| Number of division affiliates | Year |
|--------------------------------------|-------------|
| 787 | 2021 |
| 793 | 2020 |
| 769 | 2019 |
| 798 | 2018 |
| 810 | 2017 |
| 879 | 2016 |
| 774 | 2015 |
| 829 | 2014 |
| 658 | 2013 |
| 670 | 2012 |
| 615 | 2011 |
| 290 | 2010 |

Financial summary: As of December 31, 2021, PGD has an asset balance of \$29,551. Our revenue was \$7,681, consisting of \$1,635 in division dues and \$6,046 in donations. GSA 2021 Booth sales, our main fundraising mechanism, raised \$4,482. Expenses during this period were \$6,195, including in part \$1,250 in student awards and grants, \$4,620 in marketing and promotion, and the remainder mostly for conference-related expenses. We look forward to another great year in 2022.



Carolyn and Gene at the telescope used for their survey of asteroids and comets (credit USGS)

Memorial – Carolyn S. Shoemaker (1929-2021)

Planetary Geology Division, Geological Society of America

Among a stand of Ponderosa trees, on a ridge with a clear view of the San Francisco Peaks and star-filled skies overhead, an extraordinary woman raised a family and then became one of America's best-known astronomers. Carolyn Spellman Shoemaker, born in Gallup, New Mexico, and raised in Chico, California, passed away August 13, 2021 in Flagstaff, Arizona, a community that revered her as a northern Arizona pioneer. I had the good fortune of working with Carolyn on several projects, including the Planetary Geology Division's Eugene M. Shoemaker Impact Cratering Award. For that reason, I was asked to write a few words about her and the wonderful life she lived.

Carolyn began her academic career with a master's degree in history and political science, becoming a teacher, before learning science while working with her husband, Gene, of 46 years.

Soon after they were married in 1951 and moved to Grand Junction, Colorado, she went into the field with Gene when he was mapping. There she learned the stratigraphy and structural deformation of the Colorado Plateau. Gene soon became involved in Apollo, first at NASA Headquarters in Washington DC in 1962, and then to the new USGS Branch of Astrogeology in Flagstaff in 1963, where stratigraphic mapping, the development of field geological tools, and geologic training for the Moon began, and where Carolyn sank roots that would last the rest of her life.

Despite the demands of the Apollo program, Carolyn and Gene continued to explore the western landscape. In 1968, in the midst of final preparations for the Apollo 11 mission, the USGS sponsored a photographic survey of the route taken by John Wesley Powell's 1871-1872 run of the Green and Colorado Rivers. Carolyn joined Gene on the second and third legs of the expedition, from the Flaming Gorge Dam to the town of Green River, Utah.

After the Apollo 11 mission, Carolyn and Gene moved to Pasadena, California (while keeping their home in Flagstaff). There Carolyn had a scientific awakening during the Voyager mission. As she later wrote: "I shall never forget walking over to the Caltech campus, where, on a large screen in Beckman Auditorium, images of the Jupiter flyby were being displayed as they came in. Then and there, I fell in love with planetary science, the skies, our solar system, and the universe. I was excited and captivated. Exploration of the Moon during Apollo days had been vicariously, for me, a heady experience, but the idea that *I* could look at Jupiter and its moons in something like real time left me awestruck."

Carolyn began learning and eventually teaching astronomical techniques at Caltech. In 1982, she and Gene began the Palomar Asteroid and Comet Survey (PACS). She found her first near-Earth asteroid that same year (1982 RA) and soon thereafter found her first comet while scanning films in Flagstaff that had been captured at the Palomar Observatory. The find was designated Comet Shoemaker 1983p. Carolyn was captivated by the search and discovery process. By the time PACS ended in 1994, she had discovered a world record 32 comets. Within a dozen years, Carolyn had surpassed the accomplishments of many other investigators who spent an entire career scanning the skies.

Among the most famous of those discoveries was Comet Shoemaker-Levy 9, detected by both Shoemakers and David Levy in 1993, after the ice-rich denizen had split into 21 fragments during a close pass of Jupiter in 1992, and before the fragments hit Jupiter, one after the other, in dramatic fashion in 1994.

The scientific community recognized Carolyn's accomplishments in several prestigious ways, both before and after the discovery of Comet Shoemaker-Levy 9. In 1985, Hildian asteroid 4446 Carolyn was named in her honor. In 1988, she and Gene received the Rittenhouse Medal from the Rittenhouse Astronomical Society. In 1996, she received an honorary doctorate degree from Northern Arizona University and NASA's Exceptional Scientific Achievement Medal. In 1998, she and her husband were bestowed the James Craig Watson Medal by the U.S. National Academy of Sciences. That joint award was particularly important, because, as Carolyn later noted, "Together, we could do more than either of us alone."

As their work so eloquently illustrated, asteroids and comets continue to pummel planets and produce impact cratering phenomena. In an effort to study both the cause and effect of collisional processes, Carolyn and Gene augmented their astronomical survey of the heavens with a geological survey of Australian impact structures, studying 17 impact sites between 1984 and 1997. Sadly, that work was interrupted by a tragic accident that injured Carolyn and claimed the life of her husband.

In the aftermath of that event, Carolyn contacted Caltech geologist Lee Silver and me with an idea for an award in memory of Gene that we both quickly endorsed. Carolyn provided seed money for the award's endowment, which I helped her shepherd through the GSA Foundation. Officers and members of the Planetary Geology Division endorsed the initiative and provided sufficient funds for the endowment to begin supporting student research in 1999. The award has since sponsored the research of 22 students, including a few students who are now professors and researchers in our community. As the outline of the award describes, Carolyn "established the endowment so that students will have an opportunity to pursue studies of impact craters, which was the focus of her husband's graduate student studies and a large part of his professional career." The award has a broad scope: it is for undergraduate and graduate students of any nationality, working in any country, in the disciplines of geology, geophysics, geochemistry, astronomy, or biology. The award is to be applied to the study of impact craters, whether they be on Earth or any other solid body in the Solar System. The focus of proposed work can be on cratering process, the bodies (asteroidal or cometary) that make the impacts, or the geological, chemical, or biological results of impact cratering.

In addition to that endowment, Carolyn continued to inspire students and the general public with summaries of the work she and Gene had done together. She was an advocate of science education and an active member of the Lowell Observatory Advisory Board for many years.

In the midst of a pandemic that forces so much distance between people, I find Carolyn's last words in an autobiographical article to be particularly important: "Since the time of the accident in which I lost Gene, the awareness of our human need for others has dominated much of my thinking. Family and friends have been very important in my own recovery, and the concept of their importance, I discover, is as essential as the need for knowledge of our physical world. Without the human relationships we cherish, knowledge would count for naught; both are to be nourished. Henceforth, I'll continue my scientific exploration, knowing that I must not neglect the other side of living." She did not neglect either side of living and we are thankful for the opportunity to have known her.

David A. Kring
Lunar & Planetary Institute
Houston, TX



*Wolfe Crater in Australia (credit Wolfe Creek Crater National Park), which Carolyn and Gene mapped together with Frances McDonald (E. M. Shoemaker, F. A. Macdonald & C. S. Shoemaker (2005) *Geology of five small Australian impact craters*, *Australian Journal of Earth Sciences*, 52:4-5, 529-544).*

2021-2022 Division Officers



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Debra H. Needham, Past Chair
Research Interests: I study planetary
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