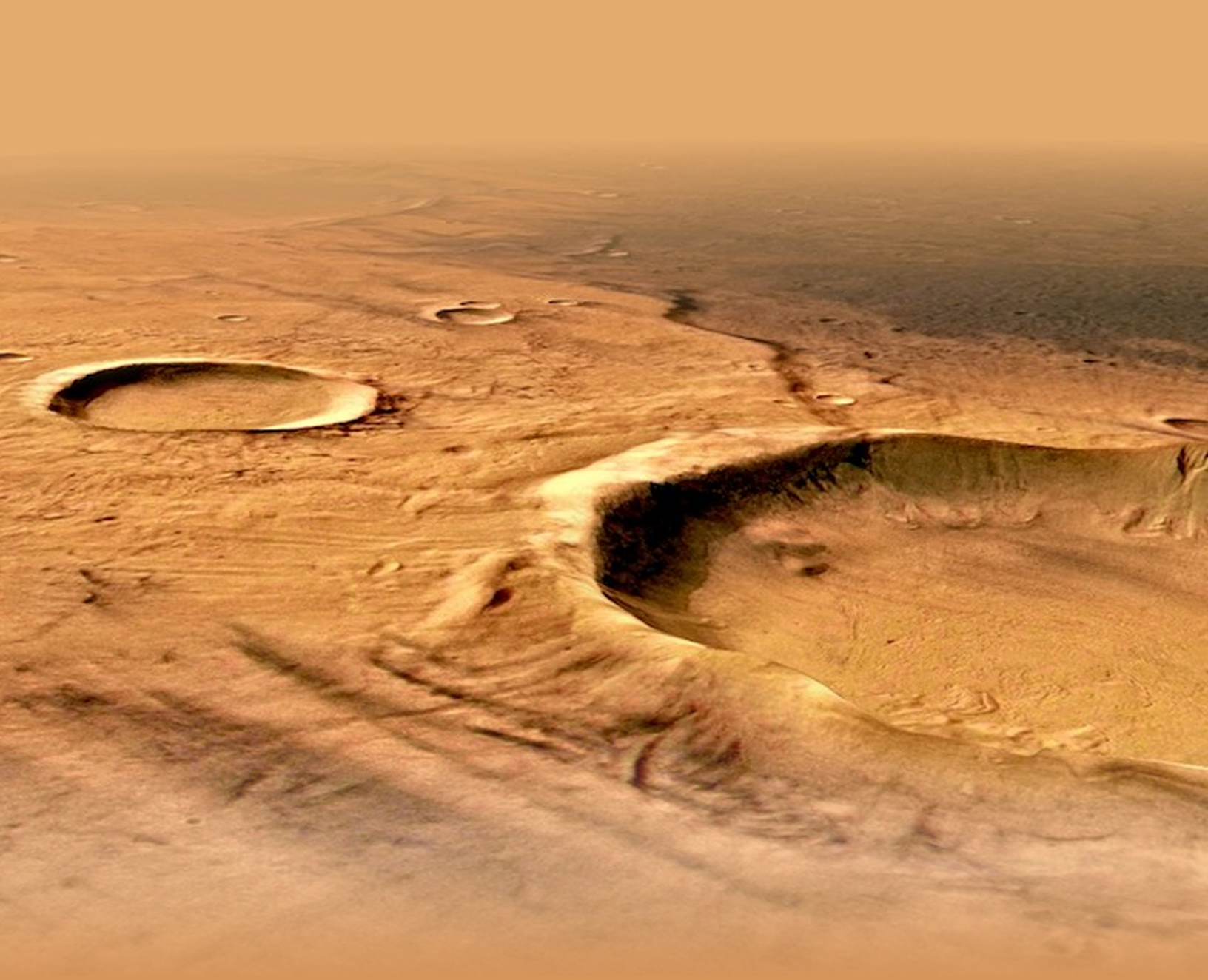

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Activity Report Q3 2019

Image: Signs of wind activity are evident within Terra Cimmeria. Credit: ESA/DLR/FU Berlin. CC BY-SA 3.0 IGO


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Technical Reports & Data Releases

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2. Burke, C. J., Fausnaugh, M. M., **Caldwell, D. A.**, Jenkins, J. M., **Smith, J. C.**, **Twicken, J. D.**, Vanderspek, R., Doty, J. P., Ting, E. B., Villasenor, J. S. (22 Aug 2019) TESS Data Release Notes: Sectors 1-13, DR20, https://archive.stsci.edu/missions/tess/doc/tess_drn/tess_multisector_01_13_drn20_v02.pdf

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9. **Jenniskens P.**, Lyytinen E., Johannink, C., Odeh, M., 2019. Outburst of 15-Bootids meteor shower. CBET 4624. D. W. E. Green (ed.), Central Bureau for Astronomical Telegrams.

10. **Jenniskens P.**, Baggaley, W. J., Cooper, T., Johannink, C., Howell, A., Moskovitz, N., Samuels D., 2019. Outburst of June epsilon Ophiuchids meteor shower. CBET 4642. D. W. E. Green (ed.), Central Bureau for Astronomical Telegrams.

11. McKay, C.P., and **Bonaccorsi, R.,** 2019, 2019 Death Valley Natl. PARK _ Badwater weather data Jan – August 2019: Data release to DEVA

12. Nielsen, E. L.; De Rosa, R. J.; Macintosh, B.; Wang, J. J.; Ruffio, J. -B.; et al.; including **Marchis, F**.; (2019/08). *The first 300 stars observed by the GPIES* (Nielsen+, 2019), VizieR On-line Data Catalog: J/AJ/158/13. Originally published in: 2019 AJ, **158**, 13N.

13. Scowen, P., R. Ignace, Neimer, Coralie, et al., (including **Sparks W.**) (2019. Astro2020: Decadal Survey on Astronomy and Astrophysics, APC white papers, no. 167; Bulletin of the American Astronomical Society, Vol. 51, Issue 7, id. 167 (2019) *PolStar—An Explorer-Class FUV Spectropolarimetry Mission to Map the Environments of Massive Stars.*

14. Stauffer J, LM Rebull, **AM Cody**, LA Hillenbrand, M Pinsonneault et al. (2019). *VizieR Online Data Catalog: Rotational evolution of young, binary M dwarfs (Stauffer+, 2018)*, VizieR On-line Data Catalog: J/AJ/156/275.

15. **Twicken, J. D**. (Aug 2019) Data Validation: Difference Imaging and Centroid Analysis, NASA/TP-2019-220320, https://ntrs.nasa.gov/search.jsp?R=20190029148

Popular Articles/Web Stories/ Other Media / Interviews

1. Blunt, K., **Marchis**, **F**. (07/07). *Episode 21*: *Dr*. *Franck Marchis and SETI*, the Blunt Report, Podcast.

2. **R. Bonaccorsi** (August 6) featured ChileNautas, interview by Andrea Obaid https://youtu.be/DOwo1wyv0oU

3. **Cabrol NA** was interviewed by Josie Glausiusz, for *Nature* as part of a new feature in the magazine presenting scientists (career, workplace).

4. **Cabrol NA** was interviewed by Chuck Fields (astronomy podcasts) to be aired in November 2019.

5. **Cabrol NA** wrote in *Scientific American* (September 5, 2019) The Quantum of Life

6. **Cabrol NA** (09/16). Interview with Laura Krantz

7. **Cabrol NA** was interviewed by Josie Glausiuusz (*Nature Magazine*) for a new feature in the magazine that portrays scientists (career, where they work).

8. **Cabrol NA** was interviewed by Daniela Mohor (El Mercurio, Chile, 4 pages) ahead of the Festival of Sciences in Valparaiso.

9. **Cabrol, NA.** Daily postings on Planetary Landscapes: https://www.facebook.com/PlanetaryLandscapes/?ref=bookmarks

10. Chalot, A., et al., including **Marchis**, **F**. (09/18). *Living planets, extraterrestrial life ... Scientists aim at the stars*, Ad Astra Magazine, Web Story.

11. **Diamond, B** Cited in *Inverse* (August 9, 2019): BernieSanders: SETI Weighs in on What He Can Actually Reveal About Aliens

12. **Diamond, B** Interviewed on *Origins* podcast (September 12, 2019) The nexus of Silicon Valley and science

13. **Doyle, L** Cited in *Forbes* (July 21, 2019): How Could We Decode a Message from Extraterrestrials?

14. **Fenton, L** Cited in *Astronomy* (August 15, 2019) The windswept craters of Mars' Terra Cimmeria

15. **Harman PK.**
    a. Interview (8/15). Air and Space Magazine.

b. *Girl Scouts, Now You Can Earn A Badge in Space Science* Air & Space Magazine, October/ November 2019 and https://www.airspacemag.com/airspacemag/scouting-cosmos-180973141/

c. Girl Scout Space Science Badges https://www.seti.org/press-release/seti-institute-collaborates-girl-scouts-develop-new-space-science-badges

d. https://finance.yahoo.com/news/girl-scouts-seti-institute-celebrate-160300782.html

e. https://www.girlscouts.org/en/press-room/press-room/news-releases/2019/girl-scouts-launches-42-new-badges.html

f. https://womenyoushouldknow.net/girl-scouts-launches-stem-outdoor-adventure-badges/

g. http://www.timesnews.net/Community/2019/08/03/Girl-Scouts-launches-42-new-badges-to-mobilize-girls-to-change-the-world

h. https://nonprofitquarterly.org/42-new-girl-scout-badges-focus-on-more-than-cookies/

i. https://www.kulr8.com/wakeup-montana/girl-scouts-launch-new-badges/video_80ea9410-ada7-11e9-a3ef-0b2fe1803eb6.html

j. https://www.theintelligencer.com/news/article/Girl-Scouts-launches-42-new-badges-to-mobilize-14190354.php

k. https://associationsnow.com/2019/08/new-badges-highlight-girl-scouts-increased-focus-on-stem/

l. https://www.thetelegraph.com/news/article/Girl-Scouts-offering-new-badges-14202281.php

m. https://www.starnewsonline.com/news/20190806/new-girl-scouts-badges-give-girls-choices

n. https://thesheridanpress.com/110187/girl-scouts-introduce-42-new-badges/

o. https://www.easttexasmatters.com/news/girl-scouts-reveals-42-new-badges-for-girls-to-influence-the-world/

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r. https://denver.cbslocal.com/2019/07/31/girl-scouts-aurora-colorado-bee-hotels-badges/

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16. Holtom, C., **Marchis**, **F**. (08/09). *Gazing into Space*, 2SER 107.3 Radio, Podcast.

17. **Jenniskens, P** Cited in *Space.com* (July 29, 2019) Catch a Shooting Star with 2019's Summer Meteor Showers

18. **Kostov VB**. Interview with New Hong Kong Television for L 98-59.

19. **Lee, P** Cited in the *Houston Chronicle* (July 11, 2019): Future of Space

20. **Lee, P** Cited in *Space.com* (July 30, 2019): Living Underground on the Moon: How Lava Tubes Could Aid Lunar Colonization

21. **Marchis**, **F**., et al.

    a. *EPSC-DPS 2019*: *Day 2*, NOVA: The American Astronomical Society, Web Story.

    b. (09/17). *Guiding The Next Asteroid Mission*: *A New Success For Unistellar's Citizen Astronomy*, Web Story.

    c. (09/17). *EPC-DPS 2019 Tuesday Press Conference*, Youtube: Europlanet, Other Media.

    d. (09/14). *Conquering space*, Nova: Tech Paf, Podcast.

    e. (09/17). *Citizen science starts to reveal Lucy mission target*: *Orus*, Europlanet Society, Web Story.

    f. (08/14). *Small Scope*, *Large Capability*, SETI Institute: Explorer, Popular Article.

    g. (8/5) The Hunt is On for Alpha Centauri's Planets, Scientific American, cited

    h. (07/21). *TMT Controversy*: *I Vote For Healing*, CosmicDiary Blog.

    i. (07/10). *Unistellar Announces eVscope's Exoplanet-Detection Abilities*, SETI Institute in the News, Web Story.

22. **Race MS** (Sept./26) Interviewed by reporter from *Popular Science* regarding article on microbes on Mars and Planetary Protection Policies.

23. **Rummel J** Cited in *Scientific American* (July 10, 2019): Science and Sustainability May Clash on the Moon

24. **Jummel J** Cited in *Astronomy* (September 5, 2019) If we find alien life, can we avoid harming it?

25. Saakyan, A., **Marchis**, **F**. (07/27). Simulation #299: *Imaging The Cosmos*, Youtube Video.

26. **Schulze-Makuch D.** bi-weekly postings on Smithsonian website: https://www.airspacemag.com/author/dirk-schulze-makuch/

27. **SETI Institute:** *Big Picture Science* (**Shostak S** and **Bentley M**)
    - Nailing the Moon Landing
    - Math's Paths

- Let's Stick Together
- Granting Immunity
- Skeptic Check: Data Bias
- For Good Measure
- Headed for Trouble

28. **SETI Institute:** Facebook Live
    - FDL Moon for Good team
    - **Harman P** and **Steel S**: New Girl Scout Science Badges
    - FDL Living with Our Star teams
    - FDL Earth Observation team
    - FDL Astronaut Health team
    - Jenkins J and **Marchis F**: TESS Spacecraft 1year after the beginning
    - **Busch M** and **Marchis F**: Asteroid 2006 QV89 Will Not Hit Earth This Year
    - **Sobron P** and **Steel S**: InVADER Mission, Exploring Hydrothermal Vents
    - **Summers D** and **Shostak S**: Planetary Protection
    - **Busch M** and **Shostak S**: A Visitor from Interstellar Space

29. **Shostak S.**

    a. "The Moon is a Stepping Stone to the Rest of the Cosmos," The Week (India), Sep 14, 2019, https://www.theweek.in/theweek/cover/2019/09/14/the-moon-is-a-stepping-stone-to-the-rest-of-the-cosmos.html

    b. "We Keep Looking for Space Aliens. Are They Looking for Us?" NBC News, Sep 18, 2019. https://www.nbcnews.com/mach/science/we-keep-looking-space-aliens-are-they-looking-us-ncna1054271

    c. "Storming Area 51 on September 20? Here's Why You're Unlikely to Find Aliens Hiding in the Desert," NBC News (not Mach), July 26, 2019. https://www.nbcnews.com/think/opinion/storming-area-51-september-20-here-s-why-you-re-ncna1034781

    d. "Newsworthy Extraterrestrials," SETI Institute web site, September 21, 2019 https://seti.org/newsworthy-extraterrestrials

    e. "Why Humans will Outlive Climate Change and Nuclear War, No Matter How Bad it gets," Quartz, September 26, 2019. https://qz.com/1716016/why-humans-will-outlive-climate-change-and-nuclear-war/

30. **Showalter, M** Cited in *Scientific American* (August 22, 2019) The Solar System's Lonliest Planets, Revisited

31. **Siemion, A** Cited in *Phys.org* (July 18, 2019): Breakthrough Listen Launches New Optical Search with Arizona's VERITAS Telescope Array

32. **Siemion, A** Cited in *Forbes* (July 30, 2019): Hunt for 'Alien Laser Flashes' Underpins New Search for Intelligent Life in the Universe

33. **Siemion, A** Cited in *Forbes* (September 28, 2019): Search for E.T. Snags 'Extraordinarily Exciting' Bounty from Qualcomm Cofounder

34. **Sobron, P** Cited in *Discover* (August 9, 2019): New SETI Project Will Practice Looking Alien Life Near Deep-Sea Vents on Earth

35. **Stucky TS** (09/19). *NASA is Testing a Drill to Search for Life on Mars – On Its Own*, https://www.nasa.gov/feature/ames/ARADS-drill/.

36. **Tarter, J** Video Interview with *Wired*: Astronomer Jill Tarter Answers Alien Questions from Twitter

37. **Tarter, J** Interviewed on the *Jim Rupp Show* (September 23, 2019) Astrophysicist Jill Tarter on SETI and Technosignatures

38. **Tarter, J** Video interview with *Wired* (August 28, 2019) Astronomer Explains How SETI Searches for Aliens

39. **Tiscareno M** Cited in *Eos* (July 17, 2019): The Cassini Mission May Be Over, but New Discoveries Abound

40. Vanlede, G., et al., including **Marchis**, **F**. (09/22). *Marseille - Pays d'Aix*: *Unistellar delivers its first telescopes*, La Provence, Web Story.

41. Wolfe, I., et al., including **Marchis**, **F**. (08/30). *Search for Extraterrestrial Intelligence*, Diffusion Science Radio, Podcast.

Invitation to Speak (Professional and Public)

1. **Bishop JL** (Sept./11). Characterizing the surface of Mars through remote spectral identification of minerals. Keynote Speaker at 9th European Conference on Mineralogy and Spectroscopy. Prague, Czach Republic.

2. **Bonaccorsi R** (July 8 2019) *Science expeditions to planetary analogs*" Benjamin Dean Astronomy-lectures, California Academy of Sciences, San Francisco, CA, July 8. /www.calacademy.org/events/benjamin-dean-astronomy-lectures/

3. **Bonaccorsi R** (July 31 2009). *Field Science Expeditions to Planetary Analogs*, Astronomy on Tap South Bay #11, San Jose' California.
4. Technologies for detecting life in the solar system are first tested and the next generation of scientists and space explorers begin their training, in extreme environments on Earth.

5. **Busch MW** (2019 October 7), "Near Earth Asteroids, Space Missions, and the Impact Hazard", California Academy of Sciences, Benjamin Dean Astronomy Lectures - https://www.calacademy.org/events/benjamin-dean-astronomy-lectures/near-earth-asteroids-space-missions-and-the-impact-hazard .

6. **Busch MW** (2019 October 14-28), talks with three classes of primary & secondary students via the Skype-A-Scientist program - https://www.skypeascientist.com/ .

7. **Cabrol NA** (09/05). Invited lecture at Triple Ring, Newark, CA.

8. **Caldwell, D., Lee, P.,** Pittman, B. (07/18). Back to the Moon: For Science and Exploration, panel discussion at SRI.

9. **Caldwell, D.**, **Lee. P., Marchis**, **F.**, **Race, M**. (08/19). *SETI and the Drake Equation*!, 10th Grade Physics Discussion with Dan Peluso, Valejo CA (via Zoom).

10. **Estrada PR** (09/25). *Born with the Dinosaurs? The Origin, Age, and Remaining Lifetime of Saturn's Rings.* Astronomy on Tap, Uproar Brewing Company, San Jose, CA.

11. **Jin, M.** (July 2019) The influence of stellar winds and stellar flares/CMEs on the exoplanets habitability, *Erwin Schrödinger International Institute for Mathematics and Physics (ESI),* University of Vienna.

12. **Harman PK** (Girl Scouts)
    a. https://www.seti.org/seti-institute-news-august-8-august-14-2019
    b. https://www.hillhappenings.com/list/2019/7/24/ready-for-takeoff-girl-scouts-and-space-science
    c. https://www.girlscouts.org/en/about-girl-scouts/advocacy/advocacy-news.html

d. https://www.prnewswire.com/news-releases/girl-scouts-and-the-seti-institute-celebrate-apollo-11-anniversary-300890009.html
e. https://eos.org/articles/girl-scouts-emphasize-stem-education
f. (NASA AAA) https://www.seti.org/training-high-school-teachers-see-light
g. Girl Scout Astronomy Adventure Destination Camp https://www.seti.org/girl-scout-space-science-badges-take

13. **Marchis**, **F**.

a. (09/27). *Exploring the Solar System*, California College of Arts, with VR2 Planets.

b. 09/20). *VR2 Planets*, EPSC-DPS Joint Meeting 2019, Centre International de Conférences de Genève (CICG), Geneva, Switzerland.

c. (09/17). *Presenting First Occultation Observation*, EPC-DPS 2019 Press Conference, Geneva, Switzerland.

d. (09/17). *Citizen Science Astronomy with the Unistellar Network*: *From Planetary Defense to Exoplanet Transits*, EPC-DPS 2019 Conference, Geneva, Switzerland.

e. (09/01). *Unistellar eVscope Network and its Potential for Occultation*, 38th European Symposium on Occultation Projects (ESOP), teleconference with Paris, France.

f. (08/09). *MQAAAstro seminar*: *25 years of adaptive optics*.

g. (08/07). *Another Pale Blue Dot*: *Inside SETI Institute's Exoplanet Search*, Association for Astronomy at Macquarie University, Sydney, Australia.

h. (08/07). *Astronomy Entrepreneurship talk @ MQAAAstro*, Association for Astronomy at Macquarie University, Sydney, Australia.

i. (08/05). *Diversity Talk and Q&A*, Association for Astronomy at Macquarie University, Sydney, Australia.

j. (07/31). *SETI Institute*: *Searching and Imaging Earth* 2.0 ... *Where Are They*?, Astronomy on Tap, San Jose CA.

k. (07/02). *Worldwide Citizen Astronomy Network*, Science Images at Musée de l'Elysée, by CineGlobe, Lausanne, Switzerland.

14. **Race M** (Aug./20). Looking for life on Mars and Planetary Protection. Speakers at MIT ACADEMY, Vallejo.

15. **SETI Institute:** SETI Talks
    - **Lee P, Caldwell D** and Pittman B: Back to the Moon for Science and Exploration
    - Filippenko A, Keating B and **Shostak S**: Nobel Prize: Blessing or Curse?

16. **Shostak S.**

    a. Jul 8, Moderator of Astrobiology Panel, Univ. of California Berkeley Extension, San Francisco

    b. Jul 11, "Top Space Trends," panel discussion, Space Tech Summit, Santa Clara, CA

    c. Jul 31, "Looking for Life in Space," San Jose Rotary Club, San Jose, CA

    d. Aug 1, Moderator, panel discussion on laser ranging the moon, IEEE meeting, Milpitas, CA

    e. Aug 10, "Are We Being Visited?" SpaceFest, Tucson, AZ

    f. Aug 13 – 25, Three talks on life in space aboard Celebrity Cruise ship around British Isles and Ireland, as part of *Scientific American* special interest cruise.

    g. Sep 7, "Searching for Life in the Cosmos," Silicon Valley Wealth Advisors, Cupertino, CA

    h. Sep 9, "The 21st Century," Kiwanis Club, San Jose, CA

    i. Sep 14, "Are We Being Visited?", TEDx talk, Marin County, CA

    j. Sep 29, "The History of Ice Cream," SETI Institute Ice Cream Social

17. **White O.** (2019). Comparative Geology in the Kuiper Belt: Pluto, Charon, and MU69", Geological Society of America 2019 meeting in Phoenix, AZ, September 22-25. Abstract #144-9.

Highlights/ Significant Events and Activities

1. **Backman, DE Clark, C, Harman, PK,** NASA AAA Cycle 7 webinar series concluding sessions on August 13 and 14.
2. **Backman, DE Clark, C, Harman, PK,** (9/22 – 27) and 9/29 – 10/4) NASA AAA cycle 7 Flight Weeks, Palmdale, CA.
3. **Cabrol NA and the SETI Institute NAI Team**. The SI NAI Science team meeting was held at the Institute's HQ in Mountain View on August 27-29.
4. **Cabrol NA and the SI Science Council**. The SI Science Council was helf on 09/10 at the Institute's HQ in Mountain View.
5. **Bywaters, KF** Upcycling through Integration: New Flight Hardware for Monitoring Microbial Growth Innovation Fair, NASA Ames, 8/8/2019
6. **Caldwell, D., Lee, P.,** Pittman, B. (07/18). Back to the Moon: For Science and Exploration, panel discussion at SRI
7. **Cartwright RJ** (09). Observing time. Remote observing of classical Uranian moons with the Discovery Channel Telescope and the VIS spectrograph DeVeny.
8. **Fenton LK** (3-22 June 2019) Fieldwork in Smith Creek Valley, NV, investigating boundary layer conditions and their controls on dust devil activity and behavior.
9. **Gorti U** (07-09). Co-I on various ALMA observing projects.
10. **Harman, PK**, July 23 – August 4, Girl Scout Astronomy Destination Camp Director.
11. **Jin, M.,** FDL 2019 Domain Mentor for Space Weather SDO team
12. **Marchis**, **F**.
    a. (09/15-20) EPC-DPS 2019 Conference, Geneva, Switzerland
    b. (09/01). 38th European Symposium on Occultation Projects (ESOP) in Paris, France.
    c. (08/15) NASA FDL Results Showcase at Google Cloud with SETI Institute.
    d. (08/05-09) Association for Astronomy at Macquarie University (MQAAAstro), Sydney, Australia.
    e. (07/31) Astronomy on Tap, San Jose CA.
    f. (07/03-07) World Conference of Science Journalists (WCSF2019) at Musée de l'Elysée, Lausanne, Switzerland.

13. The **SETI Institute NAI Team** had a 3-day in-person team meeting at the SI HQ in Mountain View (Aug. 27-29, 2019). Tori Hoeler was invited for a presentation where he introduced the NFoLD RCN; May Chiao, the Editor-in-Chief of Nature Astronomy was a (remote) host of the meeting and made a presentation about the types of subjects and articles relating to our NAI projects that could be suitable for submission to Nature.

14. **The SETI Institute CAN 7 team** requested, and was granted, permission to join the NFoLD RCN.

15. **Sparks W** (and team) completed programs to seek plumes on Europa using the Hubble Space Telescope (HST), and SOFIA. The data reduction effort is under way in earnest and a status report was presented at a team meeting in September. The Jupiter opposition period was May-July 2019 hence there was substantial work planning and executing the HST observations up until the end of that period. Each visit required individual treatment, since complex moving target specifications and timing are needed. The observations completed successfully and the preliminary data processing has begun. We have been acquiring laboratory data on the circular polarization properties of anoxygenic phototrophs over recent years. Our goal is to assess the degree to which measurements of this type can be used as a biosignature, and their potential utility in remote sensing as well as in situ instrumentation. During this quarter, we drafted a paper describing the results and the work is currently under review by the co-authors.

Honors and Awards

1. **Beyer, RA**. AGU Outstanding Reviewer Award.
2. **Cabrol, NA**. Invited by May Chiao, Editor-in-Chief of *Nature Astronomy* to write a commentary on the Sagan et al., (1993) *Nature* article "A Search for Life on Earth from the Galileo Spacecraft". *Beyond the Galileo Experiment* was published by *Nature Astronomy* on July 5, 2019.
3. **Rosner, S**:
    a. *NASA Honor Award,* NASA, for the successful design, fabrication, installation, and commissioning of the on-board Cryocooler for the Stratospheric Observatory for Infrared Astronomy (SOFIA).
    b. *T-TST Best Paper Award,* IEEE Transactions on Terahertz Science and Technology (T-TST), Recognizes the most significant contribution in a paper published in IEEE T-TST, for "First Supra-THz Heterodyne Array Receivers for Astronomy with the SOFIA Observatory", IEEE Trans. on THz Sci. and Technol., vol. 6, issue 2, 199-211
    c. *FILMSS Star Award,* KBRwyle / FILMSS, Certificate of Recognition for outstanding contributions in support of the FILMSS contract, specifically for support of the Acceptance of HAWC+ as a 2nd generation SOFIA Facility Class Science Instrument (FSI).
4. **Sparks W**. AURA Outstanding Achievement (team) for TESS Data Management and Archival.
5. **Sparks W.** 2019 NASA Silver Achievement Medal: TESS Team.

Projects with interns

1. **Bywaters, KF** (June-Aug). Summer REU Intern—worked on Solid-state nanopore – Testing analog Icey world sample and DNA under a range of pH.

2. **Rosalba Bonaccorsi** (July 2019) led the 2019 REU Summer camp as Astrobiology Fieldtrip Director. The Research Experience for Undergraduates program has been funded by the NSF and the Fieldtrip is an important element of the 10 week-program. The fieldtrip is based at the SETI Institute's Hat Creek Radio Observatory (HCRO) (Shasta County, Northern California). During the week-long experience 11 summer students conducted radio astronomy experiments led by Dr. Jill Tarter for two days, followed up by hands on exploration-based activities simulating a manned and/or robotic planetary astrobiology mission to relevant sites of the nearby Lassen National Park (Cinder Cones, Lava tubes, and hot springs). Two weeks later a second two-day coastal trip followed with the objective of exploring ocean worlds-like planetary analog environments. Both field experiences allow students to engage in the scientific practice of observing their surroundings by asking simple questions to plan observations, and carrying out further investigations while engaging in constructing explanations thru collaborative conversations to share scientific individual findings.

3. **Cabrol NA.** Development of the SEEDS miniaturized environmental array during the summer with the San Jose State University Dpt. Of Engineering (undergrads). The array is to be deployed in Chile as a prototype for future Mars mission concepts. The students worked under the guidance of NA Cabrol et the SI, and the supervision of John Hines and Periklis Papadopoulos at SJSU.

4. **Cabrol NA** gave an introduction to Astrobiology to the REU students: *Searching for Life Beyond Earth.*

5. **Doyle, L.** (August). One postdoc and three interns from Cornell University participated in the field work in Alaska (see field work description).

6. **Kostov VB**. TOI-1338: TESS' First Transiting Circumbinary Planet, project with summer intern Wolf Cukier, paper submitted to AAS journals

7. **Race MS** (June-Aug). Summer STAR Intern—worked on Planetary Protection – updating and archiving information for the new PP website.

8. **Tiscareno, M., Director, SETI Institute REU Summer Program** | The REU Program took place June-August 2019 at the SETI Institute under the direction of Matt Tiscareno, and the mentorship of SI's PIs (name in parenthesis). Rosalba Bonaccorsi supervised fieldworks and travels.

    a. Olivia Durrett (Andrew Siemion)

    b. Kevin Fillhouer (Pascal Lee)

c. Madeline Garner (Kathryn Bywaters)
d. Noah Goldman (Uma Gorti)
e. Rowan Huang (Virginia Gulick)
f. Mikayla Hudak (David Summers)
g. Lauren Little (Friedemann Freund)
h. Eli Metzler-Winslow (Ann Marie Cody)
i. Cameron Moye (Pascal Lee)
j. Jakayla Robinson (Matt Tiscareno)
k. Brian Szutu (Peter Jenniskens)

Field Work

1. **Cabrol NA**. (10/15-) and the **SETI Institute Team** deployed in Chile for the 3rd field expedition of the NAI project. The expedition was suspended on October 24 due to social unrest in the country and the team was pulled back to the US after completing science at the first study site (Salar de Pajonales). The team will return to Chile to complete the field season as soon as it is safe to do so.

2. **Rosalba Bonaccorsi –** *Aseptic drilling and bioburden/contamination monitoring during September 2019 ARADS campaign in the Atacama Desert*. Rosalba Bonaccorsi traveled to the Atacama September 6 thru September 24 to join the Atacama Rover Astrobiology Drilling Studies (ARADS) team led by Brian Glass (NASA Ames Research Center). The objective of the 4-year ARADS project was to design and test tools, techniques and operations for future planetary exploration in the Atacama with the grand goal of preparing for future robotic astrobiology drilling missions to Mars. Rosalba worked closely with other scientists and engineers from the SETI Institute, Kim Warren Rhodes (Ecologist) and Thomas Stucky (drill engineer). Rosalba was the Contamination mitigation lead tasked to prevent and monitor organic and biological contamination - during drilling, sample handling and instrument analysis of biomarkers in drilled samples - and to certify achieved cleanliness after microbial reduction and sterilization practices. This fieldwork was part of a 3-week simulated mission to test life-detection instruments for use on an autonomous rover-mounted robotic drill.

3. **Doyle, L**. Deployment of hydrophone array in Fredrick Sound, Alaska (August) for the Templeton-funded study of humpback whale intelligence.

4. **Stucky TS** (09/09 – 09/23). Provided software, drilling, and automation support for the Atacama Rover and Astrobiology Drilling Studies project, which conclude its 4th year of operations in the Atacama Desert this September.

Contribution to ongoing/planned missions

- **Bishop JL** (2002-ongoing). Compact Reconnaissance Imaging Spectrometer for Mars (CRISM), Visible/near-infrared (VNIR) imager in orbit at Mars on the Mars Reconnaissance Orbiter (MRO) and mapping surface composition at scales as fine as 18 meter per pixel.

- **Bonaccorsi R**. participation to the ARADs project is a contribution in support of the planned Life Detection Icebreaker Mission to Mars (Pi: Chris McKay). The mission aims to drill ca. 1-2 meter into the ice grounded soil of Mars (former Phoenix Mission site) and analyze the retrieved samples for indicators of recent life. In particular a life detection mission will involve category III Planetary protection practices together with mitigation of molecular organic contamination, which is important contribution to Icebreaker mission planning/concepts.

- **Bonaccorsi R**. Laboratory simulation of Enceladus' plumes (hypervelocity production of -200 C ice grains) in support of the ELSAH mission planning.

- **Gulick, Ross Beyer, Livio Tornabene**. MRO HiRISE

- **Kagawa H.** Synthetic biology.

- **Marcu O** (2017-ongoing). WetLab2, First facility to provide gene expression in space, on the International Space Station. Developing protocols and workflow for plant automated extraction and processing.

- **John Marshall, Chloe Beddingfield**. OSIRIS-Rex

- **Mark Showalter**, **Ross Beyer**, **Cristina Dalle Ore**, **Oliver White**, **Orkan Umurhan**, and **Chloe Beddingfield.** New Horizons.

- **Sobron P** (ongoing). *NASA Mars 2020 rover mission Science Team member*, SHERLOC and SuperCam instrument development and operation.

- **Sobron P** (ongoing). *ExoMars 2020 rover mission Science Team member*, RLS instrument development and operation.

- **Spry JA** (2015-ongoing) Mission support to the NASA Office of Planetary Protection for the New Horizons, OSIRIS-Rex, Parker Solar Probe, ARTEMIS, InSight, MarCO, Solar Orbiter, EM1, EM1 secondary payloads (cubesats) and Psyche.

Contribution to mission planning/concepts

- **Jin, M.,** Served as a Co-I in a NASA Astrophysics SMEX mission proposal (submitted in August, 2019).

- **Kostov VB**. Contributed to mission concept "Pandora: Multiwavelength Characterization of Exoplanets and their Host Stars", to be submitted in response to NNH17ZDA004O.

- **Marcu O** (April-ongoing). WetLab2, 1) demonstrating feasibility in SPM (Sample Prep Module); 2) providing justification for future support of plant missions on the ISS; 3) provided science input for the need for hardware development for deep space mission.

- **Showalter MR**, **Beyer RA**, and **Tiscareno MS** are participating in a Discovery Mission proposal for a centaur reconnaissance mission.

- **Sparks, W.** (see Scowen et al., 2019) technical report.

Telescope Observation Time

- **Rho. J.** Telescope Observing Time: Polarization observations of the supernova remnant Cas A with SOFIA HAWC+ (7 flights in September, 2019).
- **Sparks, W.** As part of a major campaign targeted at Europa's plumes, our program HST GO#15424 to observe transits of Europa across the face of Jupiter using far ultraviolet time resolved imaging with the Hubble Space Telescope executed through the 2019 opposition period, completing final observations in July 2019.
- Unistellar:
    - Everett, C.J., **Marchis**, **F**. (07/19) Unistellar eVscope, 50th Anniversary Apollo 11 event astronomic observations and guests aboard USS Hornet, Alameda CA.
    - **Marchis**, **F**.
        - (09/30). Unistellar eVscope, observations and Citizen Science with Google, Mountain View CA.
        - (09/27). Unistellar eVscope, observations in Golden Gate Park, San Francisco CA.
        - (09/19) Unistellar eVscope, observing the Dumbbell Nebula and other deep sky object from the middle of Paris, France.
        - (09/16) Unistellar eVscope, observing with guests at Park Beaulieu, Geneva, Switzerland.
        - (09/16) Unistellar eVscope, observing M27 with guests in Geneva, Switzerland.

- (09/06) Unistellar eVscope, observations and media, Chabot observatory event.
- (09/03) Unistellar eVscope, Desert Night Life at California Academy of Sciences, San Francisco CA.
- (08/24) Unistellar eVscope, observations and guests, Chabot observatory demonstration, Oakland CA.
- (08/17) Unistellar eVscope, observations and guests with the Commonwealth Scientific and Industrial Research Organisation (CSIRO) and Macquarie University PhysAstro, Queensland, Australia.
- (08/08) Unistellar eVscope, *Sidewalk Astronomy in The Domain* with Macquarie University in Sydney, Australia.
- (08/09) Unistellar eVscope, *Observing with Unistellar @ MQ Observatory* in Sydney, Australia.
- (08/07) Unistellar eVscope, observations and guests with Macquarie University PhysAstro and SciEnginering in Sydney, Australia.
- (08/05) Unistellar eVscope, observations and guests in Sydney, Australia.
- (08/26) Unistellar eVscope, observations and guests at Chabot Observatory in Oakland CA.
- (07/02) Unistellar eVscope, observations and guests for ScienceImage event at the Musée de l'Elysee, Lausanne, Switzerland.

- **Showalter M.** is observing the Pluto system using the Hubble Space Telescope on ten occasions during April–September, 2019.

Strategic Planning/Official Committees/Working Groups

- **Beyer R.** DPS Publications Subcommittee Chair (continuing)
- **Beyer B.** MAPSIT Steering Committee (continuing)
- **Bywaters KB** (ongoing). *NOW RNC,* Research Coordination Network.
- **Cabrol, NA.** Steering Committee Member, NFoLD NASA Astrobiology Research Network Coordination.
- **Cabrol, NA.** Member of the NASA OPAG Roadmap to Ocean Worlds (ROW).
- **Cabrol, NA**. Member of the MEPAG Science Analysis Group (SAG) *Scientific Objectives for the Human Exploration of Mars* (HSO-SAG) since March 2015.
- **Caldwell, D.** Served on NASA ROSES Review Panel (July 2019)
- **Clark, C**. Member of the NASA SciAct Education Technology Working Group
- **Harman, P.K**.. Member of the NASA SciAct Women in STEM Affinity Group
- **Jin, M.,** Served on NASA Review Panel at Washington DC
- **Marcu O.** (April-ongoing). Speakers Committee, Palo Alto Rotary Club, purpose is to provide community engagement of business and professional advocates.
- **Obbard, RW.** Chair, High Energy Panel, NASA PICASSO 2019, (NASA Planetary Science Division). February 2020 (exact dates TBD)
- **Paganelli F.** WGCCRE - Member (continuing).
- **Paganelli** F. served in NRA in an Astrophysics
- **Race MS** (ongoing). *International Encyclopedia of Astrobiology*, Editor, 3rd Edition, Planetary Protection Section.
- **Race MS** (ongoing). *Astrobiology in the Real World.* Assoc. Editor, Astrobiology journal, Commentary section.
- **Rummel JD** (2017-Present). The Hague International Space Resources Governance Working Group. *Leiden, The Netherlands* (COSPAR Representative).
- **Rummel JD** (2016-Present). Chair, Science Advisory Board, SETI Institute.
- **Showalter M.** National Academies study of NASA/SMD's Science Activation Program:
- **Sobron P** (ongoing). ISSI/ISSI-BJ International Teams in Space and Earth Sciences. Member in: Cross-calibration of Laser-Induced Breakdown Spectroscopy (LIBS) instruments for planetary exploration.
- **Sobron P** (ongoing). NASA's Network For Life Detection (NFoLD) Research Coordination Network.
- **Sparks, W.** (see Scowen et al., 2019) technical report.

- **Spry JA** (Ongoing to May 2019) Co-organizer (with G Kminek, **M Race** & B Siegel) of the 3rd COSPAR Workshop on Refining the Planetary Protection Requirements for Human Extraterrestrial Missions, to be held in Houston TX.
- **Spry JA** (ongoing) *Member of the EU-funded Planetary Protection for the Outer Solar System (PPOSS) team*, with training presentations made in Pasadena (at COSPAR in July), Bremen (at the IAC in October) and Beijing (at CAST in October) as well as a technical meeting on planetary protection for Europa held in Florence (September).
- **Spry JA** (Nov 2018 - ongoing) Participant/Executive Secretary in the Planetary Protection Technology Brainstorm Group.
- **Spry JA** (Sept 2018 - ongoing) Member of the NASA working groups for revision of the Documents NPR8020.12 Planetary Protection Provisions for Robotic Extraterrestrial Missions, and (with **A Baker**) NASA STD 6022 Implementing Planetary Protection Requirements for Robotic Space Flight.